Spring
Scheme of learning

Year 2

White Rose MATHS

#MathsEveryoneCan

Spring Block 1

Money

© White Rose Education 2022

White Rose MATHS

Small steps

Step 1	Count money – pence
Step 2	Count money – pounds (notes and coins)
Step 3	Count money – pounds and pence
Step 4	Choose notes and coins
Step 5	Make the same amount
Step 6	Compare amounts of money
Step 7	Calculate with money
Step 8	Make a pound

© White Rose Education 2022

Small steps

Step 9	Find change
Step 10	Two-step problems

© White Rose Education 2022

Count money – pence

Notes and guidance

In this small step, children count money in pence. They should be able to recognise coins based on their real-life experience, as well as earlier learning in Year 1, but may need a quick recap on each coin and its value. They may need to be formally introduced to the term "worth" and its meaning in this context. Although children may have seen values written as, for example, "5p" meaning 5 pence, some might need to be explicitly introduced to this notation.

Children use their knowledge from place value and addition and subtraction to find the total value of a set of coins, with all answers being less than £1. They should be able to count up in 1ps, 2ps, 5ps and 10ps, and use related facts to count up in 20ps, as well as finding the total of a mixed set of coins.

Children do not need to convert between pounds and pence, so while they must be able to recognise a 50p coin, they do not need to count up in 50ps.

Things to look out for

- Children may think that a bigger coin is greater in value, for example 2p is worth more than 5p.
- Children may simply count the number of coins, rather than consider their value.

Key questions

- What is this coin worth?
- Which coin is worth more?
- How many _____ are there?
- What is the total value of _____ 1p/2p/5p/10p coins?
- How does counting in 2s help you to count in 20s?
- How much money is there altogether?
- Which coins did you count first?

Possible sentence stems

- There are _____ _____ p coins.

  The total value of the coins is _____ p.
- There are _____ _____ p coins and _____ _____ p coins.

  The total value of the coins is _____ p.

National Curriculum links

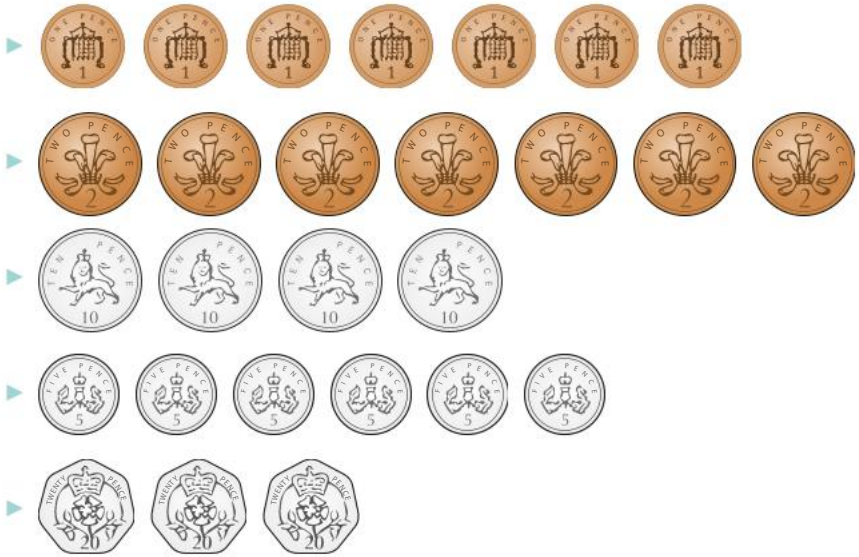
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Count money – pence

Key learning

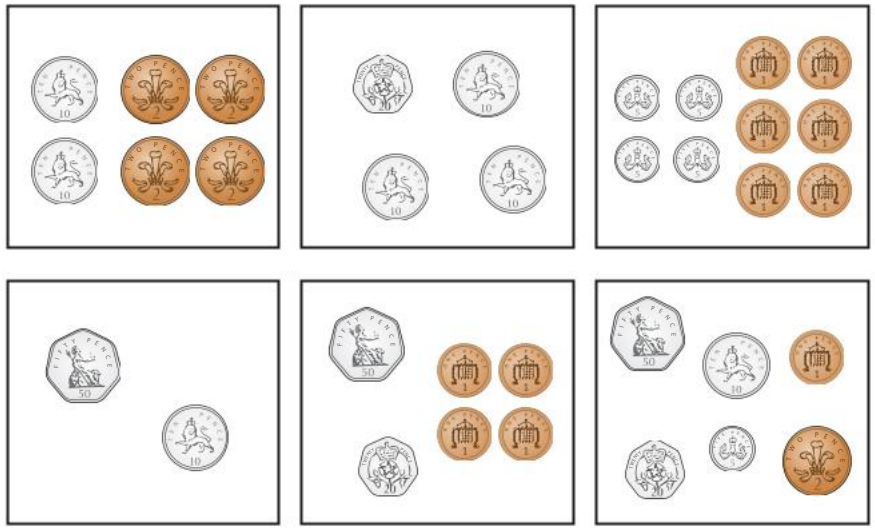
- Count the money.



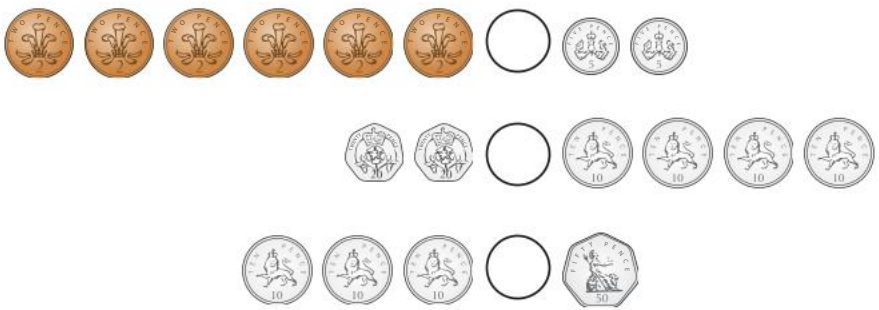
- Complete the sentences to count the money.

- There are _____10p coins.
  The total value is _____p.
- There are _____1p coins.
  The total value is _____p.
- There is _____p altogether.

- How much money is in each box?



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



© White Rose Education 2022

Count money – pence

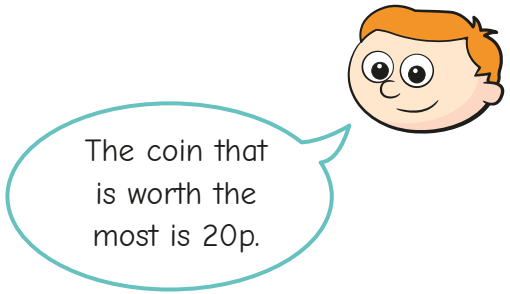
Reasoning and problem solving

Give children a selection of 1p, 2p, 5p, 10p and 20p coins and challenge them to make 20p in each denomination.

Ask them how many coins they use each time. What do they notice?

various answers

Ron has three different coins.



How much money could Ron have?

multiple possible answers, e.g. 23p, 26p, 35p

Kim has some coins.

What coins could be in the purse?

Talk about it with a partner.

multiple possible answers, e.g. 1 × 10p and 2 × 1p

Get children to work in pairs counting different sets of coins.

Ask them to describe how they count them.

Encourage children to count coins of the highest value first.

Answers will vary, depending on the sets of coins.

© White Rose Education 2022

Count money – pounds (notes and coins)

Notes and guidance

In this small step, children count money in pounds. They should be able to recognise both notes and coins based on their real-life experience, as well as earlier learning in Year 1, but may need a quick recap on each note or coin and its value.

Although children may have seen values written as, for example, "£5", meaning 5 pounds, some might need to be explicitly introduced to this notation. Children use their knowledge from place value and addition and subtraction to find the total value of a set of notes and coins. All answers will be less than £100. They should be able to count up in £1s, £2s, £5s and £10s, and use related facts to count up in £20s, as well as being able to find the total of mixed sets of notes and coins.

Children do not need to count beyond 100, so while they must be able to recognise a £50 note and know that two £50 notes are £100, they do not need to go beyond this.

Things to look out for

- Children may think that coins are always pence.
- Children may forget to write "£" with their answer.
- Children may simply count the number of notes/coins, rather than consider their value.

Key questions

- What is this coin/note worth?
- Which coin/note is worth more?
- How many _____ are there?
- What is the total value of _____ £1/£2 coins?
- What is the total value of _____ £5/£10/£20/£50 notes?
- How much money is there altogether?
- Which did you count first?

Possible sentence stems

- There are _____ _____ coins/notes.

  The total value is £ _____
- There are _____ _____ coins/notes and _____ _____ coins/notes.

  The total value is £ _____

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Count money – pounds (notes and coins)

Key learning

- Count the money.

- Complete the sentences to count the money.

- There is _____ £50 note.

  The total value is £ _____

- There are _____ £1 coins.

  The total value is £ _____

- There is £ _____ altogether.

- Complete the bar models.

- Match the money to the correct total.

£25 £60 £10

- How much money is in each box?

© White Rose Education 2022

Count money – pounds (notes and coins)

Reasoning and problem solving

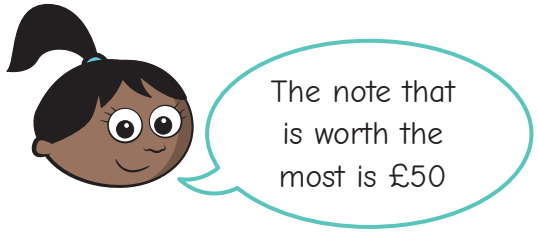
Give children a selection of £1 and £2 coins and £5, £10 and £20 notes.

Challenge them to make £20 in each denomination.

Ask them how many coins or notes they use each time. How many other ways can they make £20?

multiple possible answers

Sam has three different notes.



How much money could Sam have?

£65, £75 or £80

Max has this money.

Is Tiny correct?

Explain your answer.

Mo has the same note and coins as Max, and one extra note.

How much money could Mo have?

No

£21, £26, £36 or £66

© White Rose Education 2022

Count money – pounds and pence

Notes and guidance

In this small step, children combine their learning from the previous two steps to count money in both pounds and pence. Decimal notation is not introduced in Key Stage 1, so children will represent amounts using "and", for example £5 and 30p, rather than £5.30

As the notation of "£" and "p" may have been new to children in the previous steps, they may need reminding of these to ensure that they are using them correctly.

Children will not count across £1, so the pence value will always be less than 100p. Also, as children do not go beyond 100 in Year 2, all the pound values will be less than £100

Encourage children to consider and count pounds and pence separately before combining them. It is important that they can interpret the values they have written down, for example reading "£5 and 30p" as "5 pounds and 30 pence".

Key questions

- What is this coin/note worth?
- Which coin/note is worth more?
- What is the total value of _____ £ _____ notes/coins?
- What is the total value of _____ _____ p coins?
- How much money is there altogether?

Possible sentence stems

- There are _____ £ _____ coins/notes.

  The total value of the coins/notes is £ _____
- There are _____ _____ p coins.

  The total value of the coins is _____ p.
- There is £ _____ and _____ p altogether.

Things to look out for

- Children may mix up pounds and pence.
- Children may simply count the number of notes/coins, rather than consider their value.

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Count money – pounds and pence

Key learning

- Complete the sentences to count the money.

  - There are _____ £10 notes.

    The total value is £ _____
  - There are _____ 2p coins.

    The total value is _____ p.
  - There is £ _____ and _____ p altogether.

- How much money is there?

  -
  -

- How much money is there?

  -
  -
  -

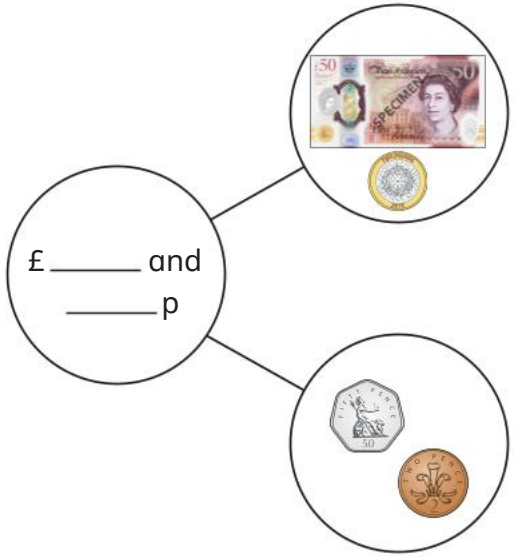
- Fill in the missing numbers to make the statements correct.
  - £10 + £5 + 50p = £ _____ and _____ p
  - £20 + £2 + 10p + 10p + 2p = £ _____ and _____ p
  - £5 + £ _____ + 50p + 20p + 20p + 1p = £10 and _____ p

© White Rose Education 2022

Count money – pounds and pence

Reasoning and problem solving

Complete the part-whole model.



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

£52 and 52p

Tiny has this money.

Is Tiny correct?

Explain your answer.

No

© White Rose Education 2022

Choose notes and coins

White Rose MATHS

Notes and guidance

In this small step, children build on the learning from earlier in the block, choosing notes and coins to make a given amount. Children select notes and coins from a bigger set, reinforcing their learning on counting money as a method of checking their answers.

Initially, children focus on selecting pounds or selecting pence, explicitly focusing on notes and coins separately, before going on to choose both pounds and pence from a set of notes and coins. Children do not need to choose an amount where they need to combine pence to make a pound. Children should be stretched to consider whether there is more than one way of selecting the given amount from the money that they have. Alternatively, they could be given limitations, for example "Choose three coins that have a total of 25p."

Things to look out for

- Children may confuse pounds and pence.
- Children may confuse the notation for pounds and pence.
- Children may select the number of coins, for example choosing any three coins for 3p, rather than considering value.

Key questions

- How much money do you need?

  How much money have you got?

  How much more money do you need?
- How do you know you have made _____?
- Can you find another way to make the same amount?
- Does it matter if you count the pounds or pence first?
- Does swapping _____ for _____ change the total?

Possible sentence stems

- There are _____ £ _____ notes/coins.

  There are _____ _____ p coins.

  There is £ _____ and _____ p in total.

National Curriculum links

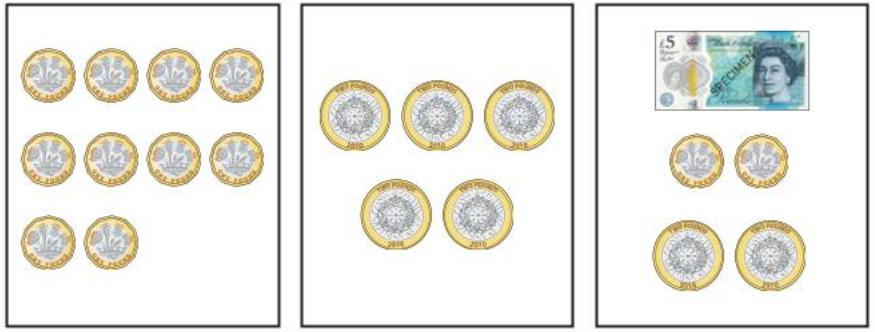
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Choose notes and coins

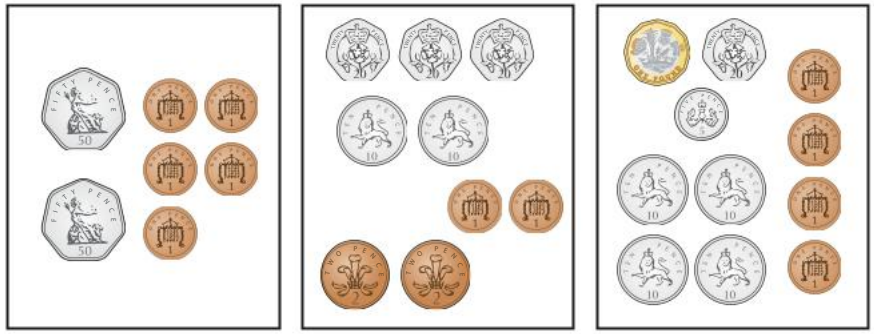
Key learning

- Choose £6 from each box.



Compare answers with a partner.

- Choose 53p from each box.



Compare answers with a partner.

- Choose £2 and 56p.

Can you choose different coins?

- Choose £45 and 18p.

Can you choose the same amount a different way?

- Draw money to show each amount.

£6	£6 and 75p	£21 and 32p
75p	£5 and 53p	£13 and 40p

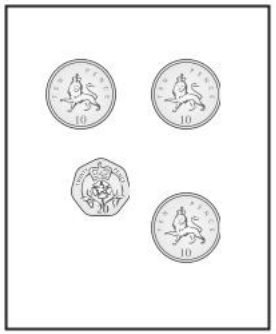
© White Rose Education 2022

Choose notes and coins

Reasoning and problem solving

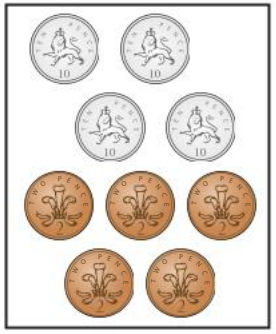
Which box does **not** show 50p?

A

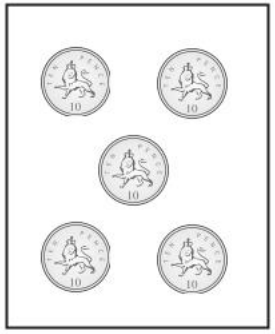


B

C



D



How do you know?

B

Use the money to fill the purses.

You can use each note or coin only once.

multiple possible answers, e.g.

£10 and 15p:
£5, 2 × £2, £1, 10p, 5p

£5 and 51p:
£2, 3 × £1, 2 × 20p, 10p, 1p

© White Rose Education 2022

Make the same amount

Notes and guidance

In this small step, children explore different ways of making the same amount. They may have had some experience of this earlier if there was more than one way to choose a given amount from a set of coins, but here they focus on it explicitly. As in the previous step, children are not required to count in pence to make a pound, as this will be looked at later.

This step follows a similar structure to the previous one, where children are first exposed to only pounds or only pence, before looking at examples that include both pounds and pence. When looking at such examples, it is useful to model a strategic approach where first the pounds are made and then the pence, to avoid children confusing the two.

Children could start by making the amount in one way, before swapping notes/coins for other notes/coins that make the same value. For example, they could swap a 20p coin for two 10p coins to make the same amount.

Things to look out for

- Children may confuse pounds and pence.
- When swapping coins for others with the same value, children may not remove the coin they are swapping, so they no longer have the correct amount.

Key questions

- Can you make the same amount a different way?
- How do you know the amount is the same?
- What can you swap a £20 note for to keep the amount the same?
- Can you swap any notes/coins to make the same amount?
- What is the fewest number of coins you can use to make _____?

Possible sentence stems

- One £_____ note is worth the same as two £_____ notes.
- One £_____ coin is worth the same as two £_____ coins.
- One _____ is worth the same as _____
- I know the amount is the same because ...

National Curriculum links

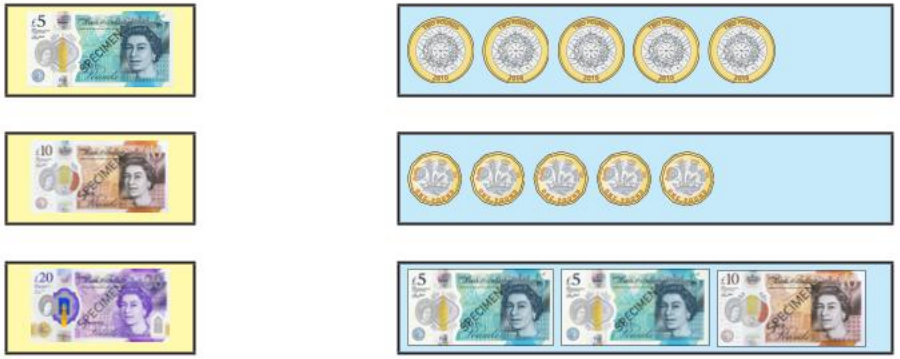
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

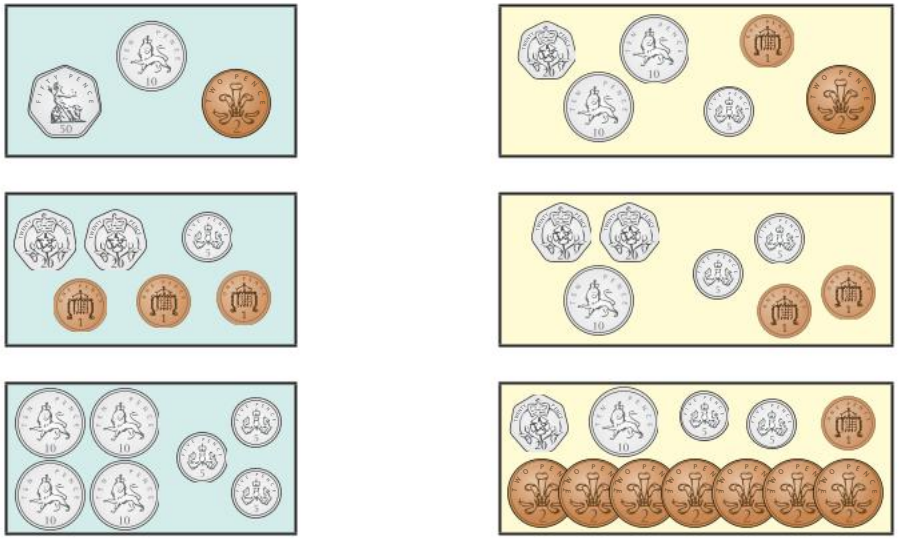
Make the same amount

Key learning

- Match the amounts that are the same.

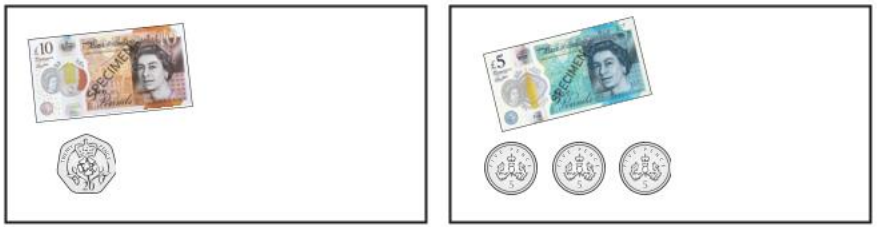


- Match the amounts that are the same.



- Match the amounts that are the same.

- Draw money so that each box has £12 and 35p.



- How many ways can you make £4 and 26p?

  Compare answers with a partner.

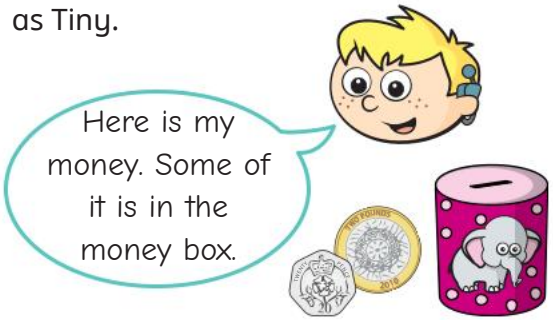
© White Rose Education 2022

Make the same amount

Reasoning and problem solving

Tiny has this money.

Max has the same amount of money as Tiny.



What coins could Max have in the money box?

Compare answers with a partner.

multiple possible answers, e.g. 50p, 20p, 2p, 2p, 2p

Mo has some money.

What is the fewest number of coins that Mo could have?

How do you know?

four

Miss Rose has £39 and 21p.

She has four notes and five coins.

What notes and coins has Miss Rose got?

Is there more than one answer?

multiple possible answers, e.g. 3 × £5, 1 × £20, 2 × £2, 2 × 10p and 1 × 1p

© White Rose Education 2022

Compare amounts of money

Notes and guidance

In this small step, children compare amounts of money using the language of "greater than", "less than", "most" and "least", together with the inequality symbols. As inequality symbols are often a sticking point for children, they may need a reminder of the meaning of each symbol before continuing with the step.

Children compare amounts of money that are made up of both pounds and pence, but they only need to focus on one of these, as the other will be the same. For example, they may compare £3 and 20p with £3 and 60p, where £3 is the constant, or compare £4 and 50p with £7 and 50p, where 50p is the constant. They should recognise that since one part is the same, they can just compare the other.

It is important that children know that £1 is worth more than 1p, so if they compare £3 with 3p, then they know that £3 is worth more.

Things to look out for

- Children may only compare the numerical values and not consider the units.
- Children may only consider the quantity of notes/coins rather than their value.

Key questions

- Which is worth more, £1 or 1p? How do you know?
- How much money is there?
- If the number of pounds is the same, what can you compare?
- If the number of pence is the same, what can you compare?
- Which amount is the greatest/smallest? How do you know?
- Who has the least/most money? How do you know?

Possible sentence stems

- £3 and _____ p is greater than £3 and _____ p because ...
- £ _____ and 20p is less than £ _____ and 20p because ...
- I know that £ _____ and _____ p is greater/less than £ _____ and _____ p because ...

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Compare amounts of money

Key learning

- Which note is worth the most?

How do you know?

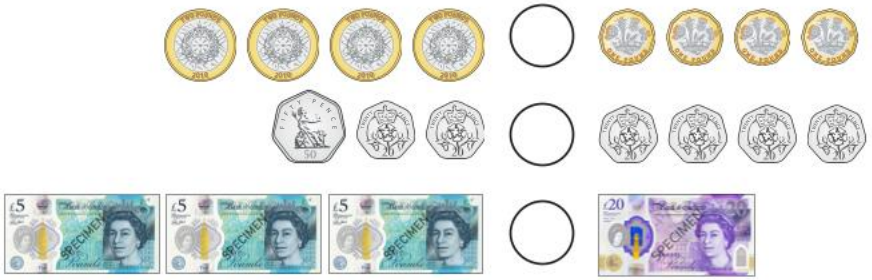
- Which coin is worth the least?

How do you know?

- Which is the greatest amount of money?

How do you know?

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



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

£3 and 56p ◯ £3 and 72p

£5 and 29p ◯ £1 and 29p

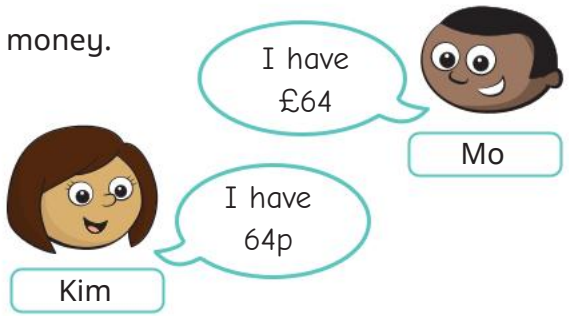
£21 and 50p ◯ £21 and 7p

- Mo and Kim have some money.

Who has more money?

Who has less money?

How do you know?



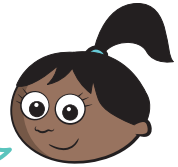
© White Rose Education 2022

Compare amounts of money

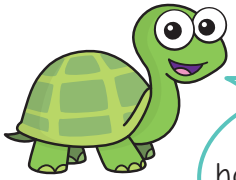
Reasoning and problem solving

Ron and Sam each have three coins.

Ron: One of my coins is a 50p coin.



Sam: One of my coins is a 10p coin



Tiny: Ron must have more money than Sam.

Do you agree with Tiny?

Talk about it with a partner.

No

Jo, Max and Kim each have some money.

Jo: I have £4 and 52p.

Max: I have £4 and 81p.

Kim: I have £2 and 52p.

Who has the most money?

Who has the least money?

How do you know?

Dan has more money than Jo, but less money than Max.

How much money could Dan have?

Max

Kim

any amount between £4 and 52p and £4 and 81p

© White Rose Education 2022

Calculate with money

White Rose MATHS

Notes and guidance

In this small step, children combine their learning from an earlier block on addition and subtraction with their new learning on money to perform calculations involving money. They need to be able to find the total cost or find the difference in prices.

As children have not converted between pounds and pence, none of the calculations will require an exchange from pence to pounds.

When finding the total, children should be encouraged to consider different methods such as counting on, partitioning and regrouping. When finding the difference, children should explore both counting on and counting back. They can compare and contrast methods to decide which one is more efficient.

Things to look out for

- Children may add all the numbers rather than adding the pounds and pence separately, for example thinking that the total of £3 and 10p and £2 and 10p is £25 or 25p, because 3 + 10 + 2 + 10 = 25
- When finding the difference, the language in the question may confuse children. For example, when asked to find how much more somebody has, they may think they need to add because of the word "more".

Key questions

- What does "total" mean?
- What does "difference" mean?
- How many pounds/pence are there altogether?
- How many more pounds/pence are there?
- How much more money does _____ need?

Possible sentence stems

- £ _____ plus £ _____ is equal to £ _____

  _____ p plus _____ p is equal to _____ p.

  £ _____ plus _____ p is equal to £ _____ and _____ p.
- The difference between £ _____ and £ _____ is £ _____

  The difference between _____ p and _____ p is _____ p.

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Calculate with money

Key learning

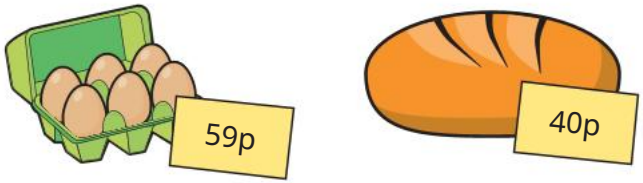
- Complete the bar models.

- How much more does the chocolate bar cost than the sweet?

- How much more money does Kay have than Ann?

Ann **Kay**

- Mr Lee buys these two items.



How much does he spend?

- Ben buys a magazine and a carton of juice.
  - How much does Ben spend?

Fay buys a teddy and a magazine.
  - How much does Fay spend?
  - How much more does a teddy cost than a magazine?

- Jo has £2 and 15p.

Tom has £2 and 40p.
  - How much money do they have altogether?
  - How much more money does Tom have than Jo?

© White Rose Education 2022

Calculate with money

Reasoning and problem solving

Here is a price list.

Item	Price
ruler	18p
pencil	32p
crayon	27p
pen	45p
glue	36p

Sam buys two items for 50p.

What two items does she buy?

Mo buys two of the same item for 90p.

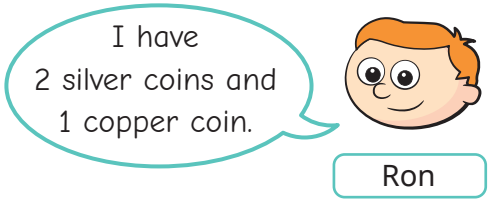
What item did he buy two of?

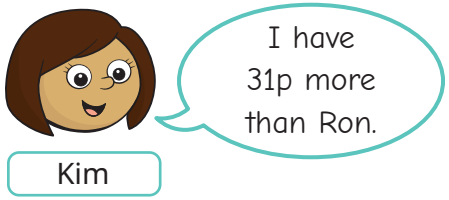
How much could Tiny have spent?

ruler and pencil

pen

Kim and Ron have some money.





What coins does Ron have?

20p, 5p and 1p

© White Rose Education 2022

Make a pound

Notes and guidance

In this small step, children explore for the first time the equivalence of £1 and 100p.

It is essential for children to understand that £1 is equal to 100p or that £1 is made up of 100 pence. Using this knowledge, they should be able to make £1 in different ways and using a variety of coins. This will support them later in the block when they work out change, as being able to make £1 in different ways will mean that children will find it easier to find change from £1

Children use their knowledge of bonds to 100 from earlier learning to support them, both working with tens and working with tens and ones. When working with just tens, children should know that, for example, 30 + 70 = 100, but should then realise that since there is not a 30p or 70p coin, this on its own cannot be used to make a pound.

As children do not go beyond 100, there is no need for them to know related facts for other whole pounds.

Things to look out for

- Children may focus on using only multiples of the same coin to make £1, rather than combining different coins.
- Children may not use combinations of 1p or 2p coins and focus only on coins with a higher value.

Key questions

- How many pence are there in £1?
- Can you make £1 using _____ p coins?
- Can you make £1 using different coins?
- How do you know you have £1?
- How do bonds to 100 help you make £1?
- 70 + 30 = 100, so can you make £1 using a 70p coin and a 30p coin? How do you know?

Possible sentence stems

- One pound is equal to _____ pence.
- There are _____ _____ p coins in £1
- _____ + _____ = 100, so _____ p + _____ p = £1

National Curriculum links

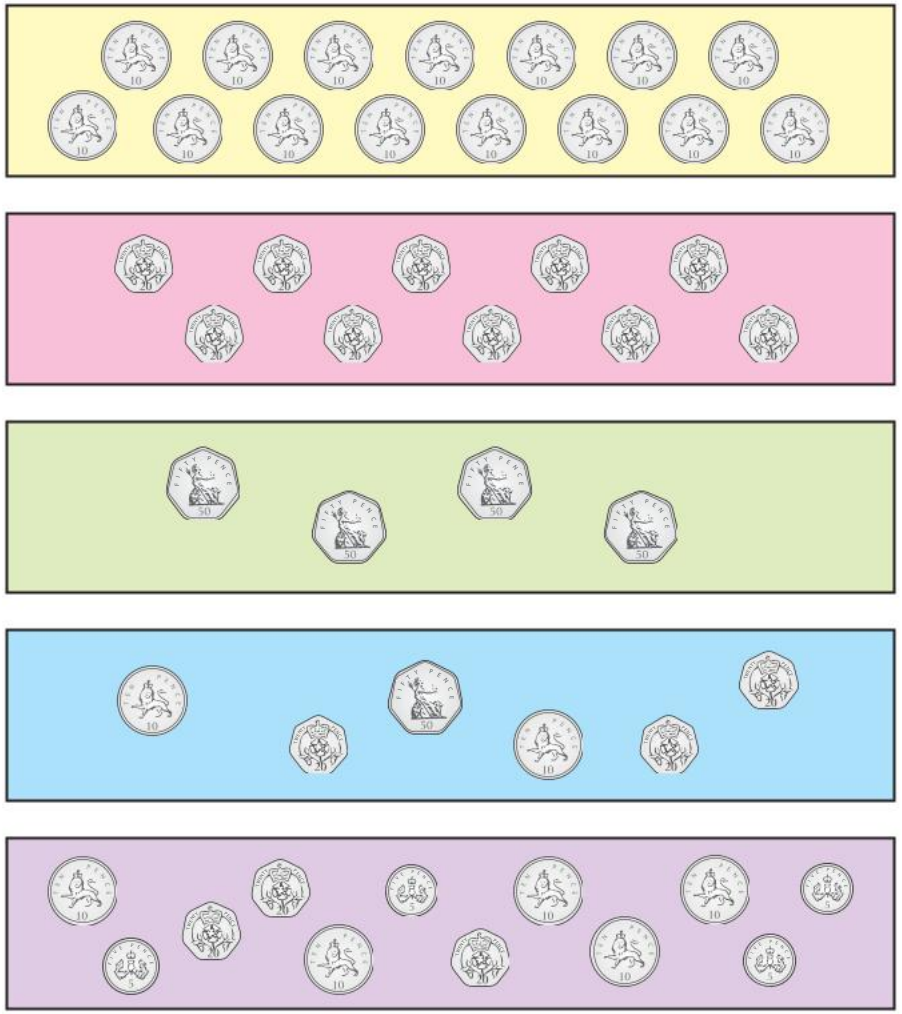
- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Make a pound

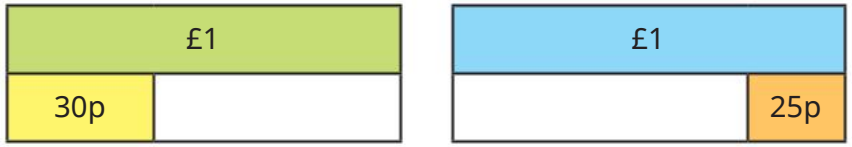
Key learning

- For each set of money, choose coins to make £1



- Draw money so that each purse has £1

- Complete the bar models.



- Complete the additions.
  - 50p + _____ p = £1
  - 10p + _____ p = £1
  - _____ p + 55p = £1
  - £1 = _____ p + 28p

© White Rose Education 2022

Make a pound

Reasoning and problem solving

Ask children to make £1 using the same value of coin.

- only 50p coins
- only 20p coins
- only 10p coins
- only 5p coins
- only 2p coins
- only 1p coins

Ask them what patterns they can see.

When children have established the relationship between coin value and number of coins, ask them to find the maximum and minimum number of coins they can use to make £1

Discuss what happens if they use different denominations rather than all the same.

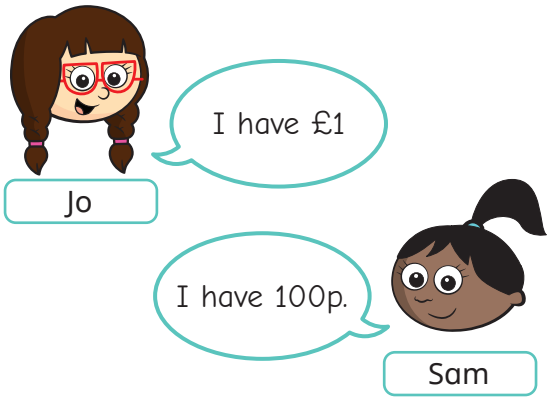
50p: 2; 20p: 5; 10p: 10; 5p: 20; 2p: 50; 1p: 100

The greater the coin value, the fewer coins are needed.

100 1p coins

1 £1 coin

Jo and Sam have some money.



Who has more money?

How do you know?

They have the same amount.

Dan has 20 of the same coin.

He has £1 altogether.

What coin does Dan have 20 of?

How do you know?

5p

© White Rose Education 2022

Find change

Notes and guidance

The focus of this small step is on finding change from £1. Children explore a variety of different methods of calculating change. They could start by making £1 using different coins, building on the learning from the previous step, then remove the coins that are spent and count what is left. They could then go on to use more abstract methods, such as counting back and counting on, using a number line. When children are confident in calculating change from £1, they can explore finding change from other whole pounds.

The examples used should be as realistic as possible in terms of the amounts involved, for example finding change from £5 (a note that exists) versus finding change from £4 (which has no specific coin or note).

Things to look out for

- Children may not understand the meaning of the word "change" in this context, so this might need explaining.
- Children may give their answer in pounds rather than pence, because the amount they are finding change from is given in pounds.
- Children may struggle when their calculations involve an exchange.

Key questions

- How many pence are there in one pound?
- How else can you make £1?
- How much money does _____ have?

  How much money does _____ spend?

  How much change will _____ get?
- If you have £ _____ and spend _____ p, how much change will you get?

Possible sentence stems

- One pound is equal to _____ pence.
- 100 – _____ = _____, so £1 – _____ p = _____ p

  The change from £ _____ is _____ p.

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

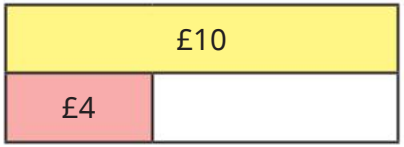
Find change

Key learning

- Kay has £10

  She buys a book for £4

  Complete the bar model.



  How much change does Kay get?

- Ben has this money.

  - How much money does Ben have?

  He spends 30p on some sweets.

  - How much does he have left?

- Ann has this money.

  She spends 65p.

  How much does she have left?

- Tom has £1 and spends 40p.

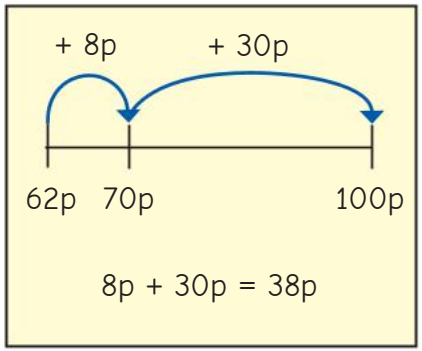
  How much change does Tom get?

- Fay and Max each have a £1 coin.

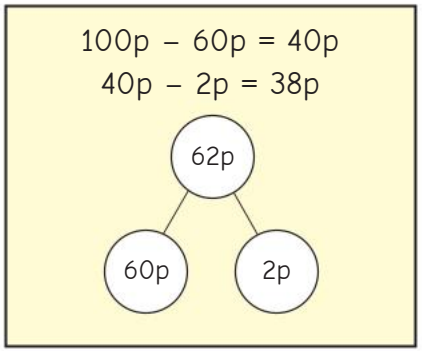
  They want to work out how much change they will get if they spend 62p.

  Here are their methods.

Fay



Max



Use one of the methods to work out the change from £1 when you spend each amount.

- 61p
- 97p
- 24p
- 13p
- 78p
- 36p

© White Rose Education 2022

Find change

Reasoning and problem solving

Kim pays for a chocolate bar with a £1 coin.

Here is her change.

How much was the chocolate bar?

How do you know?

69p

Mo pays in a shop with a £1 coin.

He gets one coin as change.

How much money could Mo have spent?

Talk about it with a partner.

99p, 98p, 95p, 90p, 80p or 50p

Ron buys two of these items.

He gets 35p change.

Which items does Ron buy?

pencil and pen

Max buys a chew bar for 9p.

He pays with a £10 note.

Do you agree with Tiny?

Explain your answer.

No

© White Rose Education 2022

Two-step problems

Notes and guidance

In this small step, children bring together all their learning from this block to complete two-step problems involving money. This step requires children to find the total, find the difference and calculate change, and combinations of all three within the same question.

Children must work out what they need to do first in the context of the question and may need support with this initially.

Finding the total can now include pairs of values that sum to a whole pound as children have explored this in a previous step. They continue to only calculate change from whole pounds.

The use of play money, number lines and part-whole models can support children in performing calculations, and bar models can be a useful way of representing a question to help children understand what they need to do.

Things to look out for

- Children may struggle with the maths because they are overwhelmed by the context of a question.
- Children may not understand what they need to do first.
- Children may perform calculations in the incorrect order.

Key questions

- How much money is there in total?
- How much money is spent?
- What is the total cost of _____ and _____?
- How much more does _____ cost than _____?
- What is the difference in price?

Possible sentence stems

- The total cost of _____ and _____ is £ _____ and _____ p.
- If I pay with a _____ note/coin, I will get _____ change.
- _____ costs _____ more/less than _____
- The difference in price between _____ and _____ is _____

National Curriculum links

- Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value
- Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

© White Rose Education 2022

Two-step problems

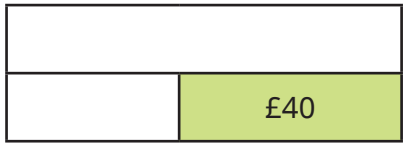
Key learning

- Kay has £33 in the bank.

  She is given £40 more.

  - How much money does Kay have now?

    Complete the bar model and number sentence.



_____ + _____ = _____

She buys a top for £25

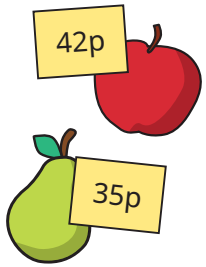
  - How much money does she have now?

    Complete the bar model and number sentence.

_____ – _____ = _____

- An apple costs 42p. A pear costs 35p.

  - What is the total cost of an apple and a pear?



  Dan buys an apple and a pear.

  He pays with a £1 coin.

  - How much change does he get?

- A coat costs £18

  A T-shirt costs £5 less than a coat.

  - How much does a T-shirt cost?

  Ben buys a coat and a T-shirt.

  - How much does Ben spend?

  He pays with a £50 note.

  - How much change does he get?

- A scarf is £12 and a bag is £25

  Sam buys one of each.

  She pays with a £50 note.

  How much change does she get?

- A book costs £3 and 40p.

  A magazine costs £1 and 30p less than the book.

  What is the total cost of a book and a magazine?

© White Rose Education 2022

Two-step problems

Reasoning and problem solving

Jo buys two items.

She pays with three £20 notes.

Which items did Jo buy?

How do you know?

jumper and shorts

A cinema ticket costs £7 and 35p.

A cinema ticket costs £4 and 10p more than a tub of popcorn.

Explain the mistake that Tiny has made.

£4 and 40p

Max buys a cinema ticket and a tub of popcorn.

He pays with this money.

How much change does he get?

© White Rose Education 2022

Spring Block 2

Multiplication and division

© White Rose Education 2022

White Rose MATHS

Small steps

Step 1	Recognise equal groups
Step 2	Make equal groups
Step 3	Add equal groups
Step 4	Introduce the multiplication symbol
Step 5	Multiplication sentences
Step 6	Use arrays
Step 7	Make equal groups – grouping
Step 8	Make equal groups – sharing

© White Rose Education 2022

Small steps

Step 9	The 2 times-table
Step 10	Divide by 2
Step 11	Doubling and halving
Step 12	Odd and even numbers
Step 13	The 10 times-table
Step 14	Divide by 10
Step 15	The 5 times-table
Step 16	Divide by 5

© White Rose Education 2022

Small steps

Step 17	The 5 and 10 times-tables

© White Rose Education 2022

Recognise equal groups

Notes and guidance

In this block, children make the connection between repeated addition and multiplication. In this small step, they start to make this connection by recognising equal groups.

It is important that children explore both equal and unequal groups, so that they are able to identify when groups are or are not equal and explain why. At this point, the addition and multiplication symbols are not used, but the language around this can still be used to support learning later in the block.

Sentence stems are used in this step to support children in identifying the groups, finding how many are in each group and developing language around repeated addition. Children use this knowledge over the next set of steps to complete multiplication calculations as repeated addition.

Things to look out for

- Children may not be able to spot equal and unequal groups.
- Children may try to find the total instead of finding the amount in each group.
- Children may not realise that two groups are equal if they do not look the same.

Key questions

- Are the groups equal or unequal? How do you know?
- How can you make the groups equal?
- How many groups are there?
- How many are in each group?
- What is the same and what is different about these two pictures?
- Do all equal groups look the same?

Possible sentence stems

- There are _____ equal groups.

  There are _____ in each group.
- There are _____ groups of _____

  There are _____ altogether.
- The groups are equal/unequal because ...

National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

© White Rose Education 2022

Recognise equal groups

Key learning

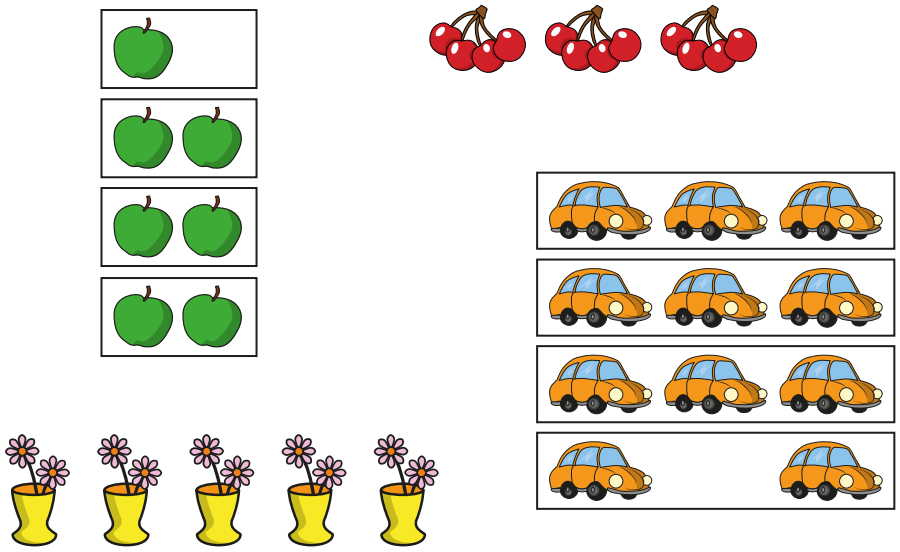
Take children outside and ask them to gather 10 objects.

Tell children to put their objects into groups.

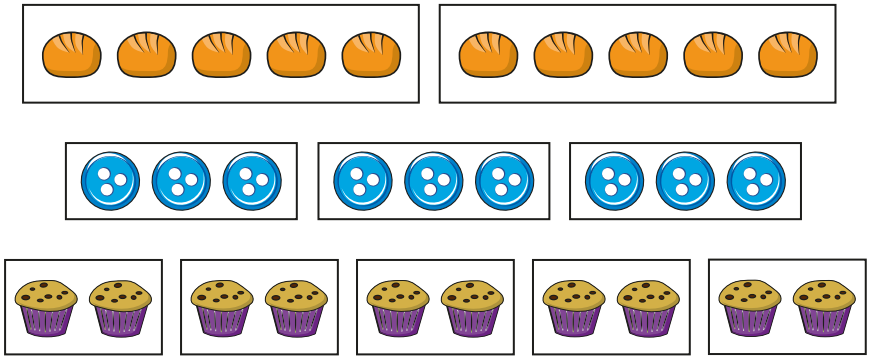
Discuss with them what they notice about their groups.

- Which pictures show equal groups?

  Which pictures show unequal groups?



- Complete the sentences for each set of pictures.



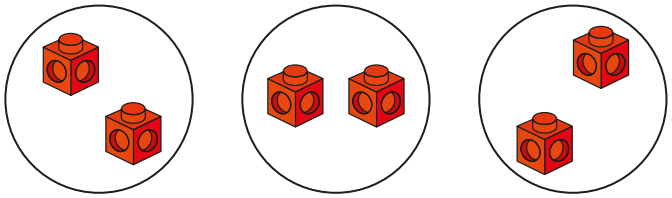
There are _____ equal groups.

There are _____ in each group.

There are _____ groups of _____

There are _____ altogether.

- Are the groups equal?



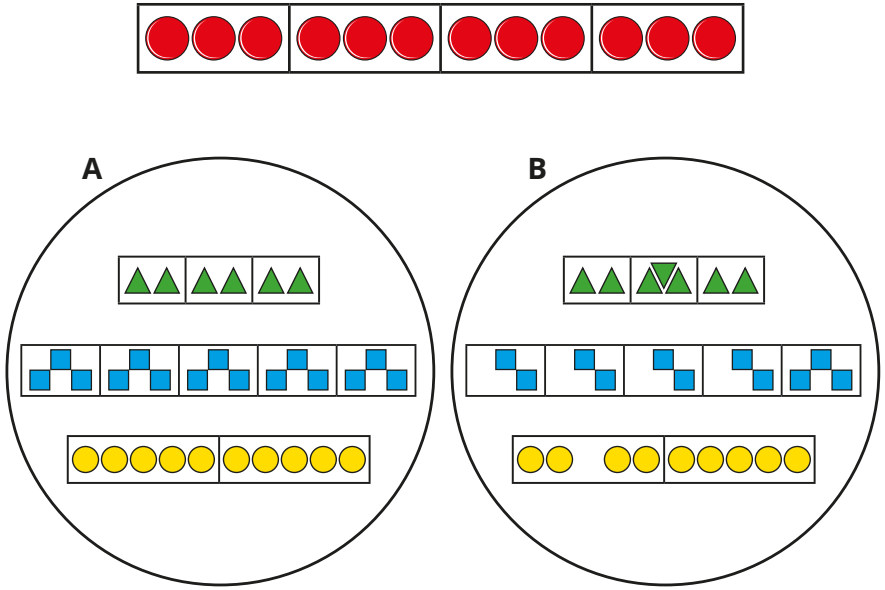
How do you know?

© White Rose Education 2022

Recognise equal groups

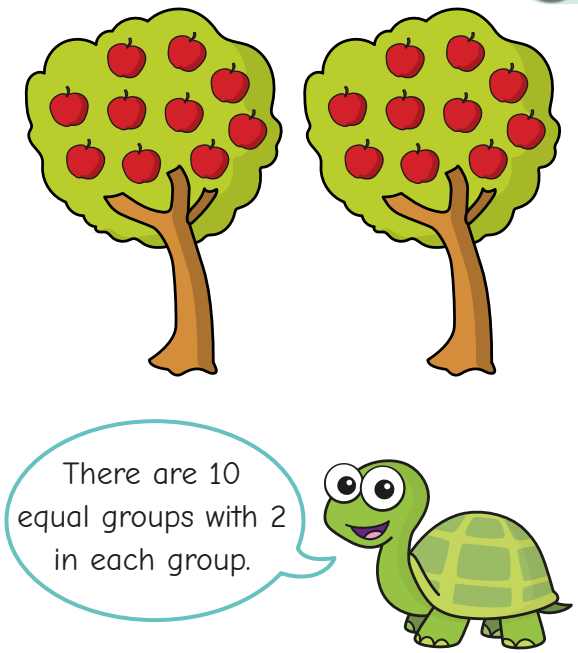
Reasoning and problem solving

Which circle do the groups of counters belong to?



Explain your answer.

A



Do you agree with Tiny?

Explain your answer.

No

© White Rose Education 2022

Make equal groups

Notes and guidance

In this small step, children move on from identifying equal groups to making equal groups with a given number of objects.

Children begin this step by identifying equal groups and matching equal groups to numerals and words. It is important that children can identify these groups accurately. They also represent equal groups by using concrete resources or drawing pictures, including completing a partly filled picture.

Children should be able to represent, for example, 4 groups of 3 as well as 3 groups of 4 accurately and know what is the same and what is different about the two forms. This could be a good opportunity to explore the idea of commutativity.

In the next step, children add equal groups as a repeated addition.

Things to look out for

- Children may not be able to recognise equal groups.
- When given a picture of incomplete groups, children may find it difficult to complete it to show a set number of equal groups.
- Children may represent a set of equal groups incorrectly, for example 2 groups of 4 instead of 4 groups of 2

Key questions

- Are the groups equal?
- How do you know if a group is equal or not equal to another group?
- How can you make these groups equal?
- How many equal groups can you put these counters into?
- Can you draw _____ groups of _____?
- How are 4 groups of 3 different from 3 groups of 4?

Possible sentence stems

- There are _____ equal groups with _____ in each group.
- There are _____ in each group.
  There are _____ equal groups.

National Curriculum links

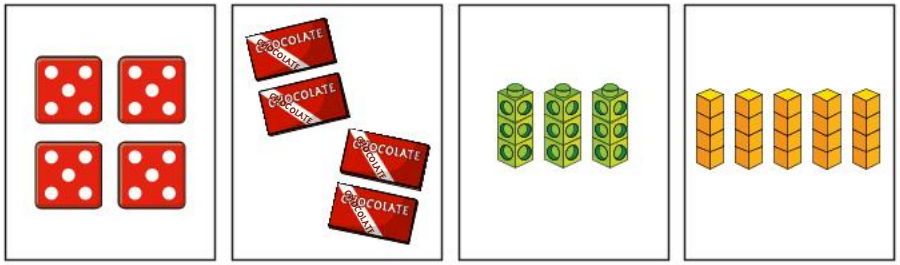
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

© White Rose Education 2022

Make equal groups

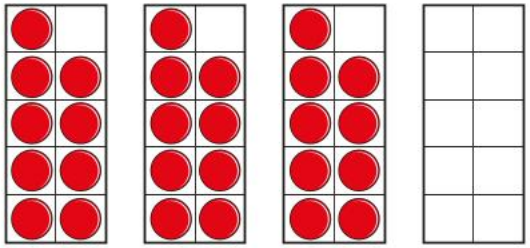
Key learning

- Match the pictures to the labels.



5 groups of 4	2 groups of 2	4 groups of 5	3 groups of 3

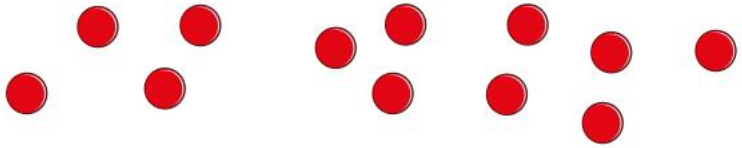
- Complete the ten frames to show equal groups.



Complete the sentence to describe the groups.

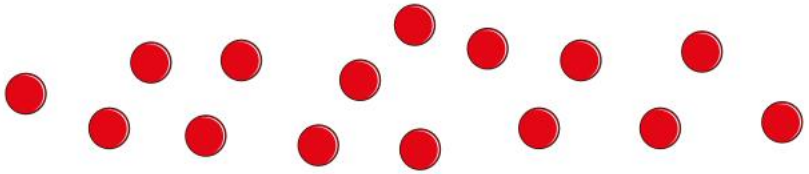
There are _____ equal groups with _____ in each group.

- Put 12 counters into different equal groups.



What do you notice?

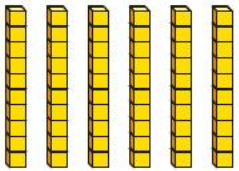
- Use 15 counters.



  - Make 3 groups of 5
  - Make 5 groups of 3

What is the same about the groups? What is different?

- Complete the sentences to describe the equal groups.



There are _____ equal groups of 10

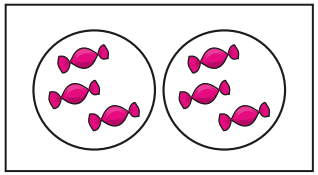
There are _____ tens.

© White Rose Education 2022

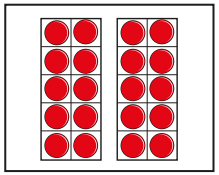
Make equal groups

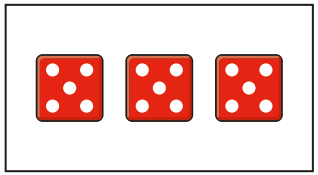
Reasoning and problem solving

Match the pictures and the labels.

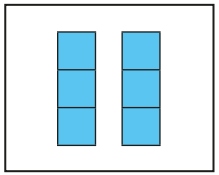


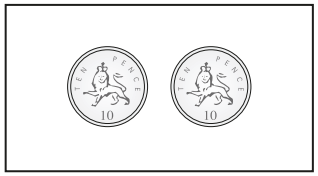
3 groups of 5



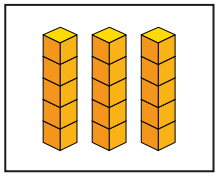


2 groups of 10





2 groups of 3



sweets – 2 groups of 3 – squares

dice – 3 groups of 5 – cubes

coins – 2 groups of 10 – ten frames

Kim and Max are making equal groups.

I am going to add more stars to make the groups equal.

Kim

What equal groups is Kim making?

I am going to move one star to make the groups equal.

Max

What equal groups is Max making?

3 groups of 4

3 groups of 3

© White Rose Education 2022

Add equal groups

Notes and guidance

In this small step, children use their understanding of equal groups to find the total using repeated addition.

Sentence stems are used in this small step to scaffold the learning and to ensure that children use accurate language when writing number sentences. Children should be able to describe pictures using sentences and also create pictures from given sentences.

As children have already learnt to add three 1-digit numbers, they should be able to add up to three groups of any 1-digit number. If there are more than three groups, children can use their understanding of counting in 2s, 3s, 5s and 10s to find the total.

Children do not need to write multiplication number sentences, which are covered in the next step.

Things to look out for

- Children may not represent number sentences accurately when using manipulatives or drawing pictures.
- Children may not have efficient strategies for adding three 1-digit numbers.
- If they cannot count in 2s, 3s, 5s or 10s, children may not answer the calculations correctly.

Key questions

- How do you know the groups are equal?
- How many equal groups are there?
  How many are in each group?
- Can you write this as an addition sentence?
- Which number sentence matches the picture?

Possible sentence stems

- There are 3 equal groups with _____ in each group.
  There are 3 groups of _____
  _____ + _____ + _____ = _____
- There are _____ equal groups with _____ in each group.
  There are _____ groups of _____
  There are _____ altogether.

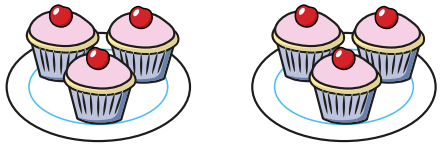
National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

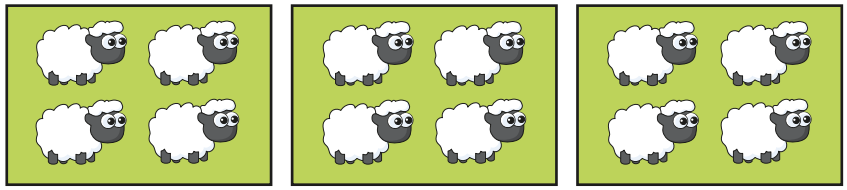
© White Rose Education 2022

Add equal groups

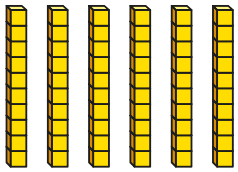
Key learning

- Complete the sentences to match the pictures.
  - 

    There are _____ equal groups with _____ in each group.

    _____ + _____ = 6
  - 

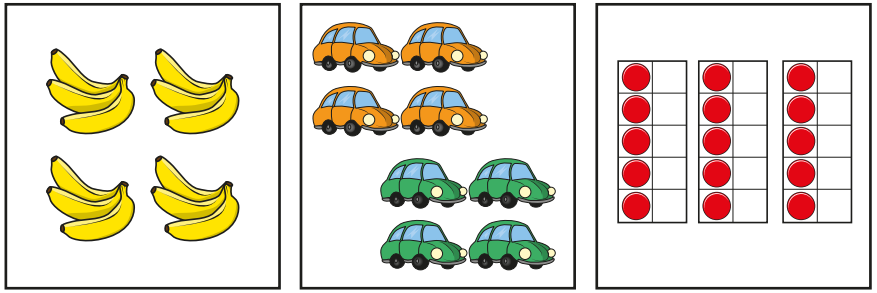
    There are _____ equal groups with _____ in each group.

    _____ + _____ + _____ = _____
  - 

    There are _____ equal groups with _____ in each group.

    _____ + _____ + _____ + _____ + _____ + _____ = _____

- Write a number sentence to match each picture.



- Draw a picture to match each number sentence.
  - 4 + 4 + 4 = 12
  - 2 + 2 + 2 + 2 + 2 + 2 = 12
  - 10 + 10 = 20
  - 5 + 5 + 5 + 5 = 20

- Complete the number sentences.
  - 5 + 5 + 5 = _____
  - 3 + 3 + 3 + 3 + 3 = _____

  What do you notice?

  Talk about it with a partner.

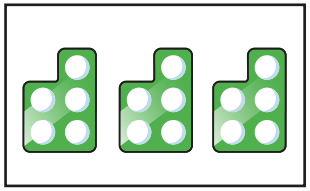
© White Rose Education 2022

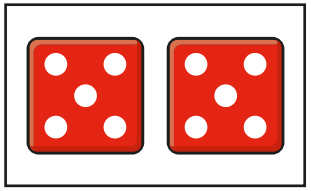
Add equal groups

Reasoning and problem solving

Which one does not belong?

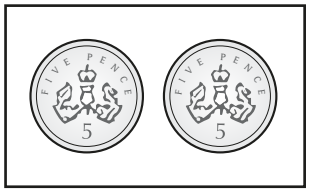
2 groups of 5





ten

5 + 5



What could you change to make it belong?

number shapes

take away one number shape

Tiny is adding equal groups.

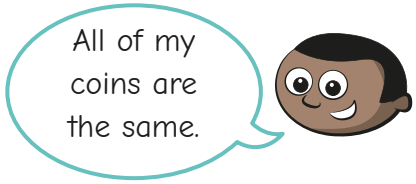
5 + 5 = 2 + 2 + 2 + 2 + 2

Do you agree with Tiny's addition?

Use cubes to help you explain.

Yes

Mo has 30p.



How many 10p coins could he have?

How many 5p coins could he have?

How many 1p coins could he have?

three 10p coins

six 5p coins

thirty 1p coins

© White Rose Education 2022

Introduce the multiplication symbol

Notes and guidance

In this small step, children are introduced to the symbol for multiplication (×) and make the link between multiplication and repeated addition.

Children should already be secure in identifying equal groups and be able to represent this as an addition number sentence. They now write both a repeated addition and a multiplication number sentence. This step focuses on recognising multiplication number sentences that are equal to repeated additions, and correctly matching them to a context. Children are not required to find the total at this stage. Children could also be challenged to put a context to given multiplication and addition sentences.

Children may find that using the language "lots of" builds on previous learning, but they should also use other variations interchangeably, such as "times", "multiplied by" and so on.

Things to look out for

- Children may not make the link between repeated addition and multiplication.
- Children may not know what each number in the multiplication number sentence represents.
- Children may find it challenging to put a context to a multiplication number sentence.

Key questions

- Is repeated addition always the most efficient method? Why?
- What does the multiplication symbol look like?
- How else can you write this repeated addition number sentence?
- What is the same about repeated addition and multiplication? What is different?
- Which addition number sentence matches the multiplication?
- Can you think of a story to match the multiplication?

Possible sentence stems

- There are 3 equal groups with _____ in each group.

  _____ + _____ + _____ = _____

  _____ × _____ = _____

National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

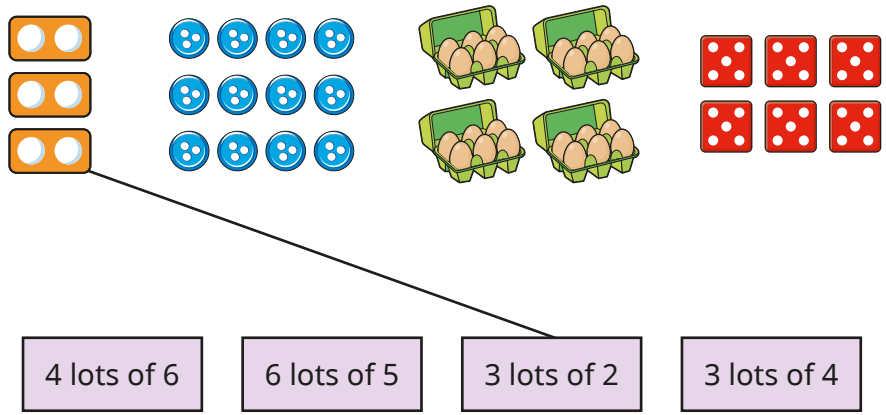
© White Rose Education 2022

Introduce the multiplication symbol

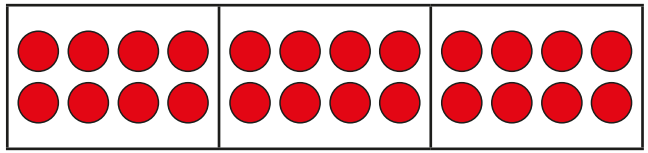
Key learning

- Match the pictures to the labels.

  The first one has been done for you.



- Complete the sentences to describe the equal groups.

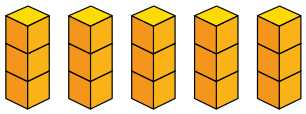


There are _____ equal groups with _____ in each group.

_____ + _____ + _____ = 24

_____ × _____ = 24

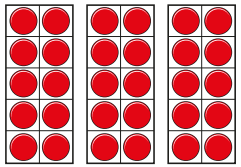
- Complete the sentences to describe the equal groups.



_____ + _____ + _____ + _____ + _____ = 15

_____ × _____ = 15

- Complete the number sentence to describe the equal groups.



_____ + _____ + _____ = _____ × _____

- Complete the table.

Sentence	Picture	Addition	Multiplication
There are 3 equal groups with 2 in each group.			

© White Rose Education 2022

Introduce the multiplication symbol

Reasoning and problem solving

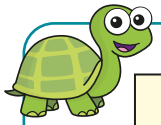
Jo puts some counters into equal groups.

What could the addition and multiplication number sentences be?

multiple possible answers, e.g.

6 + 6 = 12
2 × 6 = 12

4 + 4 + 4 = 12
3 × 4 = 12



$$3 + 3 + 3 = 3 \times 3$$

Is Tiny correct?

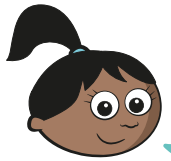
How do you know?

Draw a picture to help you.

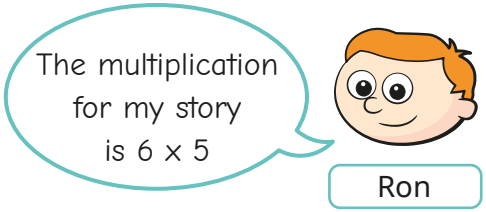
Yes

picture showing 3 groups of 3

Sam and Ron are talking about multiplication stories.



Write an addition and a multiplication for Sam's story.



What is the addition for Ron's story?

What could Ron's story be?

3 + 3 + 3 + 3

4 × 3

5 + 5 + 5 + 5 + 5 + 5

© White Rose Education 2022

Multiplication sentences

White Rose MATHS

Notes and guidance

In this small step, children continue to develop their understanding of the multiplication symbol in calculations, but now with more emphasis on finding the answers.

This step mainly uses pictures to support understanding and the language of "lots of" and "groups of". These should be used alongside the multiplication symbol to help develop children's familiarity with the symbol. Children identify the multiplication number sentences and draw pictures that represent them or express them as word problems.

Although pictures may show, for example, 4 lots of 3, children may discover that multiplication is commutative, and this idea could be explored. Commutativity is covered in more detail in the next step when looking at arrays.

Things to look out for

- Children may mix up describing "5 lots of 3" and "3 lots of 5", as the totals are the same.
- At this point, children may not recognise that, for example, 4 × 3 gives the same total as 3 × 4
- Children may find it more challenging to draw a picture to represent a multiplication than to identify the multiplication from a picture.

Key questions

- What can you see in the picture?
- How many equal groups can you see? How many are in each group?
- What does the symbol mean?
- What do the numbers represent?
- How many ways can you describe the picture?
- If the answer is _____, what could the multiplication be?
- Can you draw a picture to show this multiplication?

Possible sentence stems

- _____ lots of _____ = _____
- _____ groups of _____ = _____
- _____ × _____ = _____

National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

© White Rose Education 2022

Multiplication sentences

Key learning

- Complete the sentences to match the picture.

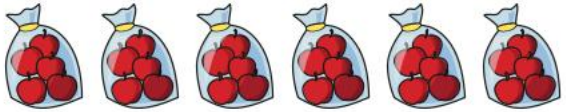
_____ lots of 3 = 12

_____ × _____ = 12

- Complete the sentences to match the pictures.

_____ lots of _____ = _____

_____ × _____ = _____



_____ lots of _____ = _____

_____ × _____ = _____

- Draw a picture to match each label.

3 lots of 2	5 × 7	7 × 5

- Complete the table.

Picture	Multiplication	Sentence
	4 × 10 = 40	4 lots of 10 is equal to 40
	35 = 7 × 5	
		6 lots of 3 is equal to 18

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

4 lots of 3 ◯

= 1 × _____

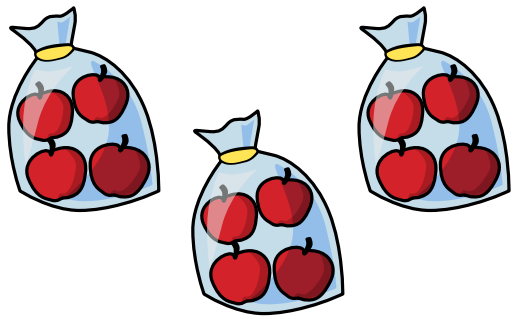
Compare methods with a partner.

© White Rose Education 2022

Multiplication sentences

Reasoning and problem solving

The picture shows 3 lots of 4



Draw a picture to show 4 lots of 3

How many apples are there in each picture?

What is the same about the multiplications?

What is different about the multiplications?

12 apples

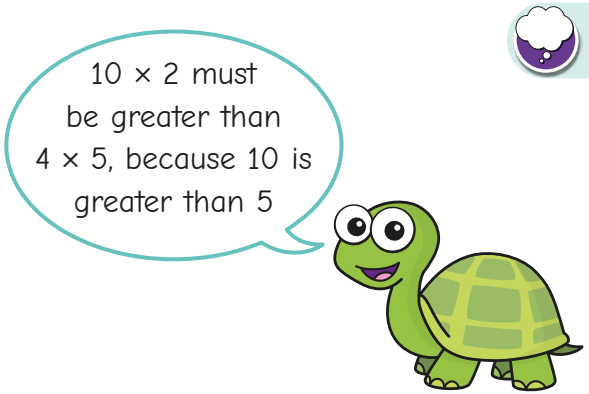
The answer to a multiplication question is 18

What could the multiplication be?

☐ × ☐

How many possible questions can you find?

1 × 18, 2 × 9, 3 × 6, 6 × 3, 9 × 2, 18 × 1



Do you agree with Tiny?

Explain your answer.

No

© White Rose Education 2022

Use arrays

Notes and guidance

In this small step, children use arrays for the first time in this block. This step focuses on the fact that multiplication is commutative and children should be encouraged to identify the two multiplication sentences that can be seen in an array.

Concrete resources should be used to help identify different sets of equal groups. Discuss why an array is a useful and efficient tool to calculate a multiplication and encourage children to draw arrays to represent the multiplication.

While the multiplication symbol is used more frequently, links should still be made to repeated addition and the language previously used to describe multiplication.

Children use arrays throughout the rest of the block to solve multiplication and division calculations.

Things to look out for

- Children may make mistakes when drawing arrays. For example, children may leave a hole in their array, and so not represent the multiplication correctly.
- Children may not recognise that, for example, 3 × 4 = 4 × 3
- Children may not see the different sets of equal groups in an array.

Key questions

- How can you organise the counters to help you find the total?
- How many rows are there?
- How many columns are there?
- What multiplication can you see in the array?
- What two multiplication sentences can you see?
- Is it easier to count in _____ s or _____ s to find the total?
- Why do 3 × 2 and 2 × 3 have the same total?

Possible sentence stems

- There are _____ rows and _____ columns.
- In this array, I can see _____ × _____ and _____ × _____
- There are _____ × _____ = _____ altogether.

National Curriculum links

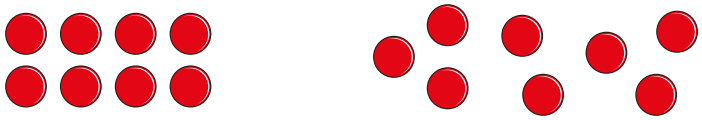
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot

© White Rose Education 2022

Use arrays

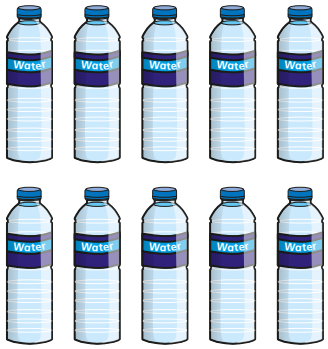
Key learning

- Look at the two groups of counters.



What is the same? What is different?
Which group of counters is easier to count? Why?

- Complete the sentences to match the picture.



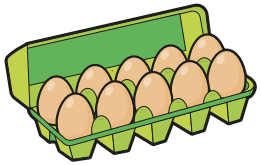
_____ + _____ = _____

_____ × _____ = _____

There are _____ water bottles.

Can you see a different repeated addition and multiplication in the picture?

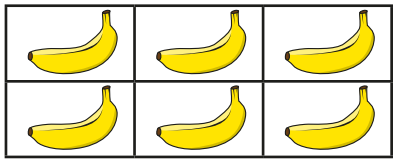
- Look at the picture.



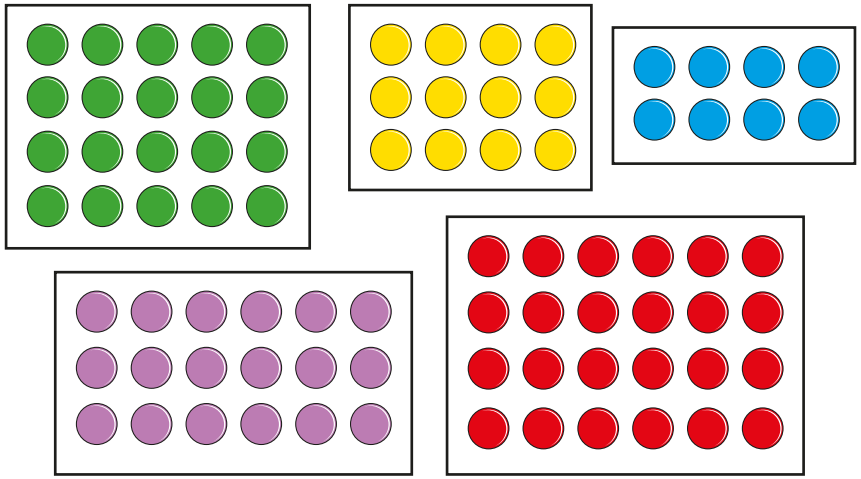
Find 2 × 5 and 5 × 2

Draw an array of counters to match the picture.

- Write two addition sentences and two multiplication sentences for the array.



- Write two addition sentences and two multiplication sentences for each array.



- Draw as many arrays as you can to show 16

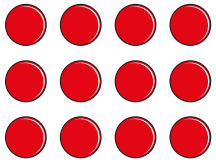
What do you notice?

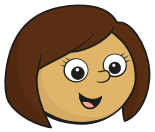
© White Rose Education 2022

Use arrays

Reasoning and problem solving

Kim and Max are looking at this array.





The array shows 3 × 4

Kim

The array shows 4 × 3

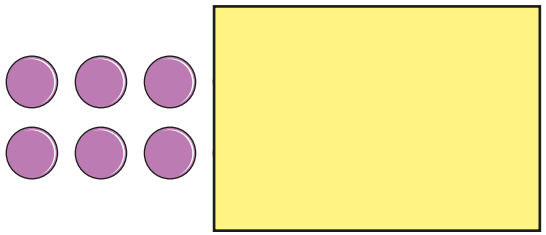
Max

Who is correct?

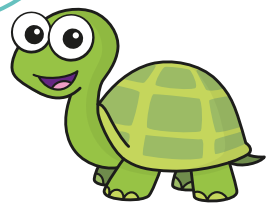
How do you know?

They are both correct.

Tiny has hidden part of an array.



There are fewer than 16 counters in total.



What could the array be?

Talk about it with a partner.

2 × 4

2 × 5

2 × 6

2 × 7

© White Rose Education 2022

Make equal groups – grouping

Notes and guidance

Now that children have looked in detail at multiplication, in this small step they use their knowledge of equal groups to support them in developing their understanding of division. This is the first time within this block that children have looked at division.

Children put objects into groups of a certain amount rather than sharing into equal groups, which is covered in the next step. They are introduced to the division symbol for the first time, and this should be supported by language and sentence stems rather than just written in an abstract calculation. An interesting discussion point is what each number in the division calculation represents and this can be considered further in the next small step when looking at division as sharing.

Children should also be able to make links between multiplication and division.

Things to look out for

- Children may mix up grouping and sharing.
- If circling groups, children may not do this in an efficient way and may end up with objects left over at both ends of the image.
- Children may think that as multiplication is commutative, division must be too.

Key questions

- How many do you have altogether?
- How many are you going to put into each group?
- How many groups do you have?
- What does the symbol mean?
- What does each number represent?
- How can you use a number line to show equal groups?
- How are multiplication and division linked?

Possible sentence stems

- There are _____ altogether.
  I have put them into equal groups of _____
  There are _____ groups.
- _____ ÷ _____ = _____

National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

© White Rose Education 2022

Make equal groups – grouping

Key learning

- Take 15 counters.

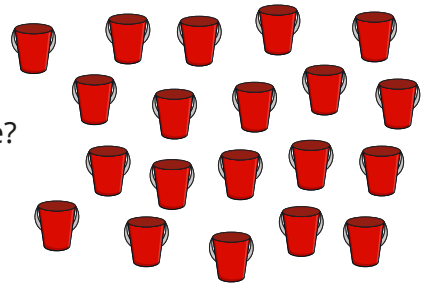
  - Put them into groups of 3
  - Complete the sentences.

    There are 15 counters.

    The counters are in groups of _____

    There are _____ groups.

- There are 20 buckets.



  - Circle groups of 5

    How many groups did you circle?
  - Complete the number sentence.

    20 ÷ 5 = _____

  Does it matter how you circle the groups of 5?

- Ben has 12 cookies and some plates.

  He puts 3 cookies on each plate.

  How many plates does Ben have?

  Use cubes or counters to show your answer.

- Ann has 20 pencils.

  She wants to put 10 pencils in each pot.

  Complete the sentences to show how many pots Ann needs.
  You could draw a picture to help you.

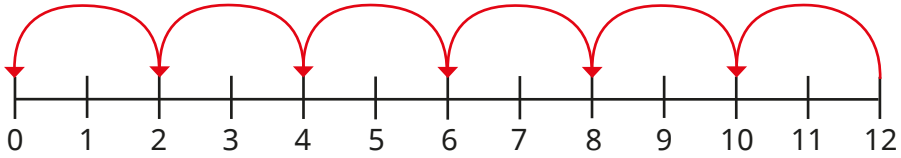
  There are _____ pencils altogether.

  There are _____ pencils in each pot.

  There are _____ pots.

  _____ ÷ _____ = _____

- Tom uses a number line to work out how many equal groups of 2 he can make from 12



  - Complete the sentences.

    12 is made up of _____ equal groups of _____

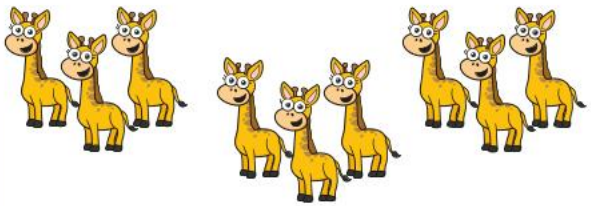
    12 ÷ 2 = _____
  - Use a number line to work out 15 ÷ 3

© White Rose Education 2022

Make equal groups – grouping

Reasoning and problem solving

Write a division and a multiplication to match the picture.



What do you notice?

$9 \div 3 = 3$
$3 \times 3 = 9$

Dan has 30 stickers.

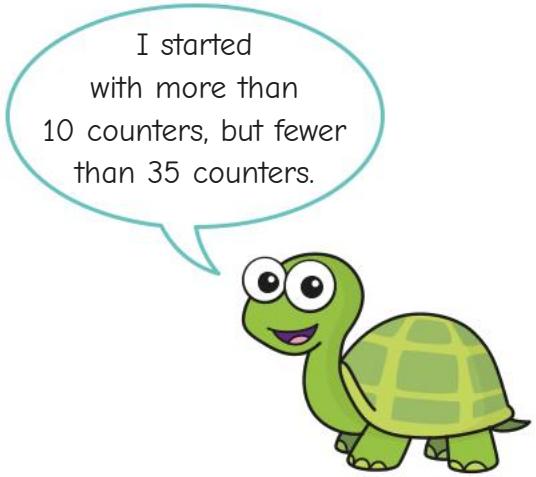
He groups the stickers, so that there is the same number of stickers in each group.

What groups could Dan have made?

Talk about it with a partner.

multiple possible answers, e.g.
10 groups of 3
5 groups of 6

Tiny has made 5 equal groups of counters.



How many counters could Tiny have started with?

How many counters will there be in each group?

Compare answers with a partner.

15 counters in 5 groups of 3

20 counters in 5 groups of 4

25 counters in 5 groups of 5

30 counters in 5 groups of 6

© White Rose Education 2022

Make equal groups – sharing

Notes and guidance

In this small step, children explore division through sharing.

Children should firstly explore this using concrete resources and physically sharing between groups. They could explore the generalisation that the greater the number they are dividing by, the smaller the answer. Bar models and pictures are also used to support children in completing the calculations. When dividing larger numbers, children could use base 10 and this may be a useful opportunity to recap place value and exchanging.

Children could also compare sharing and grouping and think about what the numbers represent in each structure. They use both grouping and sharing later in the block when dividing by 2, 5 and 10

Things to look out for

- Children may mix up grouping and sharing.
- Children may not count the number in each group to find the answer.
- When using base 10, children may not exchange, so they may think that they cannot complete calculations or will complete them inaccurately.

Key questions

- How many do you have altogether?
- How many groups are you going to share them between?
- How many does each group have?
- What does this symbol (÷) represent?
  What does each number represent?
- Can you draw a picture to represent this calculation?
- How is sharing different from grouping? How is it similar?

Possible sentence stems

- There are _____ altogether.

  There are _____ equal groups.

  There are _____ in each equal group.
- _____ shared equally between _____ groups is equal to _____

  _____ ÷ _____ = _____

National Curriculum links

- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs

© White Rose Education 2022

Make equal groups – sharing

Key learning

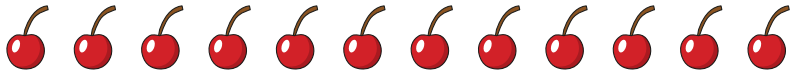
- Take 10 counters.
  - Share them into 2 equal groups.
  - Complete the sentences.

    There are 10 counters.

    There are _____ equal groups.

    There are _____ in each equal group.
  - If you share the counters into 5 equal groups, how do the sentences change?

- Kay has 12 cherries.



She shares them equally between 3 plates.

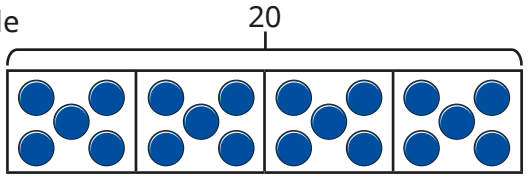
Show how Kay shares the cherries.

How many cherries are on each plate?

- Ben uses a bar model to divide 20 into 4 equal groups.

How does Ben's bar model show the question?

How does it show the answer?



20 ÷ 4 = 5

- Share 12 cubes equally between 4 boxes.

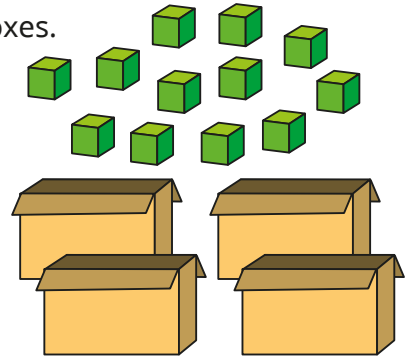
Complete the sentences.

There are _____ cubes altogether.

There are _____ boxes.

There are _____ cubes in each box.

12 ÷ _____ = _____

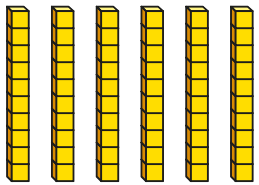


- 24 children are put into 6 equal teams.

How many children are in each team?

Use counters to show this.

- Use base 10 to help you work out the divisions.
  - 60 ÷ 6
  - 60 ÷ 3
  - 60 ÷ 2
  - 60 ÷ 5
  - 60 ÷ 10
  - 60 ÷ 4



Which did you find the easiest?

Which did you find the hardest?

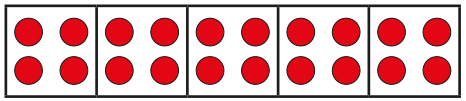
Talk about it with a partner.

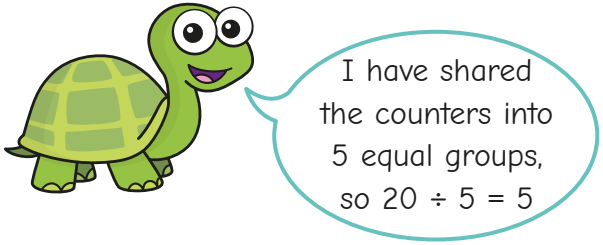
© White Rose Education 2022

Make equal groups – sharing

Reasoning and problem solving

Tiny uses a bar model to work out 20 ÷ 5



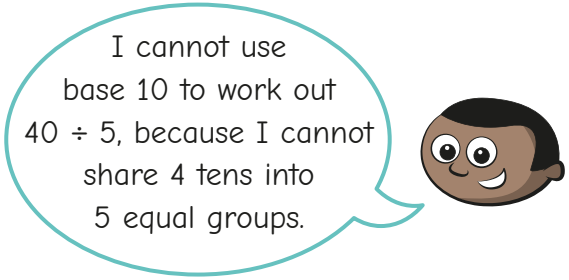


Do you agree with Tiny?

Why?

No

Mo is working out 40 ÷ 5



Do you agree with Mo?

Why?

No

Write a story to match the division.

30 ÷ 5 = 6

Is your story sharing or grouping?

Compare stories with a partner.

multiple possible answers

Ann has 20 sweets and shares them between 5 friends.

Tom has 20 sweets and shares them between 10 friends.

Whose friends get more sweets?

How do you know?

Ann's friends

© White Rose Education 2022

The 2 times-table

Notes and guidance

This small step uses skills from previous steps and from counting in 2s, 5s and 10s from the Place value block. Children explore the 2 times-table and start to become more fluent in this. This step focuses mainly on multiplication, with division covered in more detail in the next step.

Children explore the 2 times-table in a range of ways, and it is important that children are exposed to multiple representations. They should use concrete resources as well as number tracks, number lines and bar models. They will have the opportunity to practise using these representations again later in the block.

When calculating, children should be encouraged to find efficient strategies rather than always counting from 1 × 2

Things to look out for

- Children may add the two numbers together, rather than multiplying them.
- Children may always start from the first number in the times-table, instead of starting from a known fact.
- Children may be less confident in some representations than others.

Key questions

- How can you show counting in 2s?
- How do you know what _____ lots of 2 are?
- Would drawing a picture help you to work out the multiplication?
- What do you need to do with the two numbers in the number sentence?
- Do you always need to start counting from 2?
- If you know what 5 × 2 is, how can you work out 6 × 2?
- If you know what 10 × 2 is, how can you work out 9 × 2?
- Can you show the multiplication another way?

Possible sentence stems

- _____ × 2 is the same as _____ lots of 2
- _____ multiplied by 2 is equal to _____
- I know that _____ × 2 = _____, so I can add/subtract 2 to work out _____ × 2

National Curriculum links

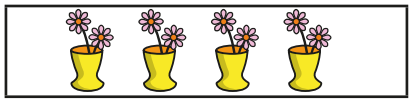
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

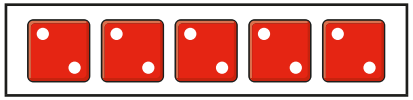
© White Rose Education 2022

The 2 times-table

Key learning

- Match the pictures to the multiplications.

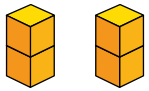




4 × 2

5 × 2

3 × 2

- Write a multiplication sentence to match each picture.
  - 
  -

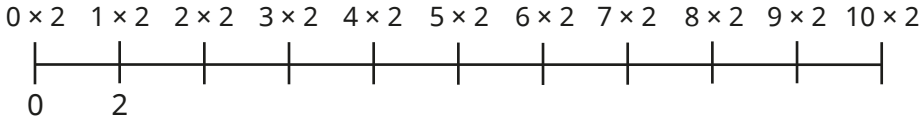
- How many wheels are there on five bicycles?

- Complete the number tracks.

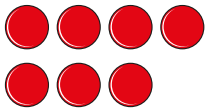
2	4		8		12

14	16	18			24

- Complete the number line.



- Complete the array to work out the multiplication.



9 × 2 = _____

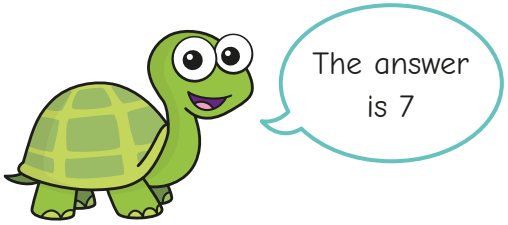
- Complete the multiplications.
  - 4 × 2 = _____
  - 2 × 10 = _____
  - _____ = 12 × 2
  - 8 × 2 = _____
  - 2 × _____ = 18
  - _____ × 2 = 6

© White Rose Education 2022

The 2 times-table

Reasoning and problem solving

Tiny is working out 5 × 2



Is Tiny correct?

How do you know?

No

Write <, > or = to compare the statements.

5 × 2 ◯ 7 × 2 <

2 × 8 ◯ 18 <

6 × 2 ◯ 8 + 4 =

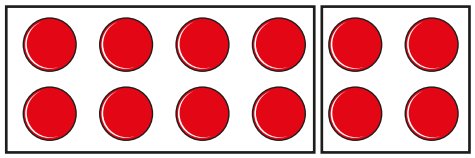
Kay has 7 cookies.

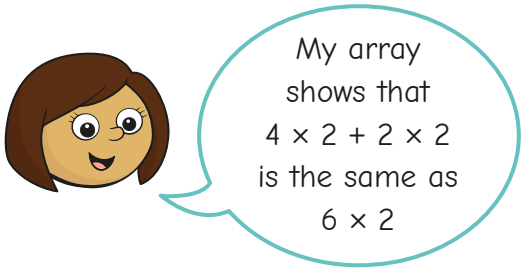
Max has twice as many cookies as Kay.

How many cookies does Max have?

14

Kim uses counters to show 6 × 2





What else does Kim's array show?

multiple possible answers, e.g.

6 × 2 = 1 × 2 + 5 × 2

© White Rose Education 2022

Divide by 2

Notes and guidance

Following on from the previous step, children use their knowledge of the 2 times-table to divide by 2

Children should be aware of the differences between the grouping and sharing structures of division. Divisions are shown using pictures as well as concrete resources to help children work out the calculations. Children use sentence stems alongside number sentences using the division symbol.

While it is important that children use concrete resources, they should also be aware that they can use the 2 times-table to help them fluently divide by 2, in the abstract. Children should be encouraged to spot patterns to help them complete calculations efficiently.

Things to look out for

- Children may not be confident with the 2 times-table.
- Children may confuse grouping and sharing.
- When using a number line, children may believe that the answer is always zero, as this is the number they will finish on.
- Children may be over-reliant on practical resources and not use their times-table knowledge.

Key questions

- How can the 2 times-table help you?
- How are division and multiplication linked?
- Will you be grouping or sharing for this question? How do you know?
- How can making/drawing an array help you?
- How many groups of 2 can you make?
- How can you share this between 2 equal groups?
- How can you use a number line to complete the division?
- If you know what 20 divided by 2 is, what is 10 divided by 2?

Possible sentence stems

- There are _____ altogether.

  There are _____ in each group.

  There are _____ groups.
- _____ divided by 2 is equal to _____

National Curriculum links

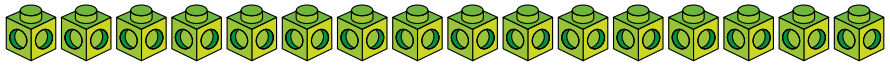
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

Divide by 2

Key learning

- Use 16 cubes.



  - Put them into groups of 2 and complete the sentence.

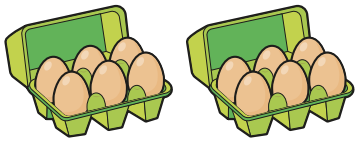
    There are _____ equal groups of 2

  - Share them into 2 equal groups and complete the sentence.

    There are _____ cubes in each equal group.

  How are grouping and sharing different? How are they similar?

- Complete the sentences.



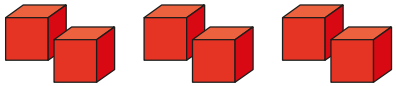
  There are 12 eggs altogether.

  There are _____ groups.

  There are _____ eggs in each group.

  12 ÷ 2 = _____ _____ × 2 = 12

- Complete the sentences.



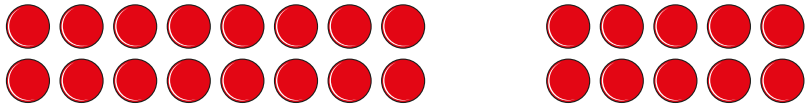
  There are _____ cubes altogether.

  There are _____ cubes in each group.

  There are _____ groups.

  _____ ÷ _____ = _____ _____ × _____ = _____

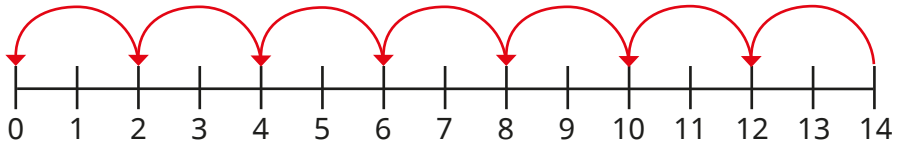
- Use the arrays to complete the number sentences.



  _____ × 2 = 16 _____ × 2 = _____

  16 ÷ 2 = _____ _____ ÷ 2 = _____

- Use the number lines to work out the divisions.



  14 ÷ 2

  10 ÷ 2

- Dan and Fay share 12 sweets between them equally.

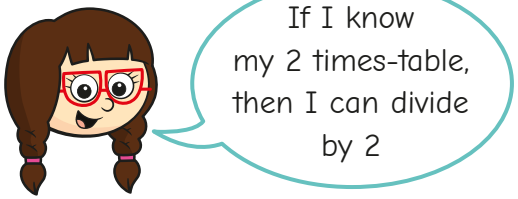
  How many sweets does each child get?

© White Rose Education 2022

Divide by 2

Reasoning and problem solving

Jo is dividing by 2



Do you agree with Jo?

Why?

Yes

Ben has 24p.
He divides it equally between 2 friends.
How much will they each get?

12p

Ben has 24p in 2p coins.
How many 2p coins does he have?

12 coins

What is the same about the two questions? What is different?

Tom shares some grapes equally between two friends.

Each friend gets more than 30 grapes, but fewer than 50 grapes.

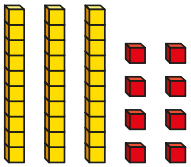
Complete the sentences to describe the number of grapes Tom started with.

He could have started with _____ grapes.

He cannot have started with _____ grapes.

Tom could have started with any even number of grapes between 62 and 98 grapes.

Tiny is working out
38 ÷ 2



How can Tiny use the base 10 to work out the division?

19

© White Rose Education 2022

Doubling and halving

Notes and guidance

In this small step, children double and halve numbers.

Introduce the concept using concrete resources and pictures to show halves and doubles. Guide them towards the connection that when they double a number, they multiply by 2 and when they halve a number, they divide by 2

Children also use pictures to identify when a number has or has not been doubled or halved; misconceptions, such as thinking that doubling means adding 2, could be explored at this point.

Once children are secure in their understanding of doubling and halving, they can look for patterns and try to predict answers based on known facts, for example "If I know what double 2 is, I can find double 20"

Some children may try to halve odd numbers, which is something that can be explored with concrete resources.

Things to look out for

- Children may not make the connection between doubling and halving and the 2 times-table.
- Children may be over-reliant on manipulatives or pictures to double or halve, rather than multiplying or dividing by 2

Key questions

- What does "double" mean?
- What does "halve" mean?
- How do you double a number?
- How do you halve a number?
- How can you use counters to help you double a number?
- Can you write this as a number sentence?
- How is doubling linked to the 2 times-table?
- How is halving linked to the 2 times-table?

Possible sentence stems

- Double _____ is _____
- Half of _____ is _____
- Double _____ is _____, so double _____ is _____
- Half of _____ is _____, so half of _____ is _____

National Curriculum links

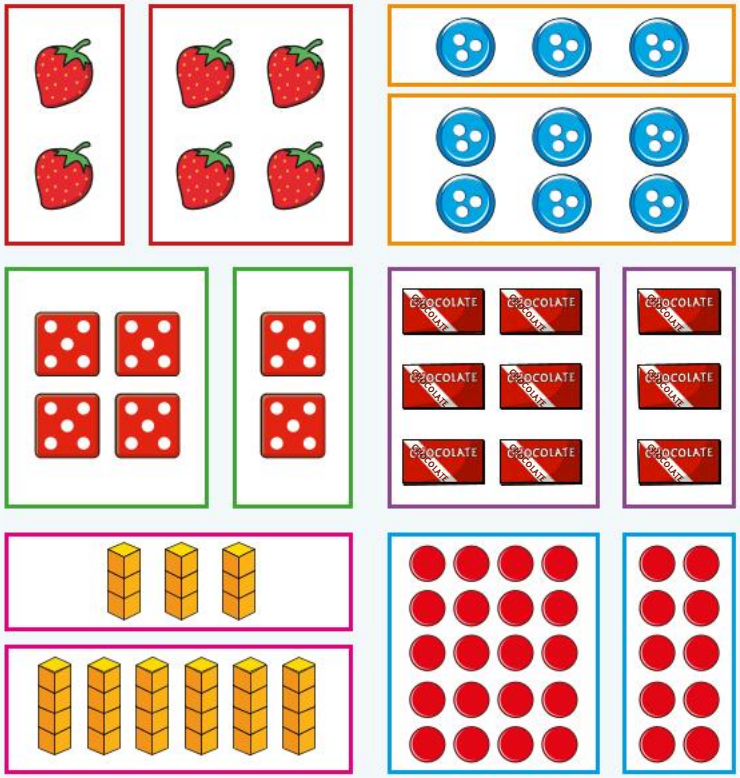
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

Doubling and halving

Key learning

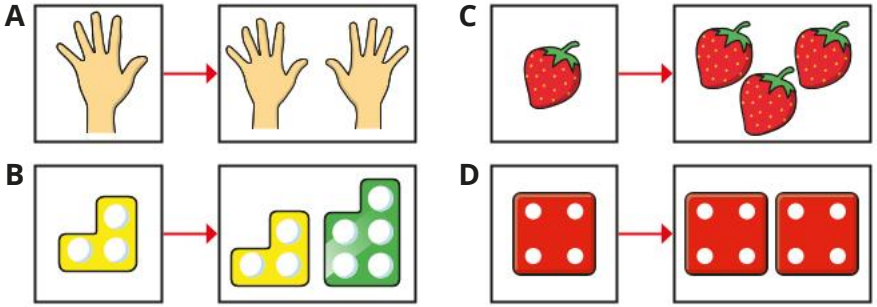
Show children the sets of pictures.



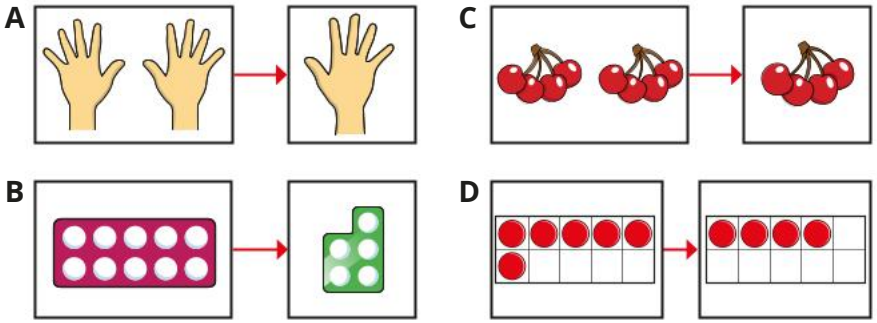
Discuss what the pictures show.

Identify with children whether each set of pictures shows doubling, halving or neither.

- Which pictures show doubling?



- Which pictures show halving?



- Write a multiplication or division number sentence to match the labels.

double 7	half of 14	double 12	half of 24

What do you notice about your answers?

© White Rose Education 2022

Doubling and halving

Reasoning and problem solving

As a class, complete the table.

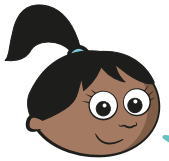
Number	1	2	3	4	5	6	7	8	9	10
Double										

Ask children to describe any patterns that they spot.

Discuss what other numbers they could double using the same patterns.

multiple possible answers

Sam is doubling and halving numbers.



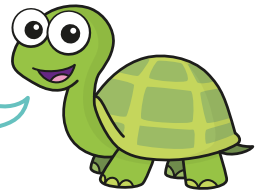
If I can multiply or divide a number by 2, then I can double and halve the number.

Do you agree with Sam? Explain your answer.

Yes

Tiny has 12 leaves.

Tiny eats half the leaves.



I must have 24 leaves left.

What mistake has Tiny made?

Tiny has doubled the starting number rather than halving it.

Tiny will have 6 leaves left.

Think of a number.

- Double it.
- Add 4
- Halve the answer.
- Take away the number you first thought of.

What number do you finish with?

Try this with a different number.

Why does this always happen?

finishing number is always 2

© White Rose Education 2022

Odd and even numbers

Notes and guidance

Children may have met the idea of odd and even numbers in Reception or Year 1. In this small step, they explore the idea more formally, identifying whether a whole number is odd or even.

Children should first be shown representations, for example number pieces, of odd and even numbers that clearly show when a number can be divided into two whole equal parts and when it cannot. It may be useful to think of a definition for odd and even numbers and to identify non-examples as well as examples of both. Children should recognise that an even number can be halved to give a whole number answer, as it is divisible by 2

Once children are secure in their understanding of odd and even, they can recognise that they need to check the ones column of a number to decide whether it is odd or even.

Things to look out for

- Zero and other numbers with zero in the ones column may confuse children.
- Children may not recognise that they only need to check the ones column of a number to see if it is odd or even.
- Children may not recognise that if a number is even, the next number must be odd.

Key questions

- What do you notice about odd/even numbers?
- How do you know if a number is odd/even?
- Why is the 2 times-table important for odd and even numbers?
- If your number is even/odd, will the next number you count be odd or even? Why?
- What digit is in the ones column? Why is this important?
- Can you halve even/odd numbers? How do you know?

Possible sentence stems

- Even numbers have _____ in the ones column.
- Odd numbers have _____ in the ones column.
- Even numbers can be divided by _____ to give a whole number answer.
- The next whole number after an _____ number is an _____ number.

National Curriculum links

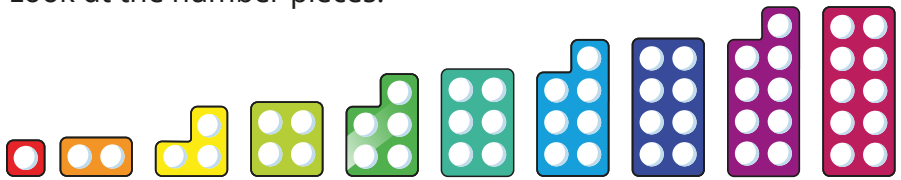
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

Odd and even numbers

Key learning

- Look at the number pieces.

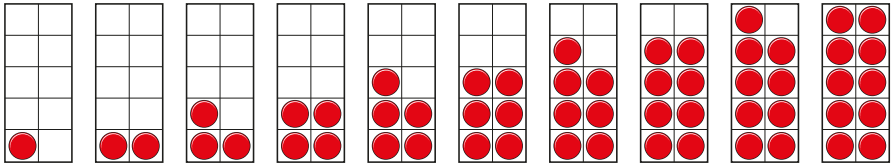


Which number pieces show odd numbers?

Which number pieces show even numbers?

How do you know?

- Which ten frames show even numbers? How do you know?



Even numbers are all in the _____ times-table.

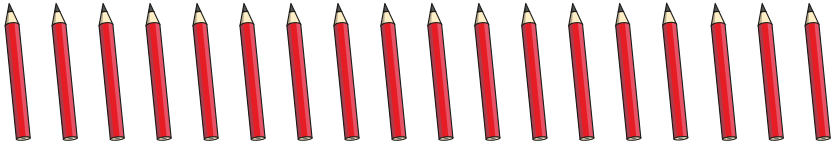
Even numbers can be divided by _____

- Use counters to show that the statements are true.

17 is an odd number.	26 is an even number.

- Group the pencils into 2s to show that 15 is an odd number.

Group the pencils into 2s to show that 18 is an even number.

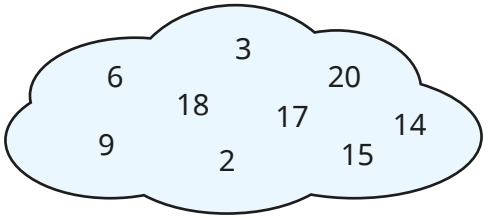


- Use a blank 100 square.

Colour all the odd numbers.

What do you notice about odd and even numbers?

- Sort the numbers into odd and even.



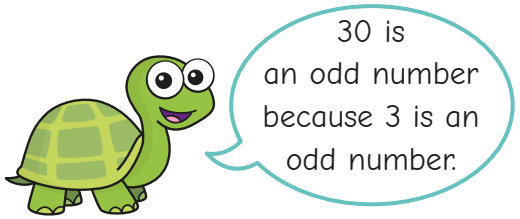
What patterns can you spot?

© White Rose Education 2022

Odd and even numbers

Reasoning and problem solving

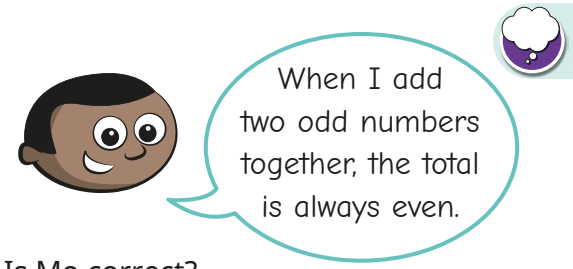
Tiny is looking at odd and even numbers.



Do you agree with Tiny?

Explain your answer.

No

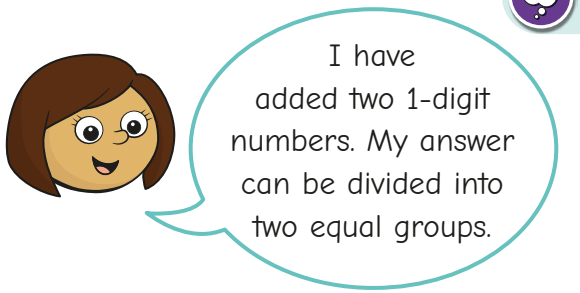


Is Mo correct?

How do you know?

What else can you find out?

Yes

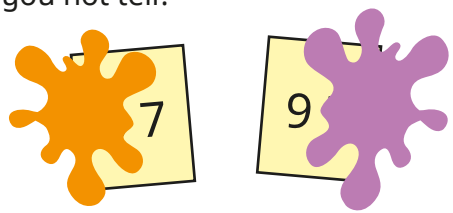


What could Kim's numbers be?

How many answers can you find?

multiple possible answers, e.g.
1 + 3 = 4

Are the numbers odd, even or can you not tell?



Talk about it with a partner.

first card: odd

second card: cannot tell

© White Rose Education 2022

The 10 times-table

Notes and guidance

In this small step, children focus on the 10 times-table. They use their understanding of multiplication to count forwards and backwards in 10s. Division by 10 is covered in more detail in the next step.

As with the 2 times-table, children explore the 10-times table through a range of representations and should be confident using these. They count in 10s using number tracks, number lines and bar models. Children should also be confident drawing an image that matches a number sentence. As children are counting in 10s, base 10 could be used to support understanding.

The 10 times-table is revisited later in the block, where children explore the links between the 10 and 5 times-tables.

Things to look out for

- Children may not be confident counting from 90 to 100
- Children may not recognise that number tracks can decrease as well as increase.
- Children may always start from the first number in the times-table, instead of starting from a known fact.

Key questions

- How can you show counting in 10s?
- How do you know what _____ lots of 10 are?
- Would drawing a picture help you to work out the calculation?
- How can you use base 10 to help you find the answer?
- Do you always need to start counting from 10?
- If you know what 10 × 5 is, how could you work out 10 × 6?
- What other way could you show this calculation?

Possible sentence stems

- _____ × 10 is the same as _____ lots of 10
- _____ × 10 = _____, so _____ × 10 = _____
- When counting forwards in 10s, the number after _____ is _____
- When counting backwards in 10s, the number after _____ is _____

National Curriculum links

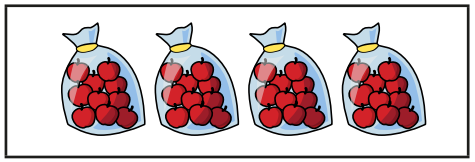
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

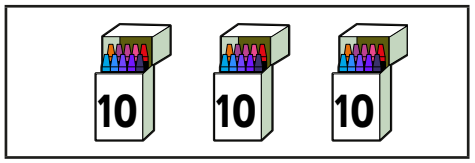
© White Rose Education 2022

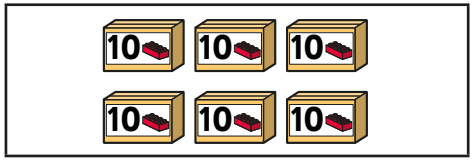
The 10 times-table

Key learning

- Match the pictures to the multiplications.







3 × 10

6 × 10

4 × 10

- Complete the sentences for each picture.

_____ × 10 = _____

There are _____ altogether.

-

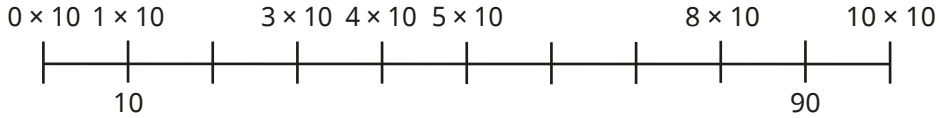
-

- Complete the number tracks.

50	40	30		10	

50	60		80	90	

- Complete the number line.



- Use the bar models to complete the multiplications.

10	10	10	10

_____ × 10 = _____

10	10	10	10	10	10	10	10

10 × _____ = _____

What do you notice about the two multiplications?

- Complete the number sentences.
  - 5 × 10 = _____
  - 10 × 3 = _____
  - 10 × 10 = _____
  - 9 × 10 = _____
  - _____ = 4 × 10
  - 10 × _____ = 60

© White Rose Education 2022

The 10 times-table

Reasoning and problem solving

Dan runs 10 m seven times.

Which cards do **not** show this?

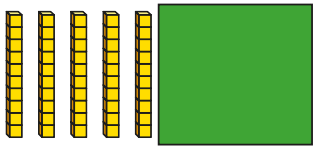
10 + 7	7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7
7 × 10	10 + 10 + 10 + 10 + 10 + 10 + 10

Explain your answers.

10 + 7 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7

Ron uses base 10 to show a multiplication.

- Some of the base 10 pieces are covered up.
- The answer is less than 100



What could Ron's multiplication be?

6 × 10, 7 × 10, 8 × 10, 9 × 10

Write <, > or = to compare the statements.

8 × 10	◯	10 × 6	>
90	◯	9 × 10	=
4 × 2	◯	4 × 10	<
5 × 10	◯	47	>

Kay is 4 years old.

Ann is twice as old as Kay.

Ann's gran is 10 times older than Ann.

How old is Ann's gran?

80 years old

© White Rose Education 2022

Divide by 10

Notes and guidance

In this small step, children use their knowledge of the 10 times-table to divide by 10

Children experience a range of grouping and sharing activities, building on their previous learning, and should be reminded of the differences and similarities between these two structures. They should be confident counting backwards in 10s and understand that they can use this to solve division calculations.

Children are exposed to a range of representations to show division. They could start by using concrete resources, such as base 10, and contextual sentence stems before moving on to using more pictorial and abstract representations, including number lines and number sentences.

Encourage children to identify their own, mathematically correct, rule for dividing by 10 and to compare ideas with others.

Things to look out for

- Children may not yet be confident with 10 times-table facts.
- Children may confuse grouping and sharing.
- Children may be over-reliant on practical resources and not make connections to their times-table knowledge.

Key questions

- How can the 10 times-table help you?
- How are division and multiplication linked?
- Will you be grouping or sharing for this question? How do you know?
- How can you use base 10 to help you?
- How many groups of 10 can you make?
- How can you share this between 10 equal groups?
- How can you use a number line to complete the division?

Possible sentence stems

- There are _____ altogether.

  There are _____ in each group.

  There are _____ groups.

  _____ ÷ 10 = _____

National Curriculum links

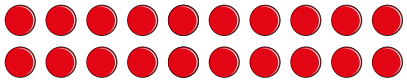
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

Divide by 10

Key learning

- Use 20 counters.



  - Put them into groups of 10

    There are _____ equal groups of 10

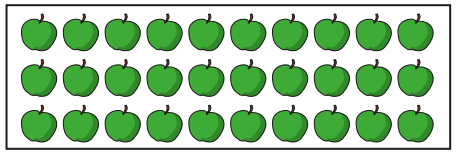
  - Share them into 10 equal groups.

    There are _____ counters in each equal group.

  What do you notice?

- Apples are sold in packs of 10

  Complete the sentences for the number of packs that can be made from each set of apples.

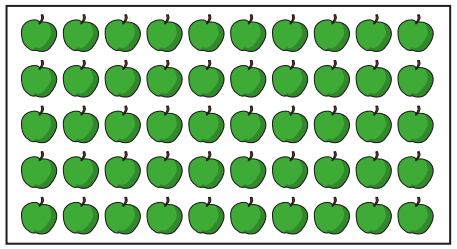


  There are _____ apples.

  There are _____ apples in each group.

  There are _____ groups.

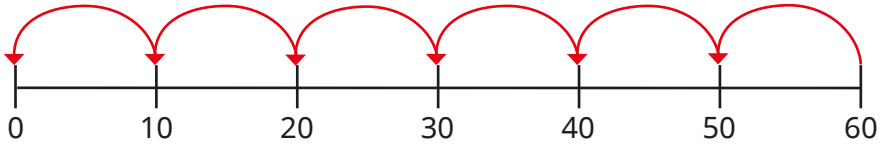
  _____ ÷ _____ = _____



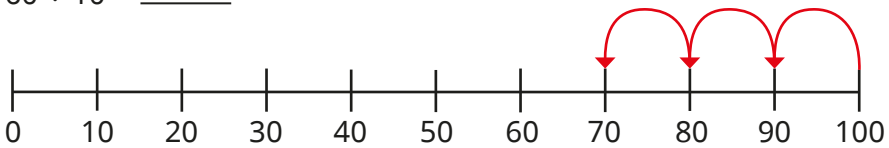
- Share 40 counters into 10 equal groups.

  How many groups are there?

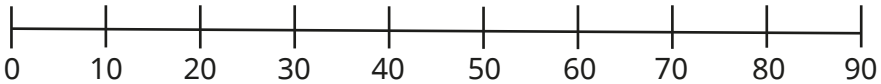
- Use the number lines to complete the divisions.



60 ÷ 10 = _____



100 ÷ 10 = _____



90 ÷ 10 = _____

- Max has 70p in his pocket.

  It is made up of 10p coins.

  How many coins does Max have?

  Draw a picture to show your answer.

- Complete the sentences.

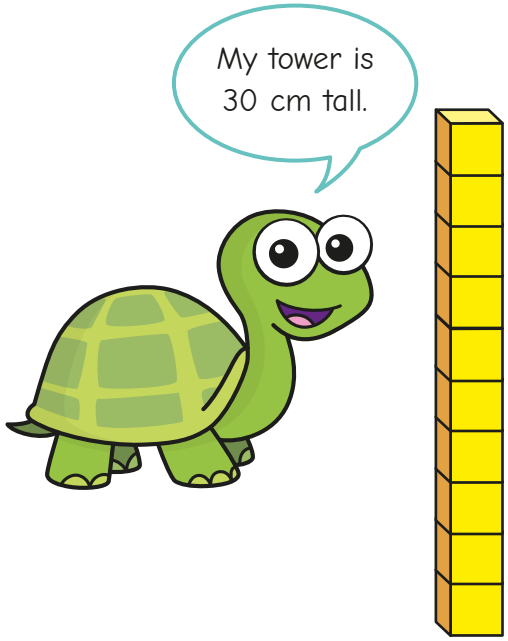
  - 70 ÷ 10 = _____
  - 5 = _____ ÷ 10
  - 6 tens ÷ 1 ten = _____
  - There are _____ tens in 40

© White Rose Education 2022

Divide by 10

Reasoning and problem solving

Tiny uses cubes to build a tower.



How tall is each cube?

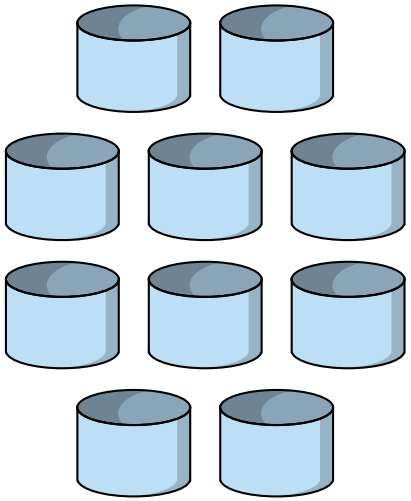
Write a number sentence to show how you worked it out.

3 cm

30 ÷ 10 = 3

Miss Hall has some pens.

She shares them equally between 10 pots.



How many pens could be in each pot?

Find as many ways to share the pens as you can.

What do you notice about your answers?

multiple possible answers, e.g.
70 ÷ 10 = 7

© White Rose Education 2022

The 5 times-table

Notes and guidance

In this small step, children focus on the 5 times-table. They use their understanding of multiplication to count in 5s.

As with the other times-tables covered earlier in the block, zero should be included, so that children realise that 0 × 5 = 0. Children develop their knowledge of the 5 times-table facts, which will be reinforced when they divide by 5 in the next step.

Children use multiple representations to show the 5 times-table and manipulatives are used to support understanding. Efficient counting strategies should be shared, and children encouraged to use known facts rather than always counting from 1 × 5

Children should be encouraged to spot patterns with the 5 times-table and may start to see links between the 5 and 10 times-tables. This will be covered in more detail later in the block.

Things to look out for

- Children may think that the 5 times-table stops at 50
- Children may get to 10 and then start counting in 10s rather than continuing to count in 5s.
- Children may always start from the first number in the times-table, instead of starting from a known fact.

Key questions

- How can you show counting in 5s?
- How do you know what _____ lots of 5 are?
- Would drawing a picture help you to work out the multiplication?
- Do you always need to start counting from 5?
- If you know what 10 × 5 is, how could you work out 11 × 5?
- What do you notice about the ones column of the numbers in the 5 times-table?
- How are the 5 times-table and 10 times-table similar? How are they different?

Possible sentence stems

- _____ × 5 is the same as _____ lots of 5
- _____ × 5 = _____, so _____ × 5 = _____
- When counting in 5s, the number after/before _____ is _____

National Curriculum links

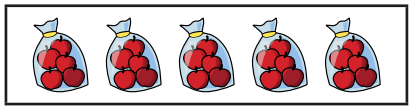
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

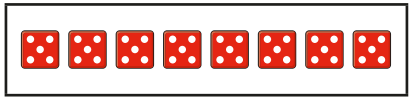
© White Rose Education 2022

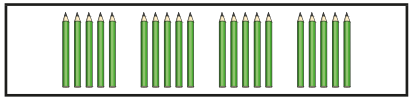
The 5 times-table

Key learning

- Match the pictures to the multiplications.







8 × 5

4 × 5

5 × 5

- Complete the sentences for each picture.

_____ × 5 = _____

There are _____ altogether.

▸

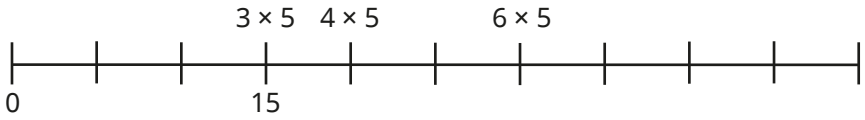
▸

- Complete the number tracks.

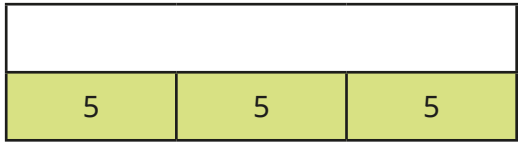
50		40		30	

35					10

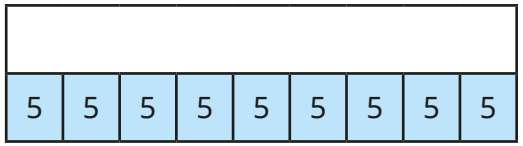
- Complete the double number line.



- Use the bar models to complete the multiplications.



_____ × 5 = _____



5 × _____ = _____

- Complete the number sentences.

▸ 5 × 2 = _____ ▸ 5 × 3 = _____ ▸ 5 × 6 = _____

▸ 4 × 5 = _____ ▸ _____ = 12 × 5 ▸ 5 × _____ = 35

- Draw a picture to show 8 × 5

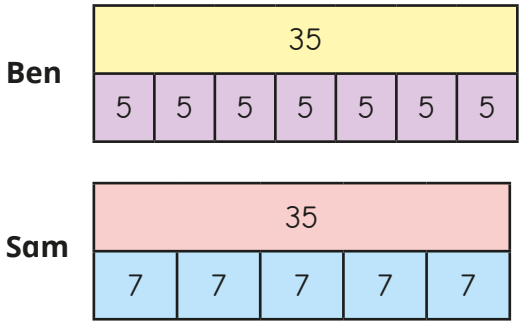
Compare pictures with a partner.

© White Rose Education 2022

The 5 times-table

Reasoning and problem solving

Ben and Sam both draw bar models to show 7 × 5



What is the same and what is different about their bar models?

The total is the same.

Ben's bar model shows 7 lots of 5

Sam's bar model shows 5 lots of 7

Tubes of tennis balls come in packs of 2 and 5

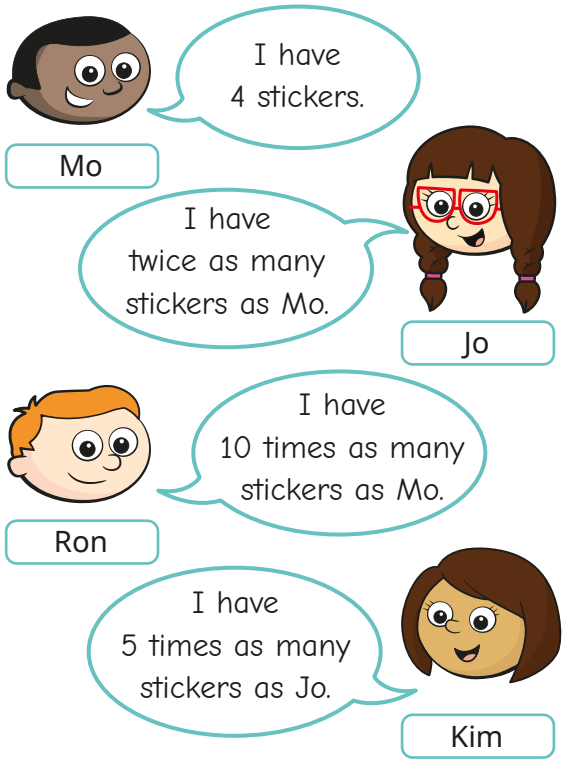
Fay has 22 tennis balls.

How many of each pack could she have?

Compare answers with a partner.

multiple possible answers, e.g.
4 packs of 5,
1 pack of 2

Jo, Ron, Kim and Mo all have some stickers.



How many stickers does each child have?

Mo: 4

Jo: 8

Ron: 40

Kim: 40

© White Rose Education 2022

Divide by 5

Notes and guidance

In this small step, children use their understanding of the 5 times-table to divide by 5, helping them to become more fluent with the times-tables facts. Children answer questions involving grouping and sharing and need to have efficient strategies for calculating both types of problems.

As with the previous division steps, children should be exposed to multiple representations when dividing and use both concrete and pictorial resources to support their understanding.

At this point, children could explore the effect of dividing the same number by 2, 5 and 10 and comparing the answers. They may start to see links between the 5 and 10 times-tables, which is covered in more detail in the next step.

Things to look out for

- Children may not yet be confident with 5 times-table facts.
- Children may confuse grouping and sharing.
- When using bar models, children may add together all the equal parts rather than just find one part.
- Children may be over-reliant on practical resources and not make connections to their times-table knowledge.

Key questions

- How can the 5 times-table help you?
- How are division and multiplication linked?
- Will you be grouping or sharing for this question? How do you know?
- How could making/drawing an array help you?
- How many groups of 5 can you make?
- How can you share this into 5 equal groups?
- How can you use a number line to complete the division?

Possible sentence stems

- There are _____ altogether.

  There are _____ in each group.

  There are _____ groups.

  _____ ÷ 5 =

National Curriculum links

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

Divide by 5

Key learning

- Use 30 cubes.

  How many towers of 5 cubes can you make?

- 20 birds have been put into groups of 5

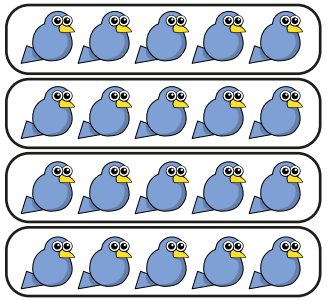
  Complete the sentences.

  There are _____ birds altogether.

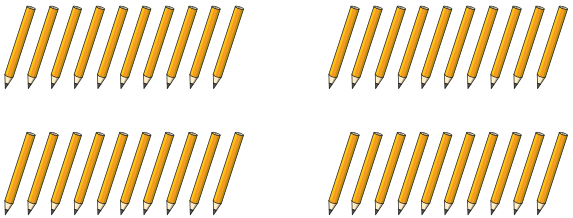
  There are _____ birds in each group.

  There are _____ groups.

  _____ ÷ _____ = _____



- 40 pencils are shared equally between 5 children.

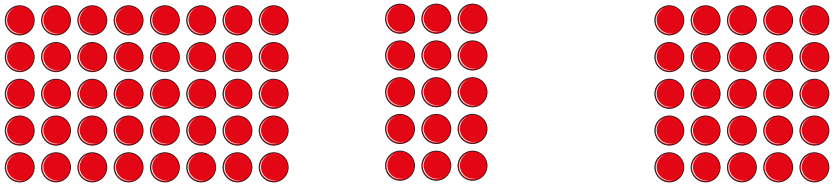


  How many pencils does each child get?

  Write a division.

  _____ ÷ _____ = _____

- Use the arrays to complete the number sentences.

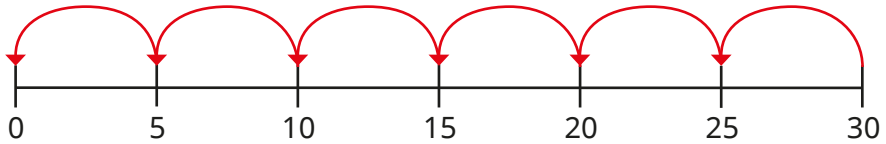


  _____ × 5 = _____ _____ × 5 = _____ _____ × 5 = _____

  _____ ÷ 5 = _____ _____ ÷ 5 = _____ _____ ÷ 5 = _____

- Use the number line to work out the division.

  30 ÷ 5



- Draw bar models to work out the divisions.
  - 20 ÷ 5
  - 40 ÷ 5
  - 60 ÷ 5

  What do you notice about your answers?

- Complete the divisions.
  - 25 ÷ 5 = _____
  - 35 ÷ 5 = _____
  - 45 ÷ 5 = _____

© White Rose Education 2022

Divide by 5

Reasoning and problem solving

Here are some number cards.

2	20	5	10	4

Use the cards to make multiplication and division sentences.

How many different sentences can you make?

Talk about it with a partner.

multiple possible answers, e.g.
4 × 5 = 20
20 ÷ 10 = 2

Tom has some marbles.

He shares them into 10 equal groups.

There are 6 marbles in each group.

Tom then shares his marbles into 5 equal groups.

How many marbles are there in each group?

How did you work it out?

12

Max buys 5 chew bars for 50p.

How much does one chew bar cost?

How much do three chew bars cost?

10p

30p

Mr Jones is putting tennis balls into tubes.

Each tube holds 5 tennis balls.

Mr Jones has 60 tennis balls.

How many tubes does he need?

Tubes are sold in packs of 5

How many packs does Mr Jones need to buy?

Will Mr Jones fill all the tubes he buys?

12

3

No
Three tubes will be left empty.

© White Rose Education 2022

The 5 and 10 times-tables

Notes and guidance

In this small step, children look at both the 5 and 10 times-tables and the relationship between them. While this will be useful revision of both, the main aim of this step is for children to see the connection between the two and to spot patterns.

Children should identify numbers that are in both the 5 and 10 times-tables and think about any generalisations that they can make. Guide them to identify that all numbers in the 10 times-table are also in the 5 times-table, but only some of the numbers in the 5 times-table are also in the 10 times-table.

Children should be able to identify that, for example, 4 × 10 = 8 × 5 and identify the fact that there are twice as many 5s as there are 10s. They should recognise that the 10 times-table is double the 5 times-table.

Things to look out for

- Children may not be aware that the equals sign can be used to show equivalence.
- Children may believe that all the numbers in the 5 times-table are also in the 10 times-table.
- Children may find it difficult to make the calculations equal if they do not make the link that 2 lots of 5 = 10

Key questions

- Which numbers are in the 5 times-table?
  Which numbers are in the 10 times-table?
  Which numbers are in both?
  What do you notice?
- What patterns can you spot?
- How many lots of 5 make 10?
- Are all the numbers in the 10 times-table also in the 5 times-table? Why?
- Are all the numbers in the 5 times-table also in the 10 times-table? Why?

Possible sentence stems

- All numbers in the _____ times-table are also in the _____ times-table.
- Some numbers in the _____ times-table are also in the _____ times-table.
- _____ × 10 = _____ × 5

National Curriculum links

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

© White Rose Education 2022

The 5 and 10 times-tables

Key learning

- Complete the number tracks.

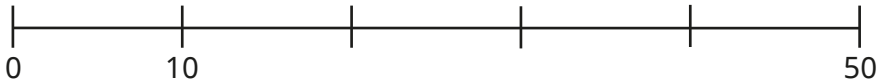
5		15					

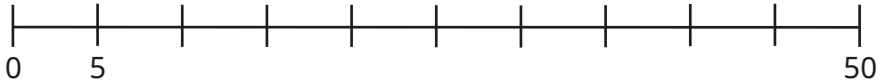
10			40				

What do you notice?

Which numbers are in both number tracks?

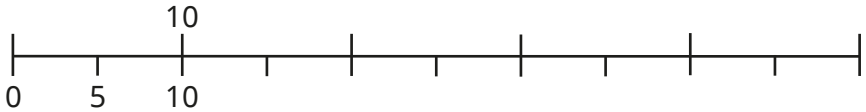
- Complete the number lines.





What do you notice?

- Complete the number line.



Which numbers are in both the 5 times-table and the 10 times-table?

Which numbers are only in the 5 times-table?

- Here is part of a hundred square.

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

  - Colour the numbers that are in the 10 times-table.

    Circle the numbers that are in the 5 times-table.

    Which numbers did you circle and colour?
  - Repeat the steps with a grid from 0 to 100

    What do you notice?
  - Complete the sentences.

    All numbers in the _____ times-table are also in the _____ times-table.

    Some numbers in the _____ times-table are also in the _____ times-table.

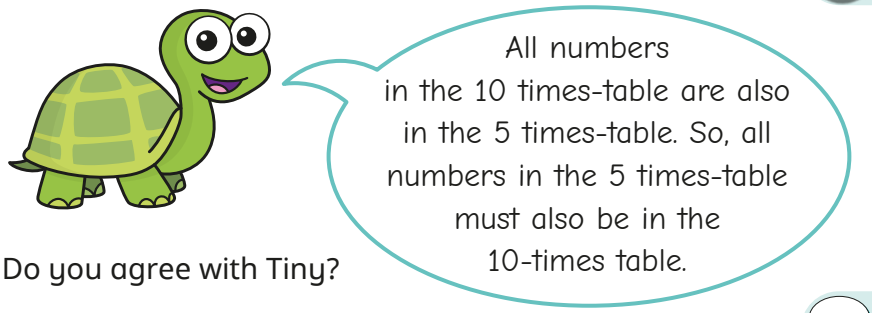
- Complete the multiplications.
  - 2 × 5 = _____ × 10
  - 5 × 8 = _____ × 10
  - _____ × 5 = 2 × 10
  - 5 × _____ = 10 × 10

© White Rose Education 2022

The 5 and 10 times-tables

Reasoning and problem solving

Tiny is thinking about the 5 and 10 times-tables.



Do you agree with Tiny?

Why?

No

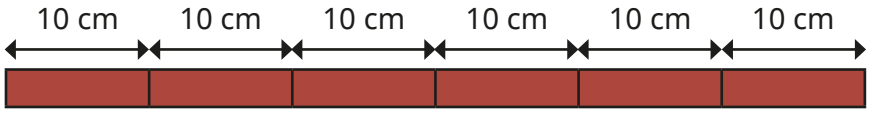
Ben has eight 5p coins.

Ann has the same amount of money as Ben in 10p coins.

How many 10p coins does Ann have?

4

There are six 10 cm pieces of wood.



How many 5 cm pieces can be made?

12

Use the 10 times-table to help you work out the multiplication.

5×18

$5 \times 18 = 10 \times 9 = 90$

© White Rose Education 2022

Spring Block 3

Length and height

© White Rose Education 2022

White Rose MATHS

Small steps

Step 1	Measure in centimetres
Step 2	Measure in metres
Step 3	Compare lengths and heights
Step 4	Order lengths and heights
Step 5	Four operations with lengths and heights

© White Rose Education 2022

Measure in centimetres

White Rose MATHS

Notes and guidance

In Year 1, children measured lengths and heights using non-standard units, such as cubes, and then began to look at measuring using a ruler. In this small step, they focus on measuring lengths and heights using a ruler, with a specific focus on measuring in centimetres. Children may need reminding that the abbreviation for centimetres is "cm" and that they should record this with their written answers.

It is essential that children understand the importance of starting from zero when measuring, and that not lining their ruler up correctly will lead to incorrect answers. They should be exposed to examples that highlight why this is so important.

Things to look out for

- Children may try to use a ruler to measure the lengths of lines that are not straight.
- Children may not line up the object they are measuring with zero on the ruler.
- Children may think that they cannot measure the length or height of anything beyond 15 cm if they are using a 15 cm ruler.
- Children may not include units with their answer.

Key questions

- What do the numbers on the ruler mean?
- Where do you need to start measuring from?
- What number does the start/end of the object line up with?
- How long/tall is the object?
- What is "cm" short for?
- Why do you need to start measuring from zero?

Possible sentence stems

- The start of the object is lined up with _____ cm.

  The end of the object is lined up with _____ cm.

  The length/height of the object is _____ cm.
- "cm" is short for _____

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

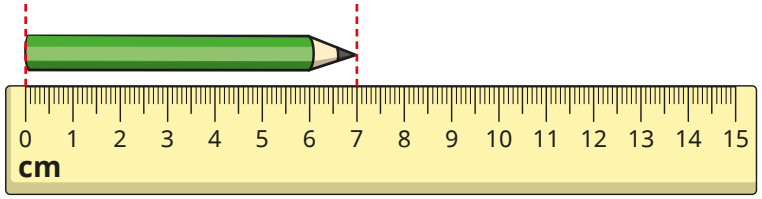
Measure in centimetres

Key learning

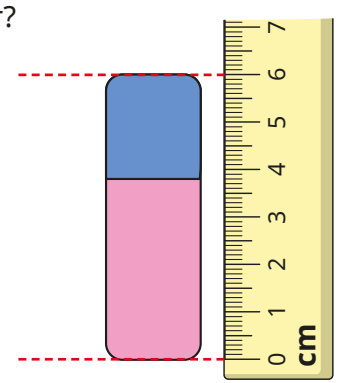
Give children a ruler and ask them to measure the lengths and heights of different objects in the classroom.

Ask them to record their measurements, using centimetres as their units.

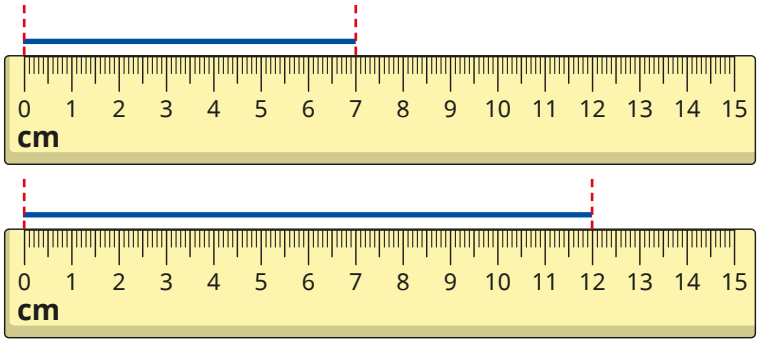
- How long is the pencil?



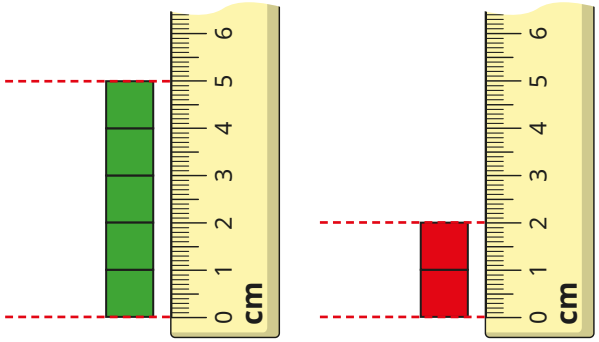
- How tall is the rubber?



- How long is each line?



- How tall is each tower?



- Use a pencil and ruler to draw the lines.

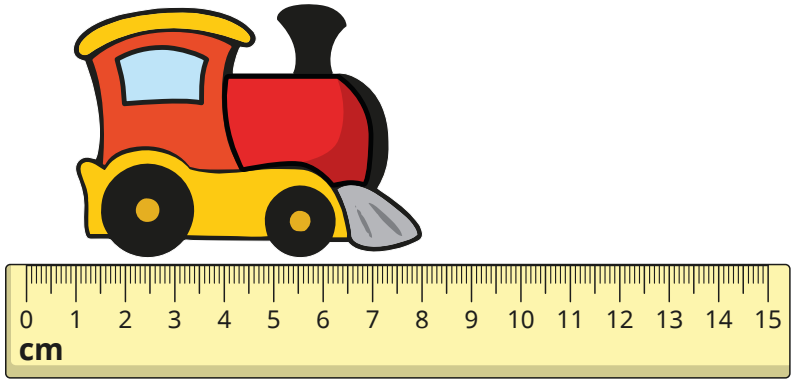
4 cm long	10 cm long	6 cm tall	2 cm tall

© White Rose Education 2022

Measure in centimetres

Reasoning and problem solving

Sam uses a ruler to measure the length of the toy train.

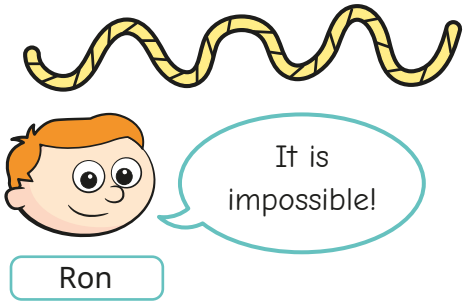


Do you agree with Sam?

Explain your answer.

No

Ron and Jo want to measure the length of the string.



Explain why Ron thinks this.

What way might Jo be thinking of?

Explore with pieces of string.

Children explore straightening out pieces of string to measure their lengths, ensuring that they start measuring from zero.

© White Rose Education 2022

Measure in metres

Notes and guidance

Building on the previous small step, children now begin to measure lengths and heights using metre sticks and tape measures, with a specific focus on measuring in metres. This is likely to be the first time that children have measured in metres, although they may be familiar with the terminology being used in everyday life.

Children will need formally introducing to "m" as the abbreviation of metres. Remind them of the importance of recording units with their answers.

The examples within this step refer only to full metre lengths and children are not expected to work with mixed units at this point. They do not need to be aware of the conversion between metres and centimetres, but should know that a metre is bigger than a centimetre and so metres are more commonly used when measuring larger objects.

Things to look out for

- Children may not line up the object they are measuring with zero, leading to an incorrect measurement.
- When using metre sticks to measure, children may not line them up correctly.

Key questions

- What do the numbers on the tape measure mean?
- How long is a metre stick?
- Why do you need to start measuring from zero?
- What number does the end of the object line up with?
- How long/tall is the object?
- What is "m" short for?
- Is a metre longer or shorter than a centimetre?

Possible sentence stems

- The object is _____ metre sticks long.
- The start of the object is lined up with _____ m.
  The end of the object is lined up with _____ m.
  The length/height of the object is _____ m.
- "m" is short for _____

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

Measure in metres

Key learning

Give children a metre stick and ask them to measure the lengths and heights of different objects in the classroom to the nearest metre.

Get them to say out loud: "_____ is _____ metres long/tall."

Ask them to record their measurements, using m as their units.

Ask children to use metre sticks to measure the length of the school hall to the nearest metre.

Observe how they do it and check that they line up their metre sticks correctly.

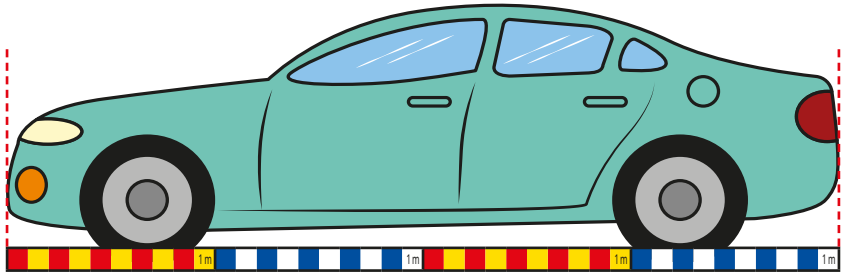
Give children a metre stick or tape measure and ask them to find different objects outside that are either longer or shorter than a metre.

Get them to draw their objects in a sorting diagram.

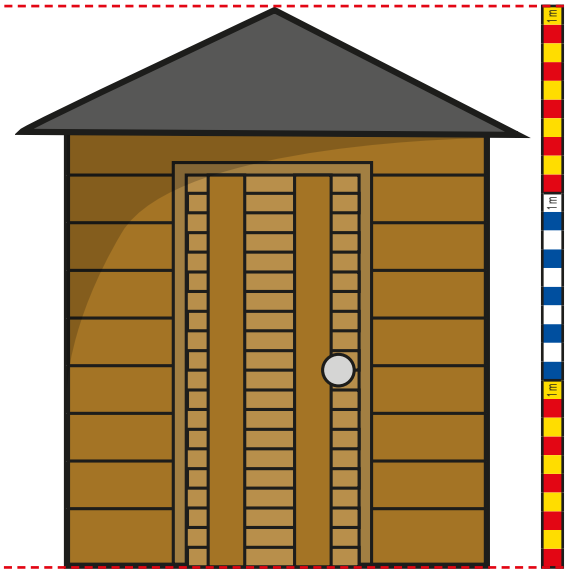
longer than a metre	shorter than a metre

- Here are two different coloured metre sticks.

  - What is the length of the car?



  - What is the height of the shed?

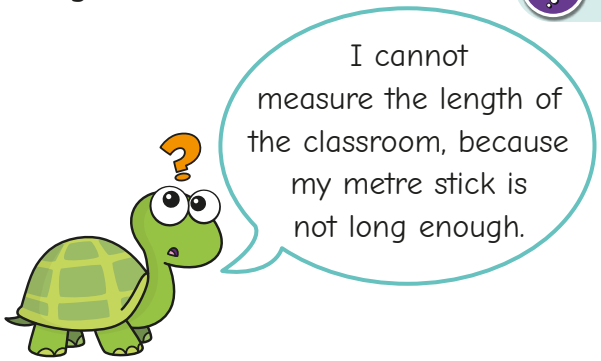


© White Rose Education 2022

Measure in metres

Reasoning and problem solving

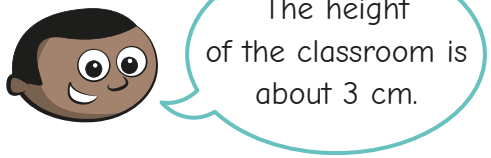
Tiny has a metre stick.



Is Tiny correct?

Explain your answer.

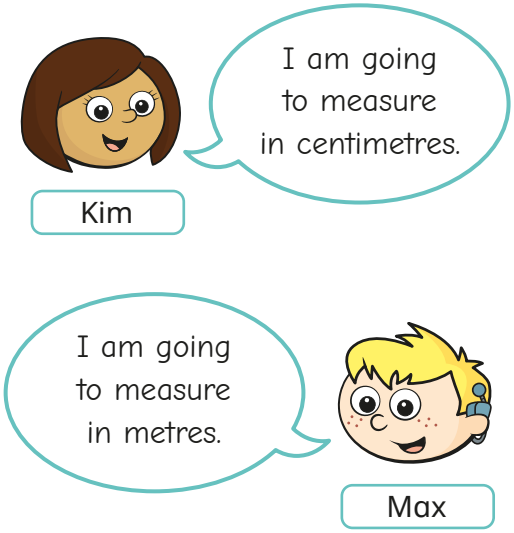
No



What mistake do you think Mo has made?

He has used centimetres instead of metres.

Kim and Max want to measure the length of the playground.



Whose way of measuring will be easier?

Explain your answer.

Max's

© White Rose Education 2022

Compare lengths and heights

Notes and guidance

In this small step, children compare the lengths and heights of objects using language such as “longer than”, “shorter than” and “taller than”. They also revisit the inequality symbols covered earlier in the year as a way of comparing lengths and heights.

At this stage, children only compare the lengths and heights of pairs of objects; ordering lengths and heights is covered in the next step.

The focus is on comparing lengths and heights given the same unit of measure, for example 75 cm and 62 cm. However, using learning from the previous step, children could also compare lengths and heights where the numerical value is the same, but the unit is different, for example 6 cm and 6 m. They use their knowledge that metres are greater than centimetres to support these comparisons.

Things to look out for

- Children may think that centimetres are bigger than metres because the word is longer.
- Children may confuse the words “longer” and “taller”.
- Children may need reminding of the meanings of the inequality symbols.

Key questions

- Which object is longer? How do you know?
- Which object is taller? How do you know?
- Which object is shorter? How do you know?
- Which is longer, 1 cm or 1 m?
- What does “</>/=” mean?
- What is the difference between “longer” and “taller”?

Possible sentence stems

- _____ is _____ cm/m long/tall.
- _____ cm/m is greater/less than _____ cm/m.
- _____ is longer/taller than _____
- _____ is shorter than _____

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =

© White Rose Education 2022

Compare lengths and heights

Key learning

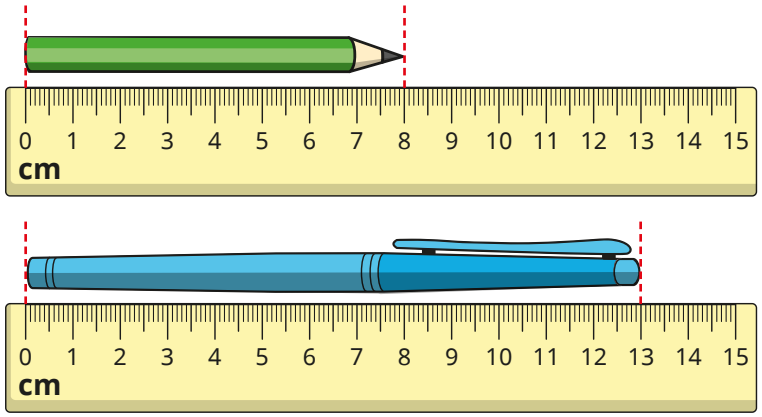
Give children two objects.

Ask them, without measuring, which is longer.
How do they know?

Now ask them to measure the length of each object. Ask how this shows which one is longer. What do they notice?

Repeat for finding which of a pair of objects is taller.

- Kay measures the lengths of a pencil and a pen.



  - How long is the pencil? How long is the pen?
  - Write **longer** or **shorter** to complete the sentences.

    The pen is _____ than the pencil.

    The pencil is _____ than the pen.

- Choose a phrase to compare the lengths.

  longer than | shorter than | the same as

  - 15 cm is _____ 60 cm.
  - Sixty metres is _____ 60 m.
  - 96 m is _____ 69 m.
  - 1 cm is _____ 1 m.

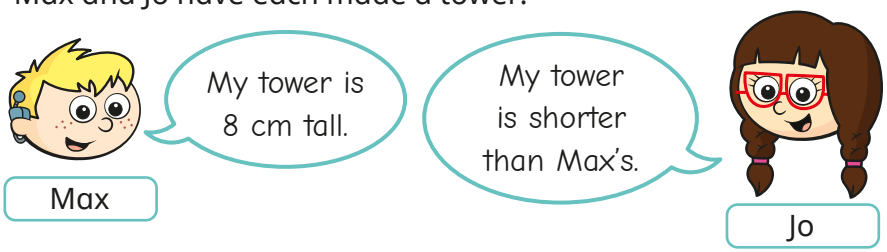
- Write <, > or = to complete the statements.

  7 metres ◯ 17 metres

  18 cm ◯ 18 m

  32 cm ◯ 32 centimetres

- Max and Jo have each made a tower.



What could the height of Jo's tower be?

© White Rose Education 2022

Compare lengths and heights

Reasoning and problem solving

Give each child an object.

Ask them to measure the length or height of their object.

Then challenge them to find something that is:

- longer/taller
- shorter
- the same length

Ask them to measure the objects that they identify for each comparison.

They record their comparisons using the sentences and inequality symbols.

_____ is longer/taller than _____

_____ is shorter than _____

_____ < _____

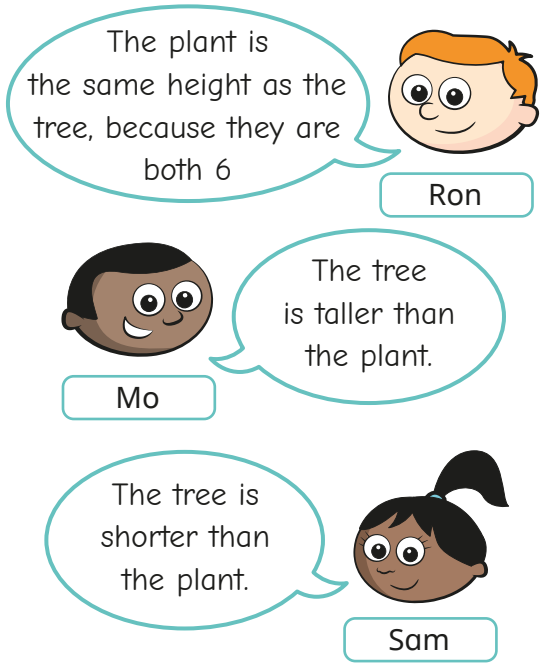
_____ > _____

_____ = _____

Answers will vary, depending on the objects.

A plant is 6 cm tall.

A tree is 6 m tall.



Who is correct?

How do you know?

Mo

© White Rose Education 2022

Order lengths and heights

Notes and guidance

Building on the previous step, children now begin to order lengths and heights. The new language introduced in this step is “shortest”, “longest” and “tallest”, but they also continue to use “shorter”, “longer” and “taller” when describing the order of the objects. They order lengths from longest to shortest, heights from tallest to shortest and vice versa. Children order given lengths and heights, as well as objects that they have measured themselves.

As in the previous step, the focus is on ordering lengths and heights where the unit of measure is the same. This supports children’s understanding of ordering numbers within 100, which they covered earlier in the year. Children could be stretched to ordering lengths and heights such as 30 cm, 15 cm and 30 m, where they need to consider the units for two values and the numerical values for the other two.

Things to look out for

- Children may use the inequality symbols incorrectly by using two different ones in the same statement, for example writing 14 cm < 20 cm > 18 cm.
- Children may confuse the language of “longer”, “longest”, “taller” and “tallest”.

Key questions

- Which object is longest? How do you know?
- Which object is tallest? How do you know?
- Which object is shortest? How do you know?
- Which is longer, 1 cm or 1 m?
- What is the difference between “longest” and “tallest”?

Possible sentence stems

- _____ cm/m is greater/less than _____ cm/m.
- _____ cm/m is longer/taller than _____ cm/m.
- _____ cm/m is shorter than _____ cm/m.
- _____ is the shortest.
- _____ is the longest/tallest.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit using rulers, scales, thermometers and measuring vessels
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =

© White Rose Education 2022

Order lengths and heights

Key learning

Give children three objects.

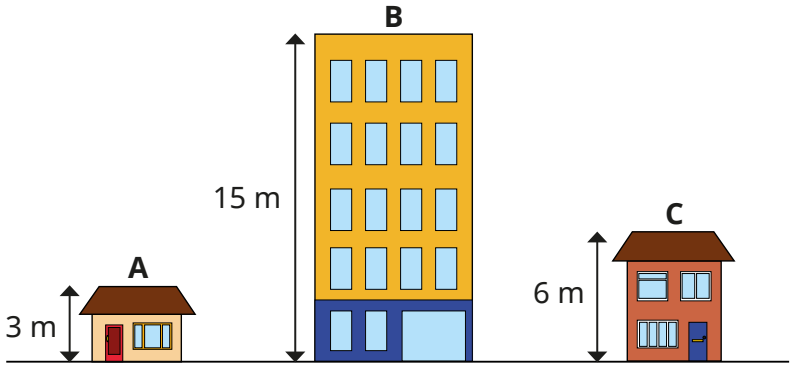
Ask them, without measuring, which is the longest. How do they know?

Ask them which is the shortest. How do they know?

Now ask them to measure the length of each object. Ask how this shows which one is the longest and which one is the shortest. What do they notice?

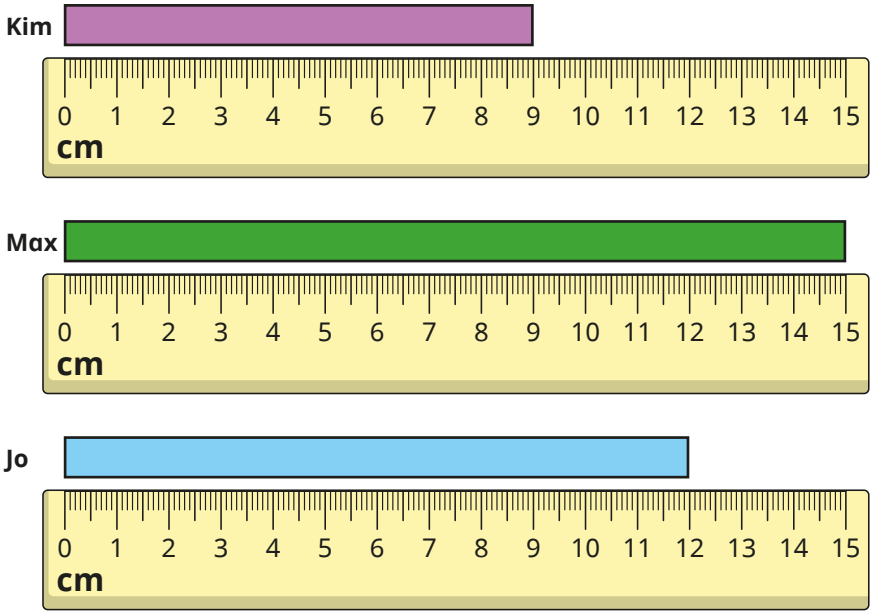
Repeat for finding which objects are the tallest and shortest.

- The height of three buildings is shown.



  - Which building is the tallest?
  - Which building is the shortest?
  - Put the buildings in order, from tallest to shortest.

- Kim, Max and Jo are comparing the lengths of ribbons.



  - Whose ribbon is the longest? Whose ribbon is the shortest?
  - Put the ribbons in order, from longest to shortest.

- Write the lengths in order.

  Start with the shortest length.

25 cm	7 cm	10 cm

© White Rose Education 2022

Order lengths and heights

Reasoning and problem solving

Four children are measuring their heights.

Fay is taller than Ann, but not as tall as Dan.

Tom is taller than Dan.

Write the children's names in order of their heights.

Start with the shortest child.

Ann, Fay, Dan, Tom

An oak tree is 20 m tall.

An elm tree is 15 m tall.

A pine tree is taller than an elm tree, but shorter than an oak tree.

How tall could the pine tree be?

Compare answers with a partner.

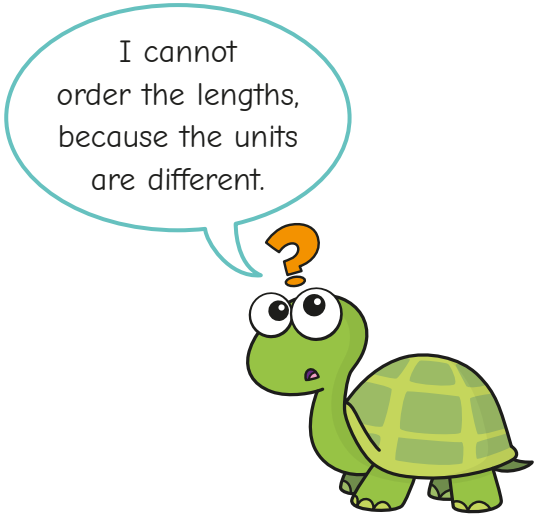
16 m, 17 m, 18 m, 19 m

A plane is 55 m long.

A boat is 95 m long.

A scooter is 55 cm long.

Tiny wants to put the lengths in order.



Do you agree with Tiny?

Why?

No

© White Rose Education 2022

Four operations with lengths and heights

Notes and guidance

In this small step, children draw on their knowledge of the four operations from earlier in the year and apply it to their understanding of lengths and heights.

Children solve both one-step and two-step problems relating to lengths and heights. They use concrete and pictorial representations to support them in understanding the questions, and in calculating efficiently.

It is important that children understand that when adding and subtracting with lengths and heights, the units that they are working with need to be the same. At this stage, they are not required to calculate with mixed units.

Things to look out for

- Children may add and subtract lengths and heights with different units.
- Children may write a unit on a multiplier. For example, when finding 4 times the size of 3 cm, they may write 4 cm × 3 cm = 12 cm.
- Word problems can often be more difficult for children to unpick, and concrete and pictorial representations can be used to support this understanding.

Key questions

- What do you need to do first? How do you know?
- Is the length/height longer/shorter? How do you know?
- Is _____ taller or shorter than _____? How do you know?
- Do you need to add or subtract?
- Do you need to multiply or divide?
- Are you working with centimetres or metres?

Possible sentence stems

- _____ is _____ cm/m long/tall.
- _____ lots of _____ cm/m is _____ cm/m.

  _____ of _____ cm/m is _____ cm/m.

National Curriculum links

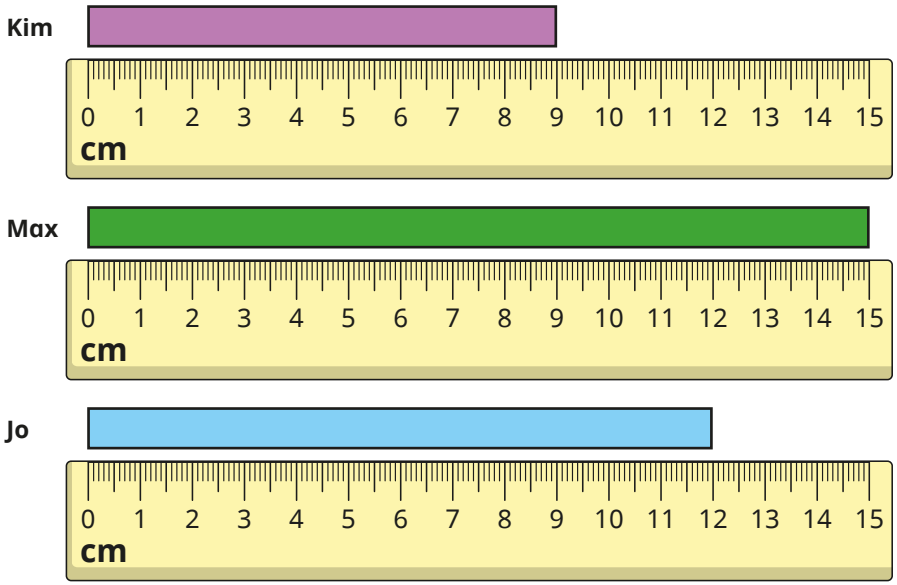
- Solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

© White Rose Education 2022

Four operations with lengths and heights

Key learning

- Kim, Max and Jo each have a piece of ribbon.



  - How much longer is Max's ribbon than Kim's?
  - Max and Jo put their ribbons together.

    How long are they altogether?

- A pencil is 12 cm long.

  A pen is 3 cm longer than the pencil.
  - How long is the pen?
  - What is the total length of the pen and the pencil?

- Ben has a toy train, a toy plane and a toy car.
  - The train is 28 cm long.

    The plane is 16 cm longer.

    How long is the plane?
  - The train is double the length of the car.

    How long is the car?

- An ash tree is 10 m tall.

  An oak tree is twice as tall as the ash tree.

  How tall is the oak tree?

- A rubber is 5 cm long.

  A bookmark is 4 times as long as the rubber.

  How long is the bookmark?

- A house is 6 m tall.

  The garage is half as tall as the house.

  How tall is the garage?

© White Rose Education 2022

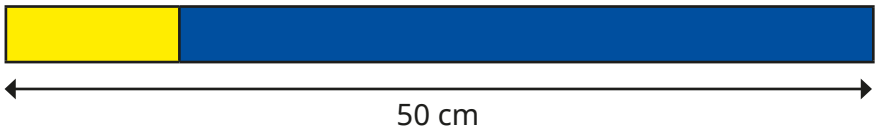
Four operations with lengths and heights

Reasoning and problem solving

Here is a strip of yellow paper.

A blue strip of paper is 4 times longer than the yellow strip.

The strips are joined end to end.



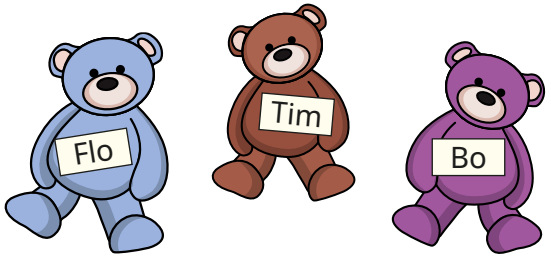
How long is the yellow strip?

How long is the blue strip?

10 cm

40 cm

There are three teddies called Flo, Tim and Bo.



- Flo is 15 cm taller than Tim.
- Tim is 3 cm shorter than Bo.
- Bo is 42 cm tall.

How tall is Flo?

How tall is Tim?

How much taller is Flo than Bo?

How did you work out the answers?

Flo = 54 cm

Tim = 39 cm

12 cm

© White Rose Education 2022

Spring Block 4

Mass, capacity and temperature

© White Rose Education 2022

White Rose MATHS

Small steps

Step 1	Compare mass
Step 2	Measure in grams
Step 3	Measure in kilograms
Step 4	Four operations with mass
Step 5	Compare volume and capacity
Step 6	Measure in millilitres
Step 7	Measure in litres
Step 8	Four operations with volume and capacity

© White Rose Education 2022

Small steps

Step 9 Temperature

© White Rose Education 2022

Compare mass

Notes and guidance

In this small step, children revisit learning from Year 1 as an introduction to mass. They should have experience of using a range of scales to weigh different everyday objects, but may need to revisit this skill. The focus of this small step is not for children to identify the mass of objects in grams or kilograms, but rather to compare the mass of two or more objects.

Children use the language "heavier" and "lighter" alongside the inequality symbols to compare mass. They can also use cubes or similar objects as a non-standard unit of measurement to compare different objects. This will help children in the next two steps when they are formally introduced to grams and kilograms for the first time.

Things to look out for

- Children may not be able to use balance scales accurately. For example, they may place the objects on one side too close to the centre, meaning that the scales cannot be used to accurately compare the masses.
- Children may need to revise the use of inequality symbols.
- Children may think that the larger the object, the greater its mass must be.

Key questions

- What does "heavier" mean?
- What does "lighter" mean?
- What does "< / > / =" mean?
- How do you use a balance scale?
- Which object is heavier/lighter? How do you know?
- Which object has the greater/smaller mass? How do you know?

Possible sentence stems

- The _____ is heavier than the _____

  _____ > _____
- The _____ is lighter than the _____

  _____ < _____

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =

© White Rose Education 2022

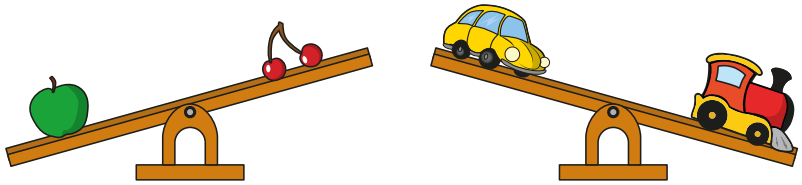
Compare mass

Key learning

Use a set of balance scales to compare the mass of everyday objects.

Discuss what children notice.

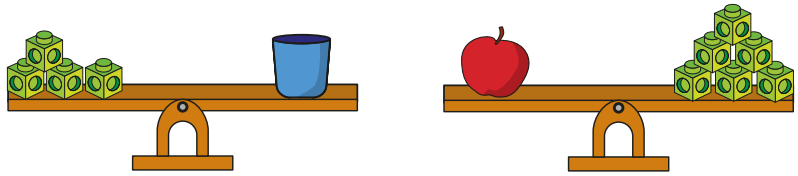
- Complete the sentences for each picture.



The _____ is heavier than the _____

The _____ is lighter than the _____

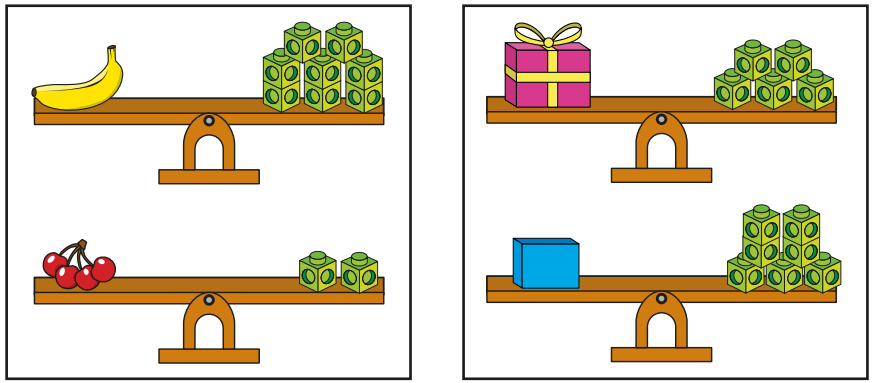
- Count the cubes to find the mass of each object.



Which object is heavier?

How do you know?

- Count the cubes to find the mass of each object.



Write <, > or = to compare the masses.

Give children a selection of objects. Ask them to choose three objects and use scales to order them from heaviest to lightest.

Ask children to complete this sentence for their set of objects.

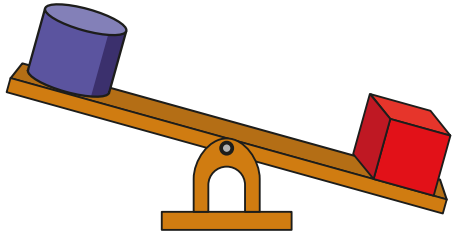
The _____ is heavier than the _____, but lighter than the _____

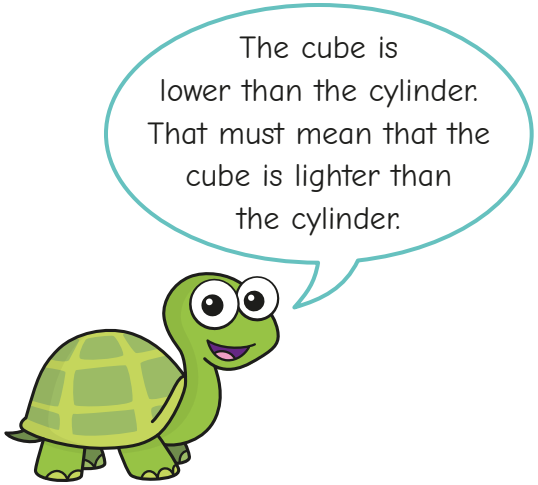
© White Rose Education 2022

Compare mass

Reasoning and problem solving

Tiny is comparing masses.



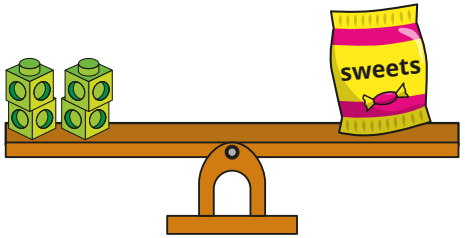


Do you agree with Tiny?

Why?

No

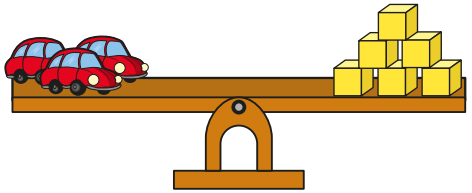
Ron uses cubes to find the mass of one bag of sweets.



What is the mass of 2 bags of sweets?

8 cubes

Which object is lighter, a car or a cube?



How do you know?

cube

© White Rose Education 2022

Measure in grams

Notes and guidance

Over the next small steps, children will be introduced to standard units of measure.

Give children experience of picking up and feeling gram weights and thinking about objects that have a similar mass to 1 g/10 g/100 g to help them contextualise their learning and support with estimating. They should also have experience of using balance scales and circular scales and think about the differences between them. They may find circular scales easier to use, especially when the arrow is pointing directly to a number. They may need support to estimate masses when the arrow does not point to a number on the scale.

In the next small step, children will develop this learning further as they go on to measure in kilograms.

Things to look out for

- Children should only measure items up to 100 g, as numbers above 100 are not covered in Year 2
- Balance scales may not be accurate or may not be used accurately, which could lead to confusion.
- Children may not read circular scales accurately, particularly if the arrow is not pointing to a number.

Key questions

- What is mass?
- What objects can you find the mass of?
- What object do you think has a similar mass to 1 g/10 g/100 g?
- How do you find the mass of an object using balance scales?
- How are circular scales different from balance scales?
- How can you find the mass of an object if the arrow is not pointing to a number shown on the scales?

Possible sentence stems

- The arrow is pointing to _____
- The _____ has a mass of _____ g.
- The arrow is pointing between _____ and _____, so the _____ has a mass of about _____ g.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

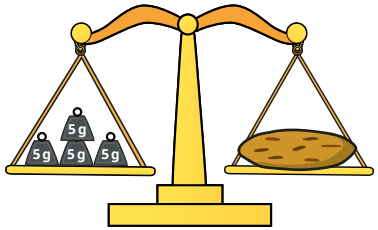
Measure in grams

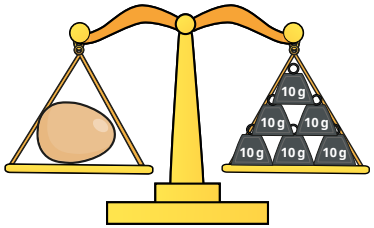
Key learning

Ask children to pick up three different weights and then look for an object that they think has the same mass as one of the weights.

Children can use balance scales to see how accurate they were.

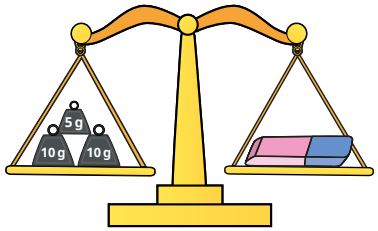
- What is the mass of each object?



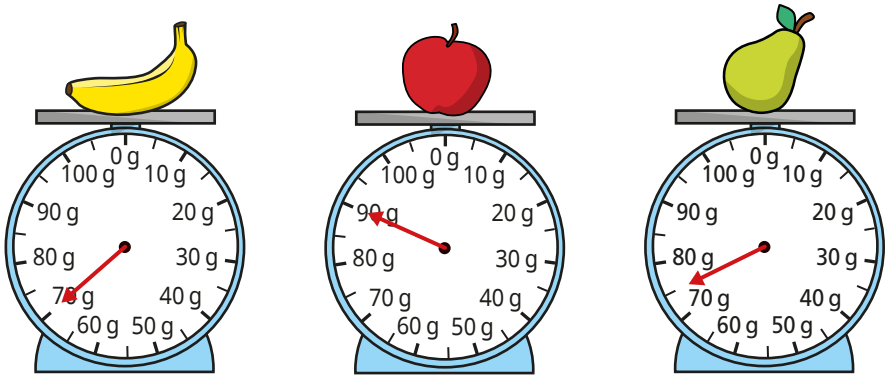


How did you work it out?

- What is the mass of each object?

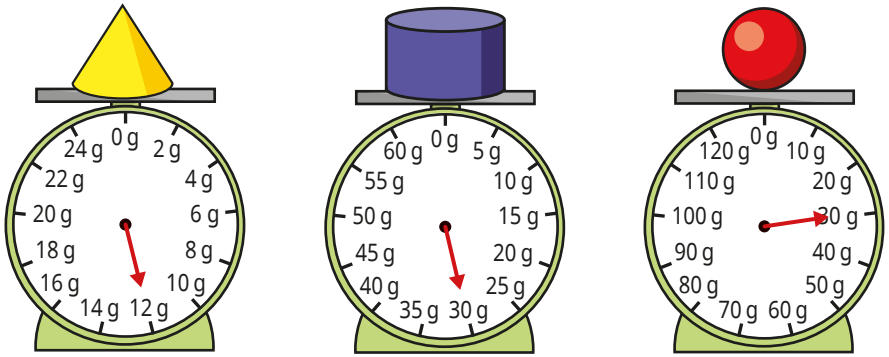


- What is the mass of each object?



How are these scales different from balance scales? How are they similar?

- What is the mass of each 3-D shape?

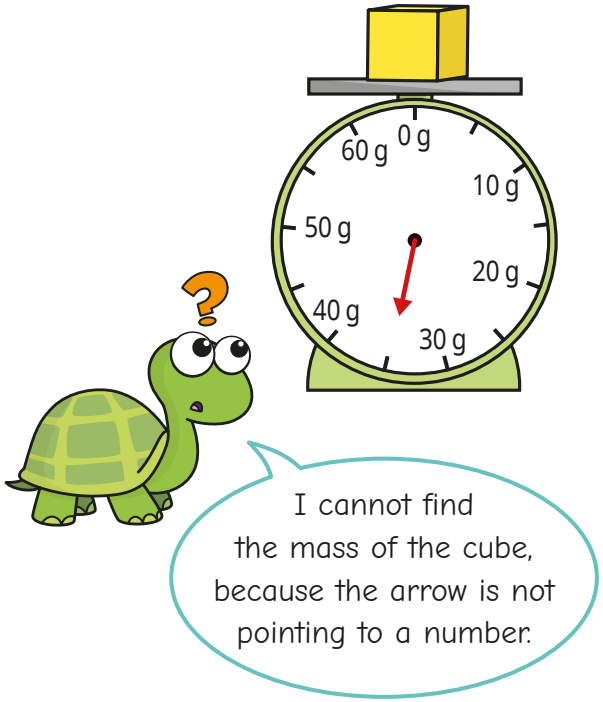


© White Rose Education 2022

Measure in grams

Reasoning and problem solving

Tiny uses scales to find the mass of a cube in grams.



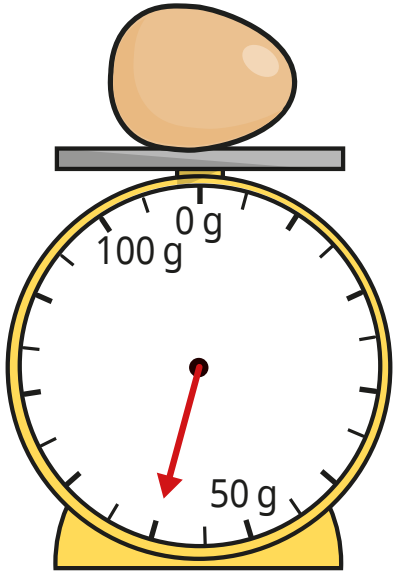
Do you agree with Tiny?

Why?

No

The cube has a mass of 35 g.

What is the mass of the egg?



How do you know?

60 g

© White Rose Education 2022

Measure in kilograms

Notes and guidance

In this small step, children move on to measure mass in kilograms. There are similarities between this step and the previous one, but it is important that children understand the differences between the units. They need to be aware of the types of items that have a mass typically measured in kilograms and those that have a mass typically measured in grams.

Give children experience of picking up and feeling kilogram weights and thinking about comparing these to everyday objects. Children should realise that a kilogram is heavier than a gram but they do not need to know that there are 1,000 g in 1 kg.

Throughout the step, children use balance scales and circular scales to find the masses of different objects. They should become more confident and accurate when using these.

Things to look out for

- Children may not understand the difference between kilograms and grams.
- Balance scales may not be accurate or may not be used accurately, which could lead to confusion.
- Children may not read circular scales accurately, especially if the arrow is not pointing to a number.

Key questions

- What is mass?
- Which is greater, a kilogram or a gram?
- What types of objects would you measure in kilograms?
- What object do you think has a similar mass to 1 kg/10 kg?
- How can you find the mass of an object using balance scales?
- How can you find the mass of an object if the arrow is not pointing to a number shown on the scales?

Possible sentence stems

- The mass of _____ is _____ kg.
- The arrow is between _____ kg and _____ kg.

  The mass of the object is about _____ kg.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

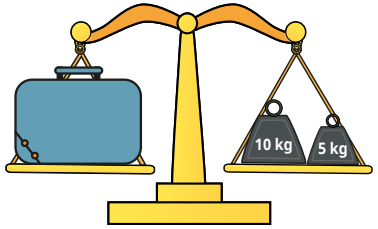
Measure in kilograms

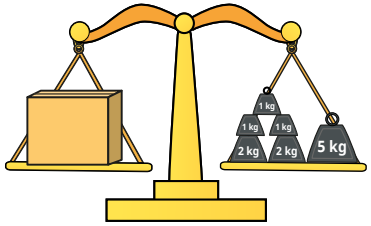
Key learning

Ask children to pick up three different weights and then look for an object that they think has the same mass as one of the weights.

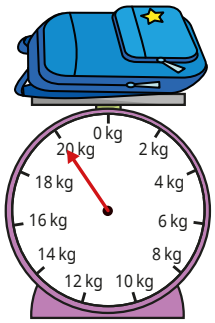
Children can use balance scales to check.

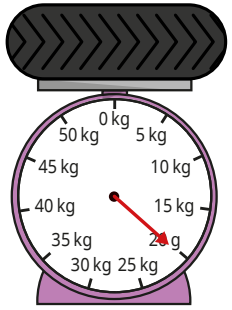
- What is the mass of each object?





- Read the scales to find the mass of each object.

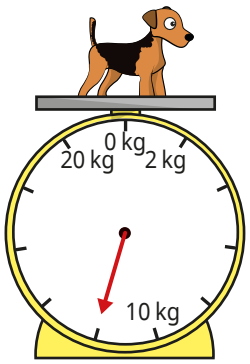


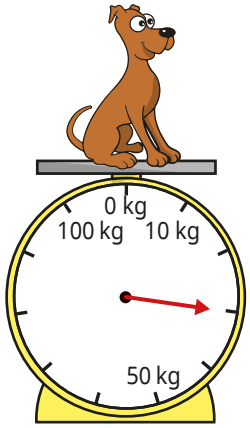


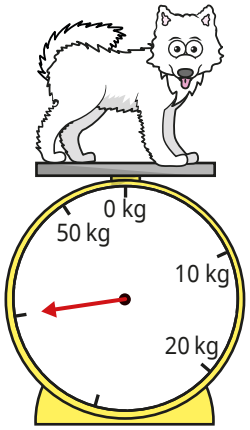
What do you notice about your answers?

What do you notice about the arrows?

- What is the mass of each dog?

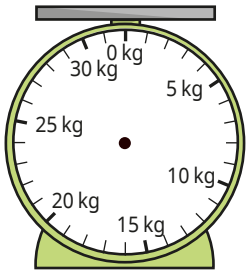




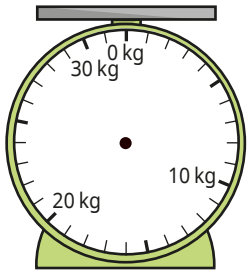


- Mark the masses on the scales.

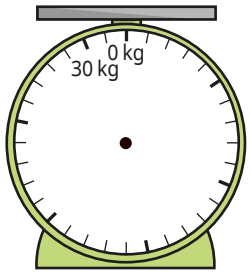
5 kg



12 kg



17 kg

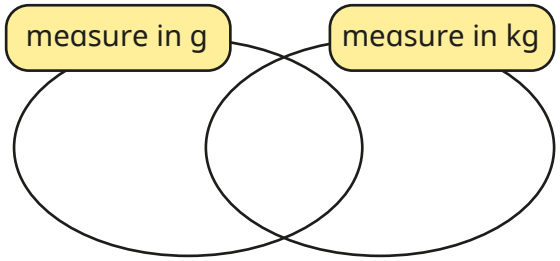


© White Rose Education 2022

Measure in kilograms

Reasoning and problem solving

Sort Whitney and the objects into the groups.



Did your partner sort in the same way?

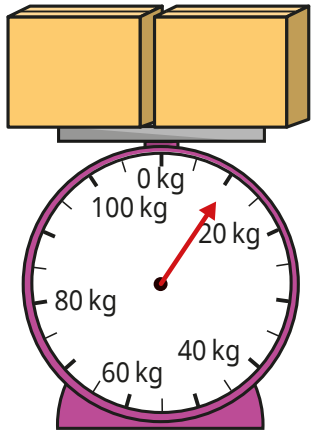
Find or think of some more objects to go into each group.

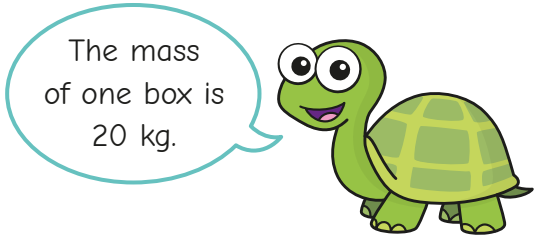
grams only:
paper clip, pencil

kilograms only:
rucksack, Whitney

either: book, pineapple

Tiny is finding the mass of **one** box.





Do you agree with Tiny?

Why?

No

© White Rose Education 2022

Four operations with mass

Notes and guidance

This small step gives children the opportunity to practise the calculation skills that they learnt earlier in the year in the context of mass. They can also consolidate their reading of different scales to find the information they need to solve the problems.

Children may need support to choose which operation to use, perhaps by drawing a bar model or part-whole model. Encourage them to share and try different methods and to consider the efficiency of their methods.

Children also solve multi-step problems involving mass. These may be challenging at first, so it is useful to model how to approach these sorts of problems.

Things to look out for

- Children may select the incorrect operation to complete the calculation.
- Children may use inefficient strategies to complete calculations.
- Children may not read scales accurately, leading to errors in their calculations.
- Support may be needed to break down multi-step problems into smaller steps.

Key questions

- Do you need to add or subtract to solve the problem?
- How can you write this as a number sentence?
- How can you represent this using a bar model/ part-whole model?
- Is there more than one way to solve the problem?
- What do you need to do first? How do you know?

Possible sentence stems

- To find the total mass, I need to _____ the mass of _____ and _____
- To find the mass of _____, I need to _____ from the total mass.
- First, I need to … Then, I need to …

National Curriculum links

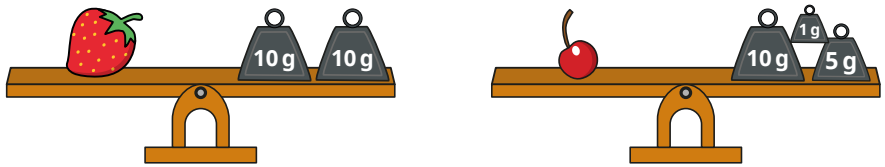
- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

Four operations with mass

Key learning

- Complete the sentences.

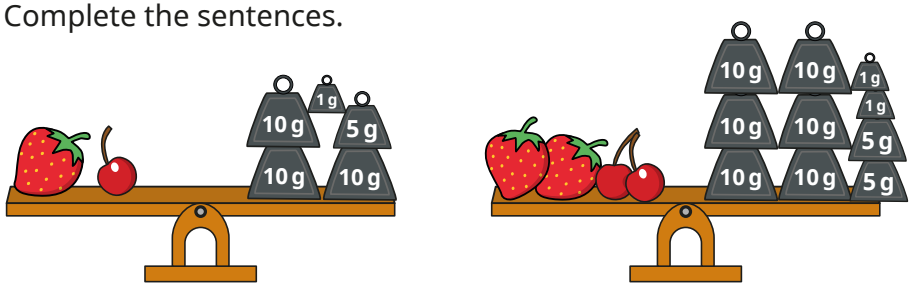


The mass of the strawberry is _____ g.

The mass of the cherry is _____ g.

The total mass of a strawberry and a cherry is _____ g.

- Complete the sentences.



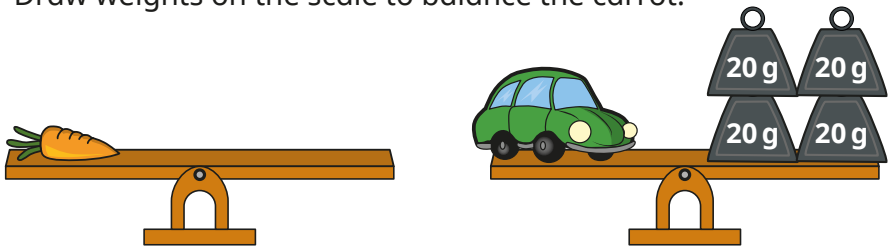
The total mass of a strawberry and a cherry is _____ g.

The total mass of 2 strawberries and 2 cherries is _____ g.

How did you work this out? Is there an easier way?

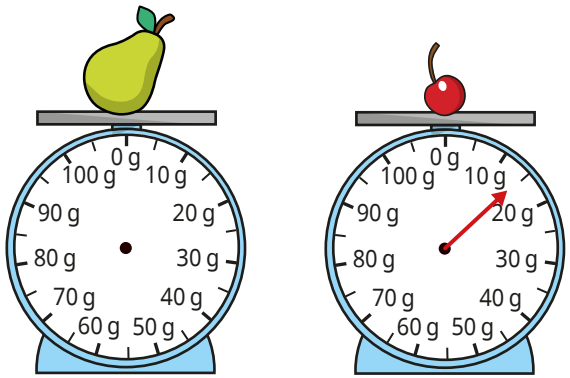
- The carrot is 40 g lighter than the car.

Draw weights on the scale to balance the carrot.



- The pear is 75 g heavier than the cherry.

Mark the mass of the pear on the scales.



- A tomato has a mass of 40 g.

An apple is 50 g heavier than the tomato.

A pear is 20 g lighter than the apple.

What is the mass of the pear?

© White Rose Education 2022

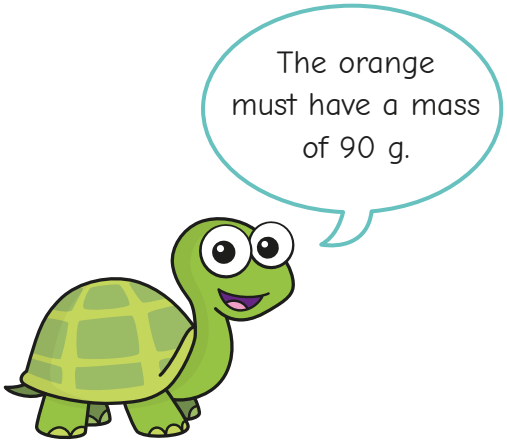
Four operations with mass

Reasoning and problem solving

Tiny is finding the mass of an orange and a pear.

The mass of the pear is 20 g more than the orange.

The pear has a mass of 70 g.

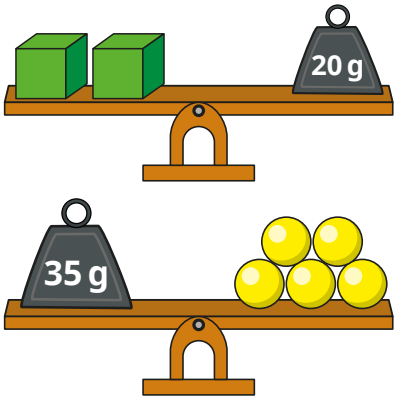


What mistake has Tiny made?

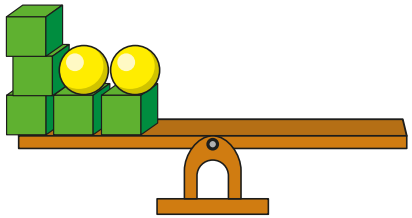
What is the mass of the orange?

50 g

These scales are balanced.



Draw weights to balance these scales.



Compare methods with a partner.

64 g shown in relevant weights

© White Rose Education 2022

Compare volume and capacity

Notes and guidance

Children encountered volume and capacity in Year 1 and in this small step they revisit this learning, before moving on to measuring in millilitres and litres in the next steps.

It is important that children know the difference between capacity and volume; discussion of the other uses of the word "capacity" in everyday life, such as a sports stadium, may support this.

Children compare the volume/capacity of different containers. Language such as "full", "half full", and "empty" could be a good starting point before comparing the amounts using "greater" and "less" and then the symbols.

There are plenty of opportunities within this step for children to complete practical tasks with different containers.

Things to look out for

- Children may need reminding of language associated with volume and capacity from earlier learning.
- Children may not be able to identify/explain the difference between volume and capacity.
- Children may think it is impossible to compare the capacities of two different-sized/shaped containers.

Key questions

- What is volume/capacity?
- What is the difference between volume and capacity?
- Which container has the greater/smaller capacity? How do you know?
- Which container is holding the greater/smaller volume?
- Which symbol should you use, <, > or =? How do you know?
- How could you check to see which container is holding the greatest/smallest volume?

Possible sentence stems

- The volume of liquid in A is _____ than the volume of liquid in B.
- The capacity of container A is _____ than the capacity of container B.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels
- Compare and order lengths, mass, volume/capacity and record the results using >, < and =

© White Rose Education 2022

Compare volume and capacity

Key learning

Give children some different containers.

Ask which container they think has the smallest/ greatest capacity.

Ask them to explore the capacity of the containers using rice or water.

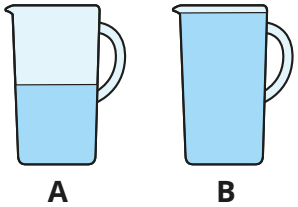
Discuss how they can work out which container has the greatest capacity.

- Here are three glasses of water.
  - Which glass is full?
  - Which glass is half full?
  - Which glass is empty?

- Here are two jugs of water.

  Write "more" or "less" to complete the sentence.

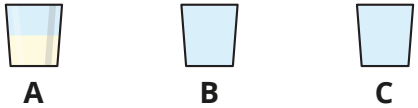
  Jug A has _____ water than jug B.



  Write <, > or = to compare the volumes.

  volume of water in jug A ◯ volume of water in jug B

- There is some milk in glass A.

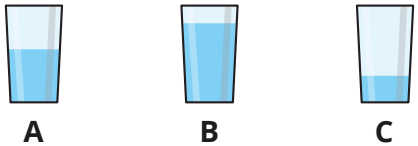


  Colour the glasses so that:
  - glass B has more milk than glass A
  - glass C has less milk than glass A

  Is there more than one answer? Why?

- Which glass contains the most water?

- Write "more" or "less" to complete the sentences.



  Glass C has _____ water than glass B.

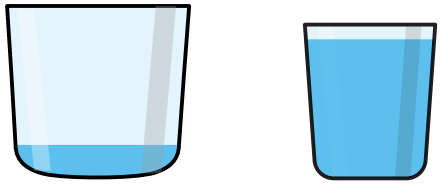
  Glass A has _____ water than glass C, but _____ water than glass B.

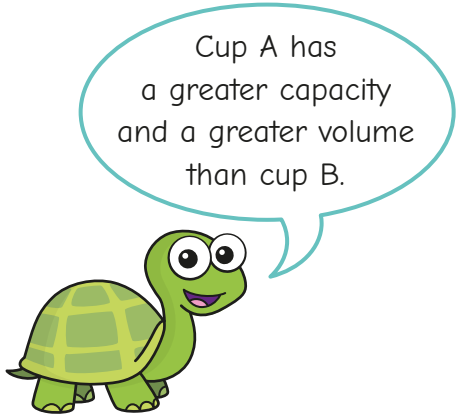
© White Rose Education 2022

Compare volume and capacity

Reasoning and problem solving

Here are two cups of water.





Do you agree with Tiny?

Why?

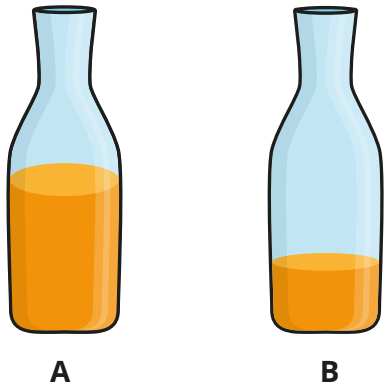
No

Kay has two full bottles of juice.

She pours some juice from bottle A into a cup.

She pours some juice from bottle B into a glass.

The picture shows how much juice is left in each bottle.



Which has more juice in it, the cup or the glass?

How do you know?

glass

© White Rose Education 2022

Measure in millilitres

Notes and guidance

In this small step, children use the skills from the previous step to support them in measuring volume in millilitres. This should be introduced practically to give children the understanding of how much space, for example, 100 ml takes up. This will be important when comparing to litres in the next step.

Carefully model how to accurately read the scales in order to avoid mistakes. Once they are secure in this, children read a range of scales to measure the volume of liquid in a container. The scales become gradually more complex, and children need to develop strategies to work out the volume shown. All containers should have a maximum capacity of 100 ml, as children have not yet explored numbers greater than 100.

Real-life contexts could be used to support understanding, for example juice cartons, teaspoons and tablespoons.

Things to look out for

- Children may look at the top of the container and find the capacity rather than the volume.
- Children may require support in interpreting more complex scales.
- Children may think that it is impossible to find the capacity of a container without a scale.

Key questions

- What is capacity? What is volume?
- How can you measure the volume of water in this container?
- How does the scale on the container help?
- How can you accurately draw the volume on this container?
- How could you find the capacity of this container?
- What mistakes do you think people may make when reading this scale?
- If the water level is between these two marks, what would be a sensible estimate for the volume?

Possible sentence stems

- The container has a capacity of _____ millilitres.
- The volume of _____ in the _____ is _____ millilitres.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

Measure in millilitres

Key learning

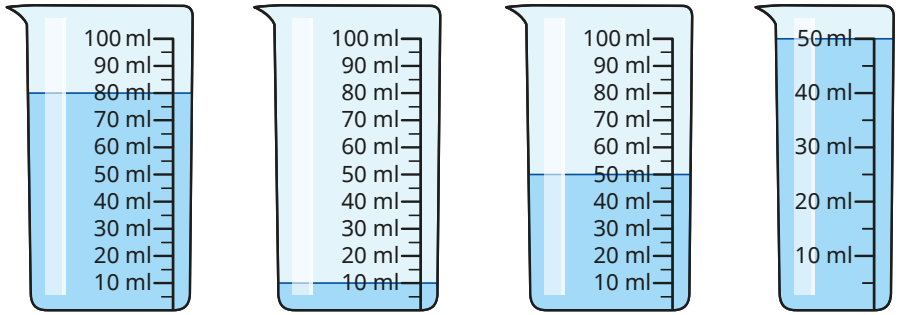
Provide a variety of different containers with millilitres clearly labelled, for example measuring spoons, measuring jugs and measuring beakers. Pour some water into each container.

Ask children to measure the volume of water in each container.

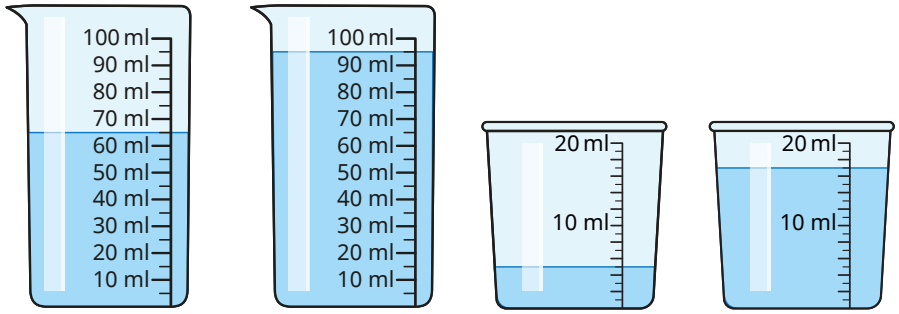
Challenge them to estimate the capacities of containers that have no scale.

They can check their answers by filling the containers and then pouring the water into a measuring jug.

- How much water is there in each beaker?

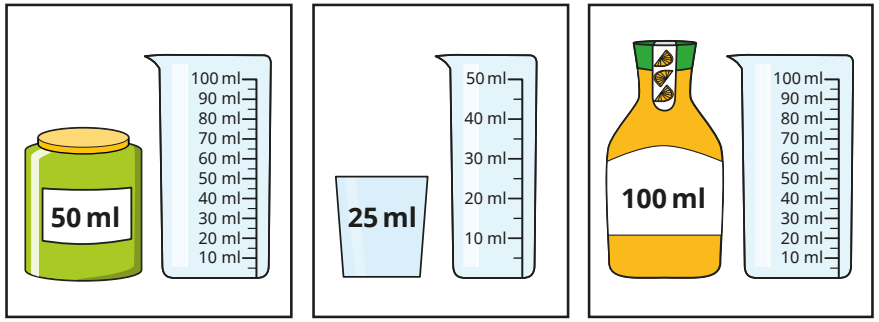


- How much water is there in each container?



- Each container is emptied into a beaker.

  Draw a line on each beaker to show the volume of liquid.

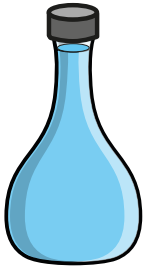


© White Rose Education 2022

Measure in millilitres

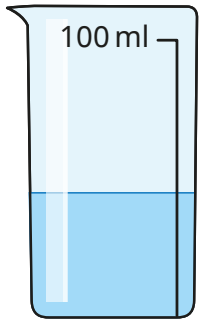
Reasoning and problem solving

How can you measure the capacity of the container?



Pour the liquid into a measuring jug.

Estimate the amount of water in the container.

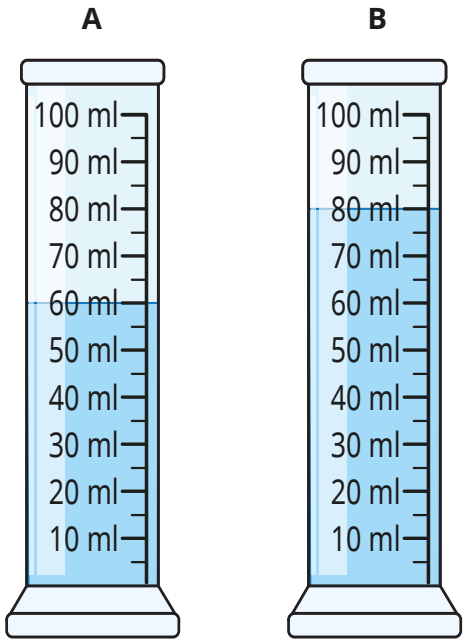


Explain your answer.

approximately 45 ml

A teaspoon holds 5 ml.

How many teaspoons of liquid are there in each container?



A: 12

B: 16

© White Rose Education 2022

Measure in litres

Notes and guidance

This small step builds on skills from the previous step, now focusing on litres. It is important that children experience seeing and practically measuring litres. They could then compare a number of litres to the same number of millilitres (for example, 10 l and 10 ml). While children do not yet need to know that 1 l = 1,000 ml, they do need to be aware that 1 litre is significantly more liquid than 1 millilitre.

As with the previous step, children read progressively harder scales that count in 2s, 5s and 10s. Model strategies to read these scales and encourage children to share their methods.

Children also shade a container to show a certain volume. This will be built on in Year 3, where children will measure in both litres and millilitres, rather than focusing on each unit in isolation.

Things to look out for

- Children may mix up millilitres and litres.
- Children may need support when reading more complex scales.
- If only looking at pictures, children may believe that millilitres and litres take up a similar amount of space.

Key questions

- How can you measure the volume of this container?
- How are litres and millilitres different?
- How much water do you estimate is in this container?
- What strategy did you use to read the scale? Is there a more efficient way?
- Where do you need to draw a line on the scale? How do you know?
- Would you measure the capacity of this container in litres or millilitres?

Possible sentence stems

- The capacity of the container is _____ litres.
- The volume of _____ in the container is _____ litres.
- 1 litre is _____ than 1 millilitre.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

Measure in litres

Key learning

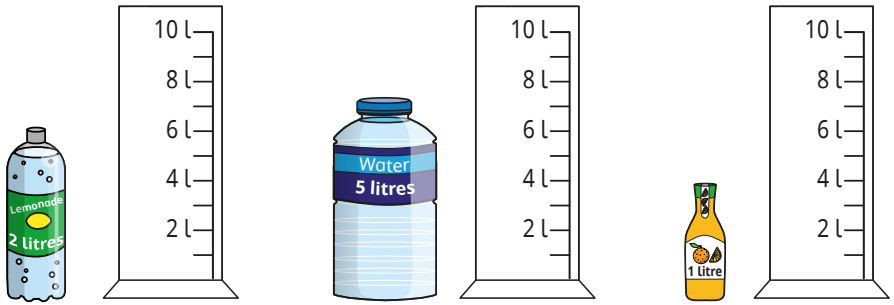
Provide a variety of containers labelled in litres for children to measure the capacities of different containers.

Challenge children to estimate the capacities and to check how accurate they were.

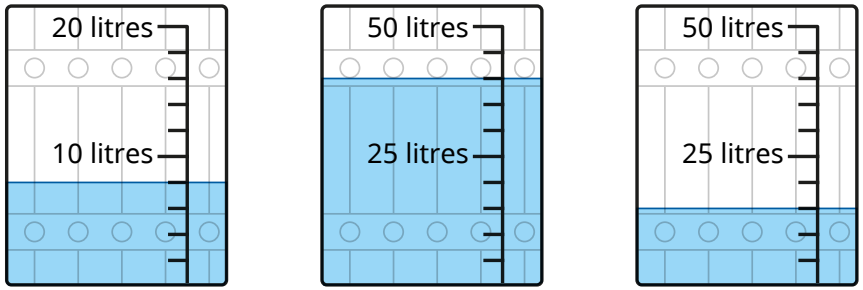
- How much water is there in each bucket?

- The liquid from each bottle is emptied into a container.

  Draw on the containers to show how much liquid they contain.



- How much liquid is there in each barrel?

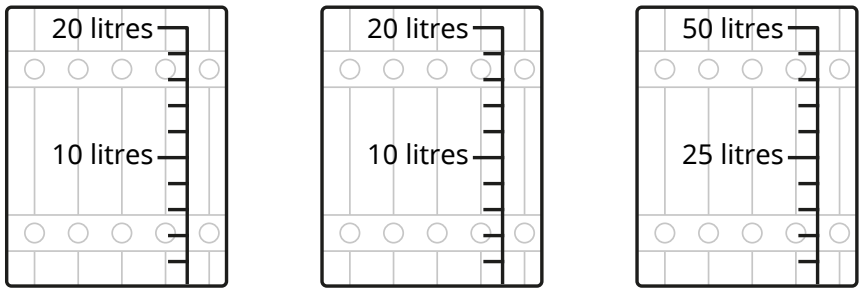


- Draw lines on the barrels to match the labels.

4 litres

13 litres

35 litres



© White Rose Education 2022

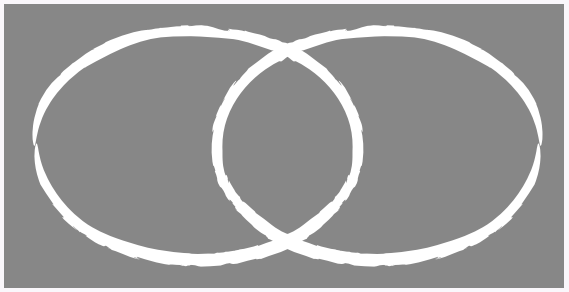
Measure in litres

Reasoning and problem solving

Draw the sorting diagram on the playground.

measure in litres

measure in millilitres



Collect different-sized containers for children to put into the sorting diagram.

Discuss children's ideas as a class.

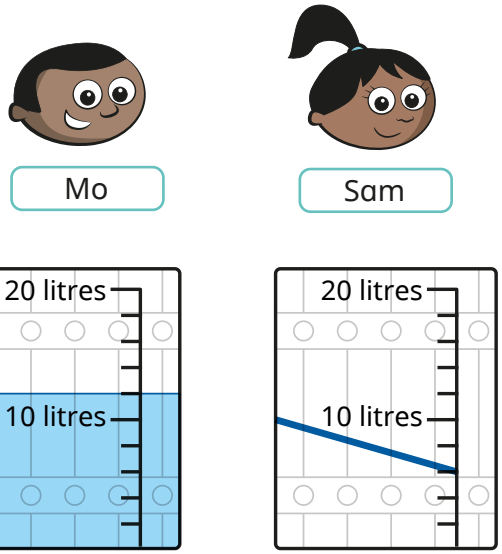
Discuss why the capacity of some containers could be measured in either litres or millilitres.

A bottle has a capacity of 2 litres.

How many bottles are needed to hold 9 litres?

5 bottles

Mo and Sam both think that they have shown 6 litres of water in the barrel.



What mistakes have they made?

Talk about it with a partner.

Mo has not used the scale correctly and has just counted 6 lines on the scale.

Sam has not drawn a horizontal line.

© White Rose Education 2022

Four operations with volume and capacity

Notes and guidance

In this final small step on volume and capacity, children use the skills they have learnt so far to answer questions involving the four operations. As with the similar step on mass, this is a useful step to consolidate learning and identify any gaps the children may have.

Children complete a range of one-step problems, identifying the operation needed to complete the calculation. They could do this by recognising key words, writing a number sentence or using a bar model. They need to be able to read scales accurately to complete the calculations without mistakes.

Children then complete multi-step problems. Initially, these may need to be modelled to help children break them down into smaller steps.

Things to look out for

- Children may not read scales accurately.
- Children may make calculation errors, for example in times-tables.
- Children may select the incorrect operation to complete the calculation.

Key questions

- Which operation should you use for this question?
- How could you write this as a number sentence?
- How could you represent this using a bar model?
- Is there more than one way to work this out?
- What mistake do you think some people may make?
- What did the question ask you to find? How do you know you have found it?
- What do you need to do first? How do you know?

Possible sentence stems

- To find the total volume, I need to _____ the volumes.
- To find how much more container A holds, I need to _____
- First I need to … Then I need to …

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

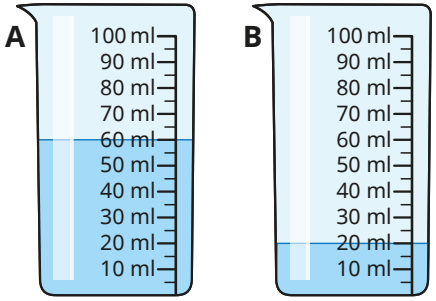
Four operations with volume and capacity

Key learning

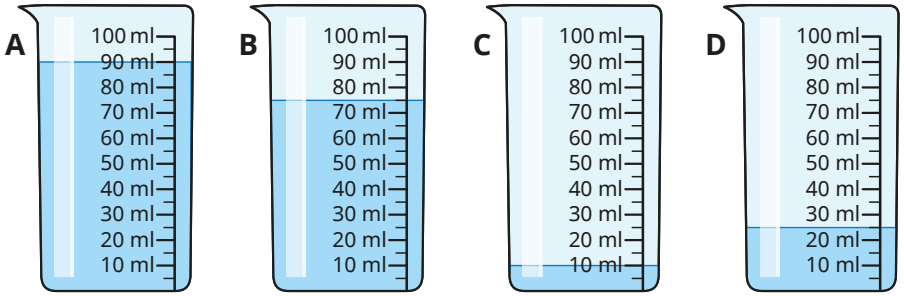
- Find the volume of water in each beaker.

  Then complete the sentences.

  - The total volume of water in jug A and jug B is _____ ml.
  - Jug A contains _____ ml more water than jug B.



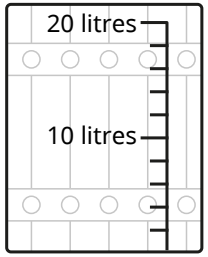
- Match each beaker with another so that the total volume is 100 ml.



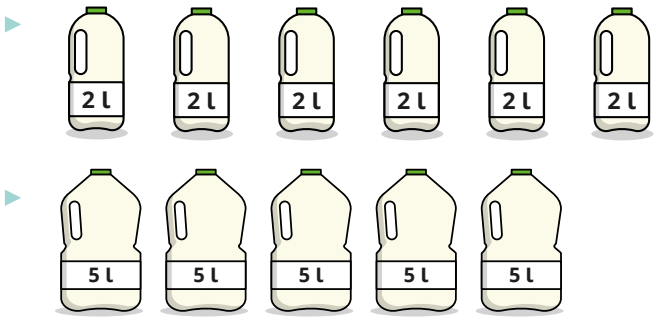
  Beaker E has 50 ml of water. How much more water is needed so that the total volume is 100 ml?

- Tom pours 2 litres of water into the barrel 6 times.

  Draw a line to show where the water reaches.



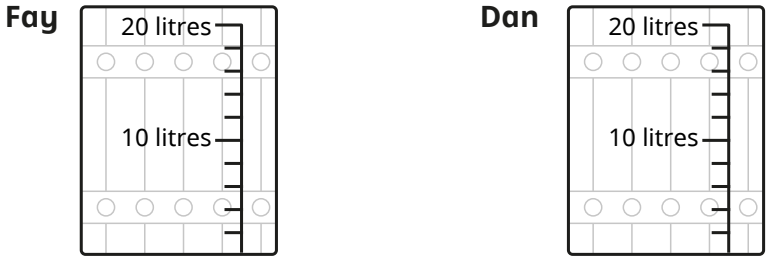
- How much milk is there altogether in each set of cartons?



- Fay and Dan both have some milk.

  They each pour their milk into a barrel.

  Draw a line to show where the milk will reach in each one.

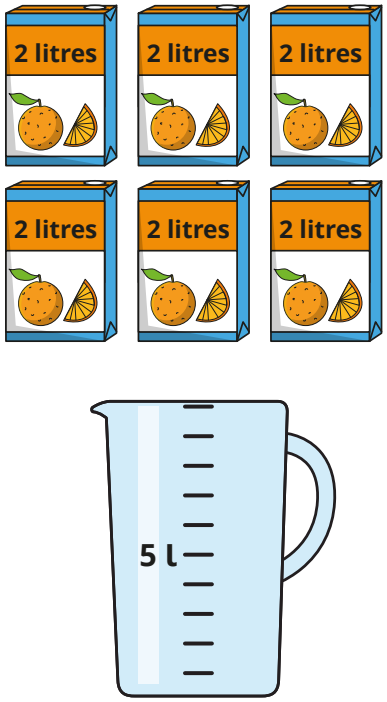


© White Rose Education 2022

Four operations with volume and capacity

Reasoning and problem solving

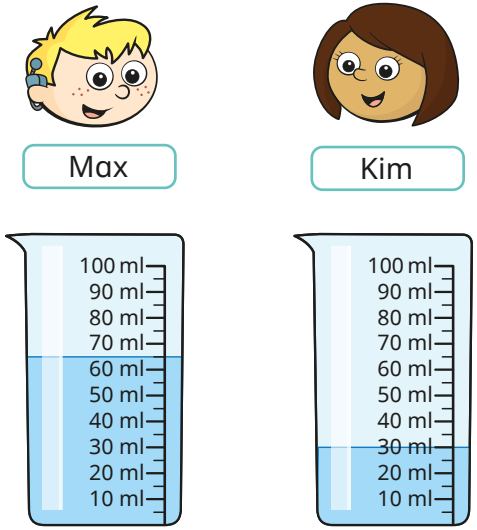
Will all the juice fit into the jug?



How do you know?

No

Max and Kim each have some water.



Max pours out 20 ml of his water.

Kim adds 17 ml to her water.

Who has more water now?

How do you know?

Kim

© White Rose Education 2022

Temperature

Notes and guidance

In this small step, children are introduced to temperature, thermometers and the unit "degrees Celsius", written °C, for the first time.

Discuss the language of temperature such as "hot", "warm", "cold" and so on. Encourage children to compare places they have visited/differences in seasons to support this. Children recognise that the temperature is higher when the weather is warmer. They may also have heard of negative numbers in this context, but this does not need to be covered in Year 2

Children use their skills from previous small steps to read scales and to colour thermometers to represent temperatures, making links with number lines.

Things to look out for

- Children may not read the scales accurately.
- Children may not draw accurately to represent a temperature, especially when estimating.
- Children may not have the conceptual understanding of what a "hot" or "cold" temperature is.
- When comparing two temperatures, children may look at the shaded part rather than the scales.

Key questions

- What is temperature? What words do you use to describe temperature?
- What does "°C" stand for?
- What does the scale show?
- How do you know that you have read the temperature correctly?
- How do you know that you have shown the correct temperature on the thermometer scale?
- How can you compare these two thermometers?

Possible sentence stems

- The temperature of/in _____ is cold/warm/hot.
- The temperature of/in _____ is _____ °C.
- The difference between the two temperatures is _____ °C.

National Curriculum links

- Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

© White Rose Education 2022

Temperature

Key learning

Discuss with children what they think temperature is.

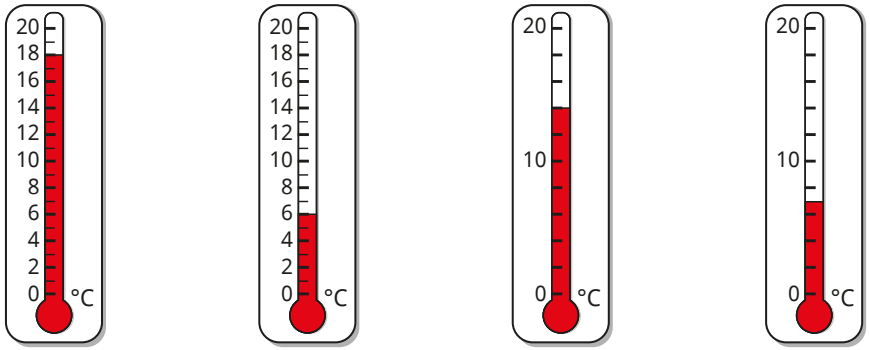
Ask them to think of a place that is hot, and then a place that is cold.

Discuss what words they can use to describe temperature.

Take temperatures around the school.

Get children to compare the different temperatures in different rooms using language such as warmer, hotter and colder.

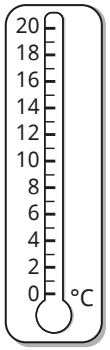
- What temperature is shown on each thermometer?



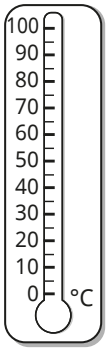
Write the temperatures in order, starting with the coldest.

- Colour the thermometers to show the temperatures.

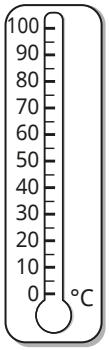
16 °C



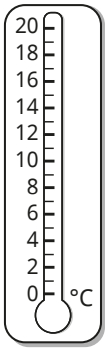
70 °C



35 °C



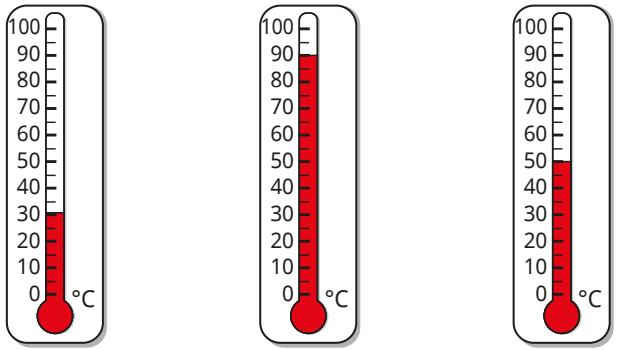
9 °C



- Mr Trent is cooking pasta.

He measures the temperature of the water three times.

What temperatures do the thermometers show?



What could have been happening at each stage when Mr Trent measured the temperature?

© White Rose Education 2022

Temperature

Reasoning and problem solving

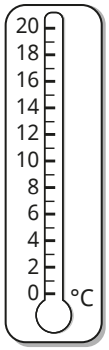
The table shows some temperatures around the world.

London	New York	Madrid	Sydney	Oslo
	7 °C	17 °C	26 °C	2 °C

London is 15 °C colder than Sydney.

Complete the table.

Show the temperature in London on the thermometer.



What is the difference in temperature between the hottest and coldest cities?

London: 11 °C

24 °C

Sam measures the temperature at 1 pm and at 5 pm.

There is a difference of 7 °C.

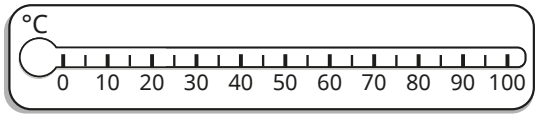
What could the temperatures be?

Compare answers with a partner.

multiple possible answers, e.g. 15 °C and 8 °C

Draw arrows to estimate where each temperature belongs on the thermometer.

1 °C	99 °C	47 °C	67 °C



Compare methods with a partner.

arrows drawn to correct positions on the thermometer

© White Rose Education 2022