Doubling and halving

White Rose MATHS

Reasoning and problem solving

As a class, complete the table.

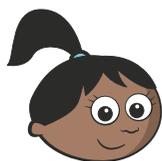| Number	1	2	3	4	5	6	7	8	9	10
Double										

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.
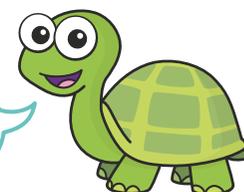
Do you agree with Sam? Explain your answer.

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

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.

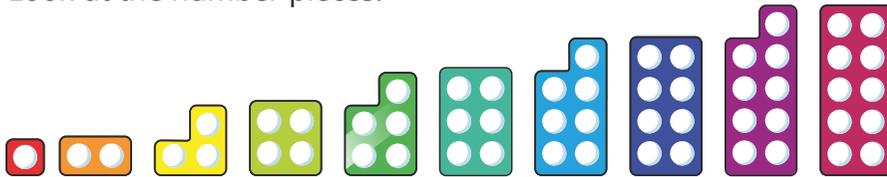- The next whole number after an _____ number is an _____ number.

National Curriculum links

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

Odd and even numbers

Key learning

- Look at the number pieces.
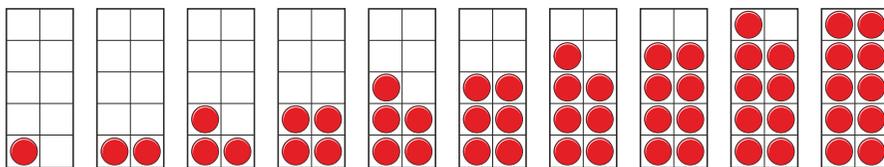

  Which number pieces show odd numbers?

  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 _____

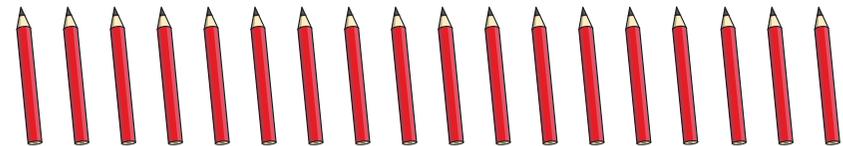- Use counters to show that the statements are true.

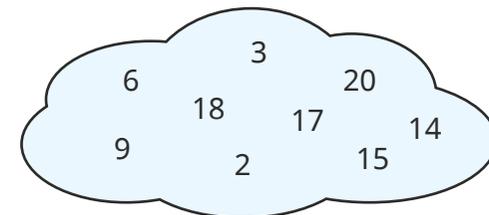 | 17 is an odd number. | 26 is an even number. |

- 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.

  6   3   20
      18   17   14
  9   2   15

  What patterns can you spot?

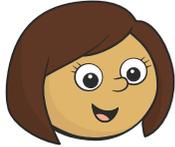# Odd and even numbers

Reasoning and problem solving

Tiny is looking at odd and even numbers.

30 is an odd number because 3 is an odd number.

Do you agree with Tiny?

Explain your answer.

No

I have added two 1-digit numbers. My answer can be divided into two equal groups.

What could Kim's numbers be?

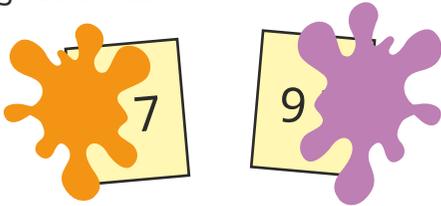How many answers can you find?

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

When I add two odd numbers together, the total is always even.

Is Mo correct?

How do you know?

What else can you find out?

Yes

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

7   9

Talk about it with a partner.

first card: odd

second card: cannot tell

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 _____
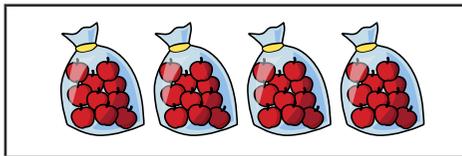- When counting backwards in 10s, the number after _____ is _____

National Curriculum links

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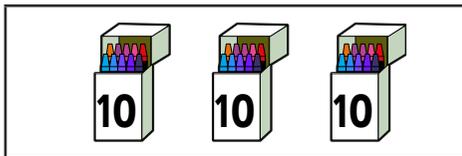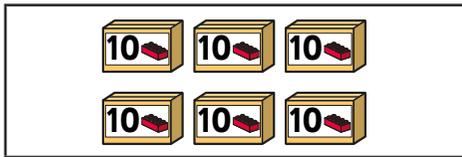
The 10 times-table

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.

0×10 1×10 3×10 4×10 5×10 8×10 10×10

10   90

- Use the bar models to complete the multiplications.

| 10 | 10 | 10 | 10 |

_____ × 10 = _____
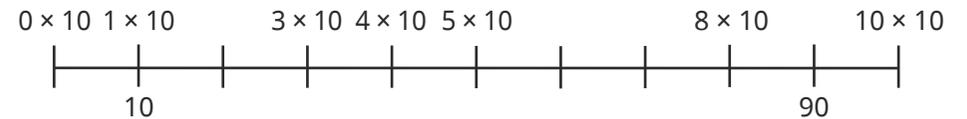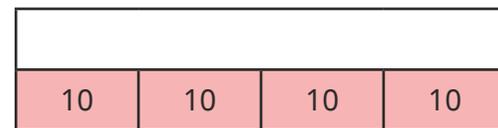
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
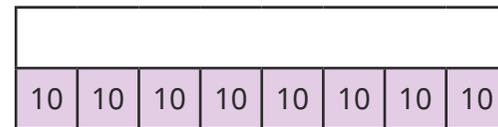
$10 \times$ _____ = _____

What do you notice about the two multiplications?

- Complete the number sentences.

▶ $5 \times 10 =$ _____   ▶ $10 \times 3 =$ _____   ▶ $10 \times 10 =$ _____

▶ $9 \times 10 =$ _____   ▶ _____ $= 4 \times 10$ ▶ $10 \times$ _____ $= 60$

The 10 times-table

Reasoning and problem solving

Dan runs 10 m seven times.

Which cards do **not** show this?

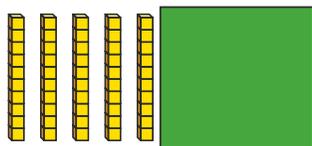| 10 + 7	7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7 + 7
7 × 10	10 + 10 + 10 + 10 + 10 + 10 + 10

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

Divide by 10

White Rose MATHS

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 = _____

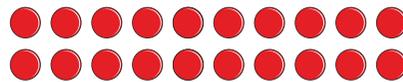### National Curriculum links

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

Divide by 10

Key learning

- Use 20 counters.

  ▶ Put them into groups of 10

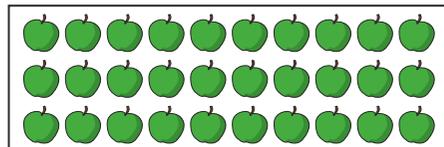 There are _____ equal groups of 10

  ▶ Share them into 10 equal groups.

  There are _____ counters in each equal group.

  What do you notice?

- Apples are sold in packs of 10

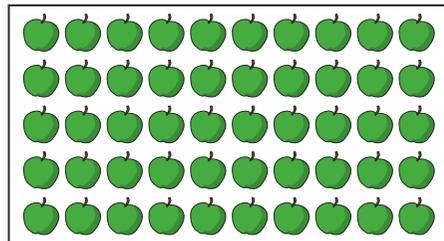 Complete the sentences for the number of packs that can be made from each set of apples.

  There are _____ apples.

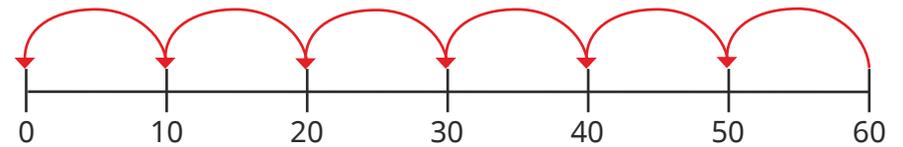 There are _____ apples in each group.

  There are _____ groups.
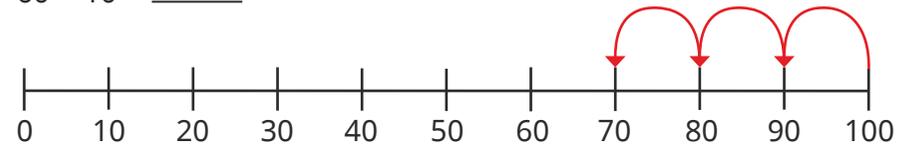
  _____ ÷ _____ = _____

- Share 40 counters into 10 equal groups.
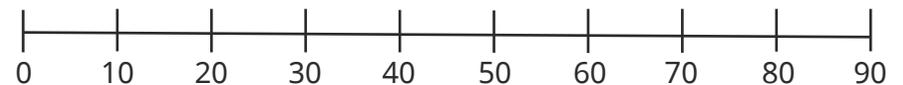
  How many groups are there?

- Use the number lines to complete the divisions.

  $60 \div 10 =$ _____

  $100 \div 10 =$ _____

  $90 \div 10 =$ _____

- 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.

  ▶ $70 \div 10 =$ _____

  ▶ $5 =$ _____ $\div 10$

  ▶ 6 tens ÷ 1 ten = _____

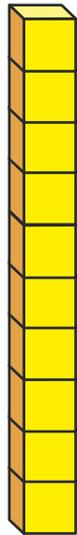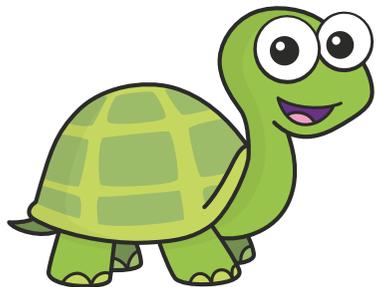 ▶ There are _____ tens in 40

Divide by 10

Reasoning and problem solving

Tiny uses cubes to build a tower.
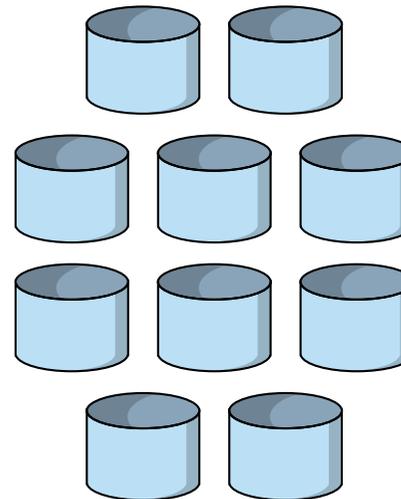
My tower is 30 cm tall.

3 cm

$30 \div 10 = 3$

How tall is each cube?

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

Miss Hall has some pens.

She shares them equally between 10 pots.

multiple possible answers, e.g.
$70 \div 10 = 7$

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?

The 5 times-table

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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 $0 \times 5 = 0$. 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 = _____

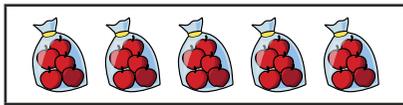- When counting in 5s, the number after/before _____ is _____

National Curriculum links

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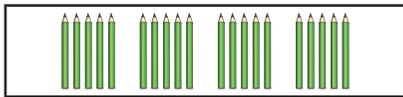
The 5 times-table

White Rose MATHS

Key learning
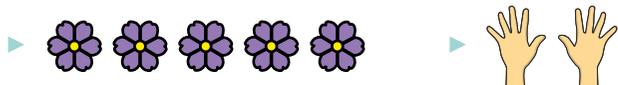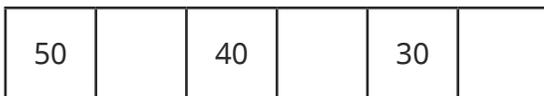
- Match the pictures to the multiplications.

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.
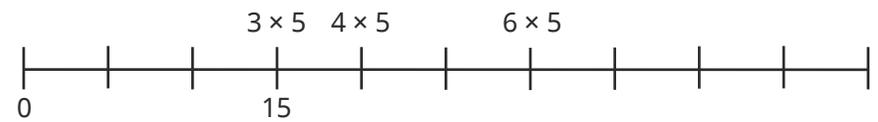
- Use the bar models to complete the multiplications.
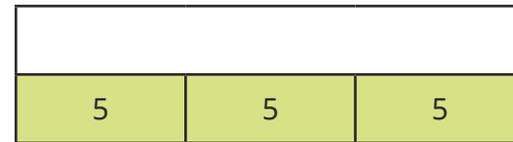
  _____ × 5 = _____
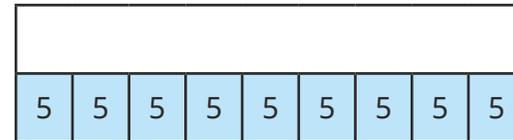
  5 × _____ = _____

- 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.

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The 5 times-table

Reasoning and problem solving

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

Ben

35						
5	5	5	5	5	5	5

Sam

35				
7	7	7	7	7
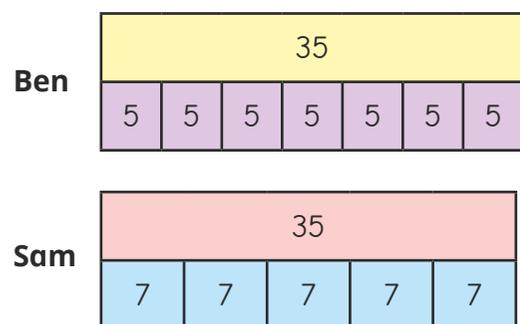
What is the same and what is different about their bar models?

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?
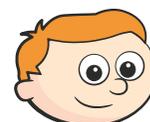
Compare answers with a partner.

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

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

Mo: I have 4 stickers.

Jo: I have twice as many stickers as Mo.

Ron: I have 10 times as many stickers as Mo.

Kim: I have 5 times as many stickers as Jo.

How many stickers does each child have?

Mo: 4

Jo: 8

Ron: 40

Kim: 40

Divide by 5

White Rose MATHS

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

Divide by 5

Key learning

- Use 30 cubes.

  How many towers of 5 cubes can you make?

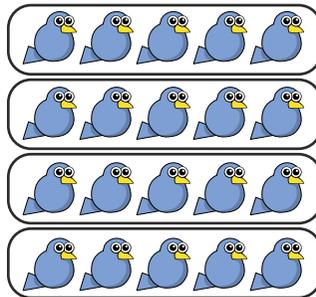- 20 birds have been put into groups of 5

  Complete the sentences.

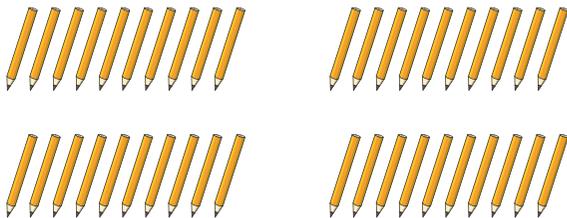 There are _____ birds altogether.

  There are _____ birds in each group.

  There are _____ groups.

  _____ ÷ _____ = _____

- 40 pencils are shared equally between 5 children.
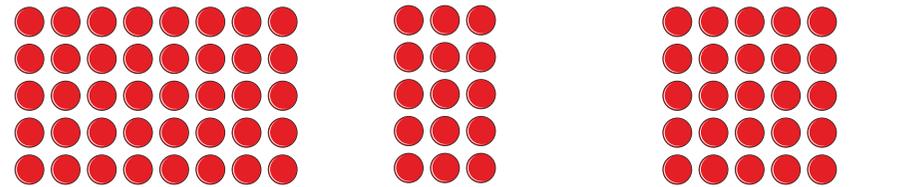
  How many pencils does each child get?

  Write a division.

  _____ ÷ _____ = _____

- Use the arrays to complete the number sentences.
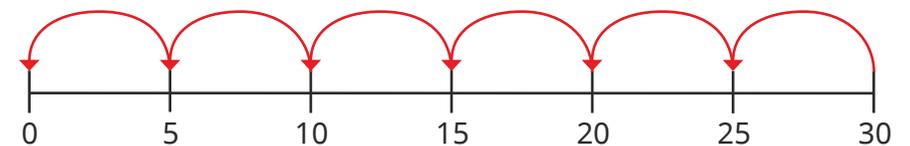
  _____ × 5 = _____   _____ × 5 = _____   _____ × 5 = _____

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

- Use the number line to work out the division.

  30 ÷ 5

  0   5   10   15   20   25   30

- 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 = _____

Divide by 5

White Rose MATHS

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.
$4 \times 5 = 20$
$20 \div 10 = 2$

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.

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, $4 \times 10 = 8 \times 5$ 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.
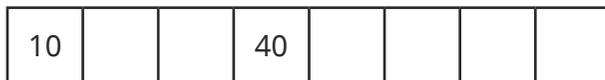
- _____ × 10 = _____ × 5

National Curriculum links

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

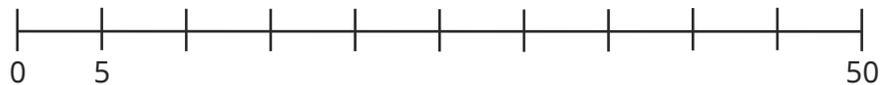# The 5 and 10 times-tables

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.

0   10   50

0   5   50

What do you notice?

- Complete the number line.

         10
0   5   10

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.

  - $2 \times 5 = \underline{\hspace{1cm}} \times 10$
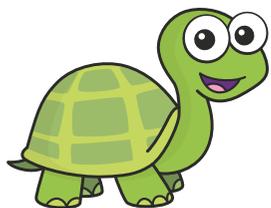 - $\underline{\hspace{1cm}} \times 5 = 2 \times 10$
  - $5 \times 8 = \underline{\hspace{1cm}} \times 10$
  - $5 \times \underline{\hspace{1cm}} = 10 \times 10$

The 5 and 10 times-tables

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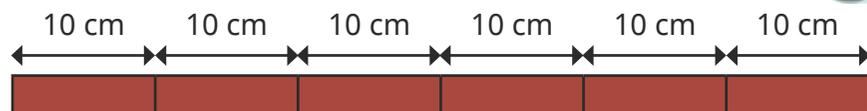
Tiny is thinking about the 5 and 10 times-tables.

All numbers in the 10 times-table are also in the 5 times-table. So, all numbers in the 5 times-table must also be in the 10-times table.

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.

| 10 cm | 10 cm | 10 cm | 10 cm | 10 cm | 10 cm |

How many 5 cm pieces can be made?

12

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

5×18

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

Spring Block 3

Length and height

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 MATHS

Measure in centimetres

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

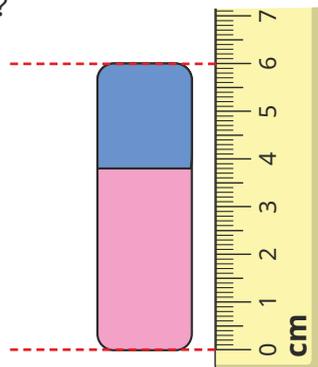# Measure in centimetres

White Rose MATHS

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.
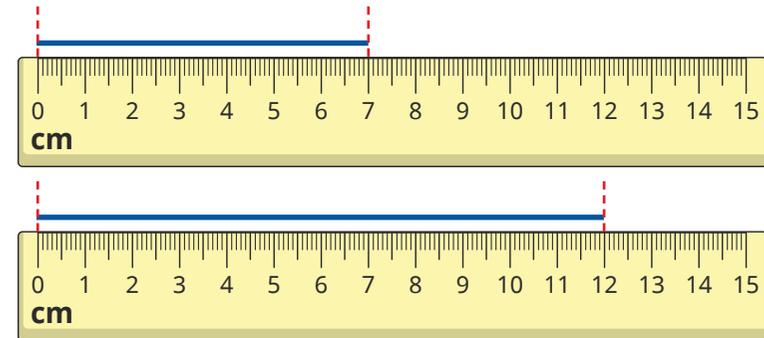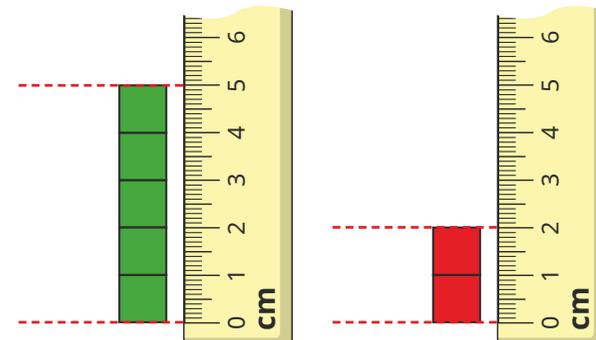
- How long is the pencil?
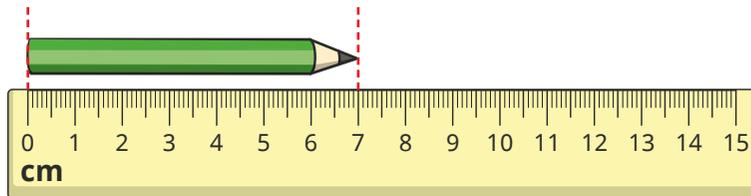
- How tall is the rubber?

- How long is each line?

- How tall is each tower?

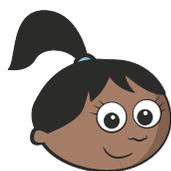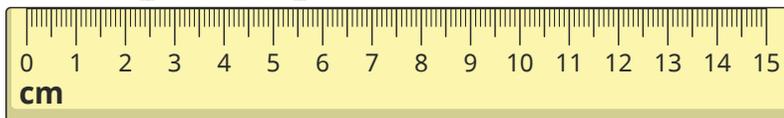- Use a pencil and ruler to draw the lines.

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

Measure in centimetres

Reasoning and problem solving

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

The train is 8 cm long.

Do you agree with Sam?

Explain your answer.

No

Ron and Jo want to measure the length of the string.
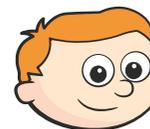
It is impossible!

Ron

Explain why Ron thinks this.

I think that I can find a way.

Jo

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.

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

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?
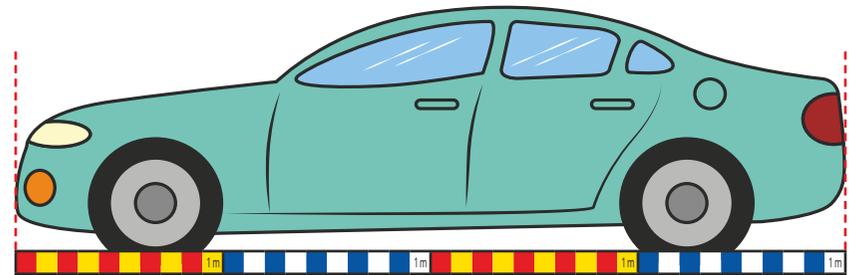
▶ What is the height of the shed?

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Measure in metres

White Rose MATHS
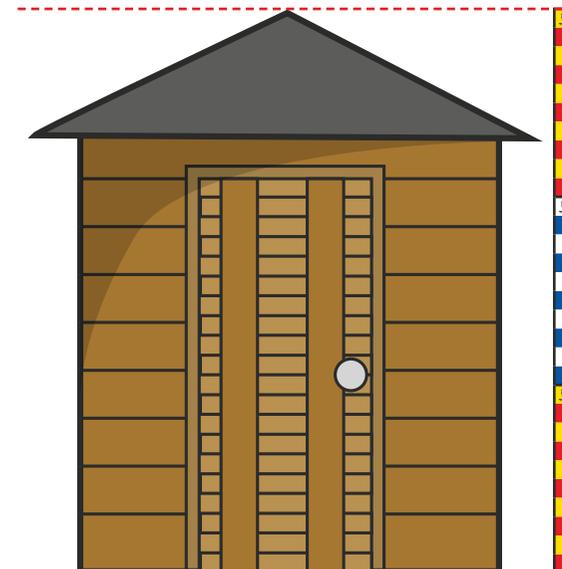
Reasoning and problem solving

Tiny has a metre stick.
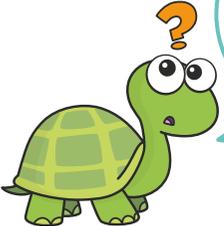
I cannot measure the length of the classroom, because my metre stick is not long enough.

Is Tiny correct?

Explain your answer.

No

The height of the classroom is about 3 cm.

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.
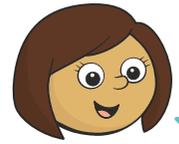
I am going to measure in centimetres.

Kim
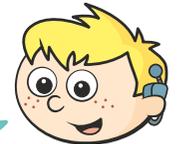
I am going to measure in metres.

Max

Whose way of measuring will be easier?

Explain your answer.

Max's

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 =

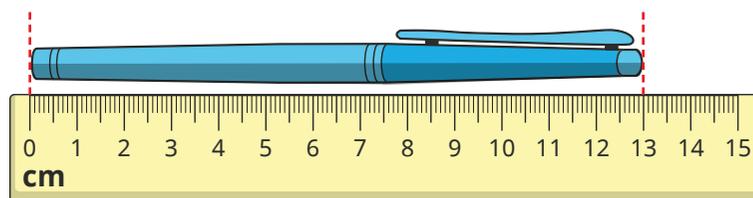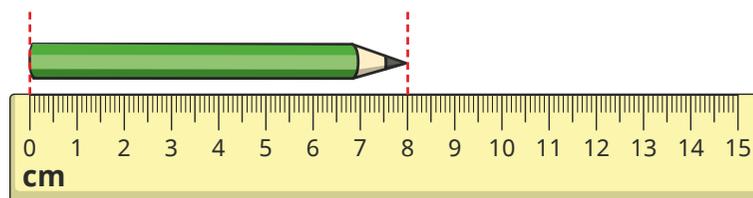# Compare lengths and heights

White Rose MATHS

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.

  My tower is 8 cm tall. — Max

  My tower is shorter than Max's. — Jo

  What could the height of Jo's tower be?

Compare lengths and heights

White Rose MATHS

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.

The plant is the same height as the tree, because they are both 6

Ron

The tree is taller than the plant.

Mo

The tree is shorter than the plant.

Sam

Who is correct?

How do you know?

Mo

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 =

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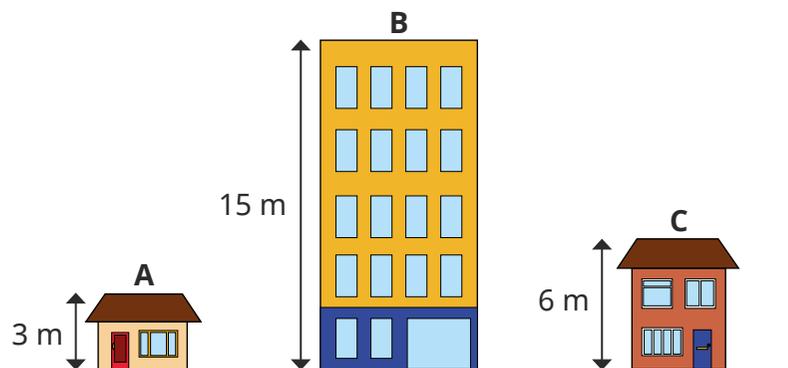
- ▶ Which building is the tallest?
- ▶ Which building is the shortest?
- ▶ Put the buildings in order, from tallest to shortest.

- Kim, Max and Jo are comparing the lengths of ribbons.
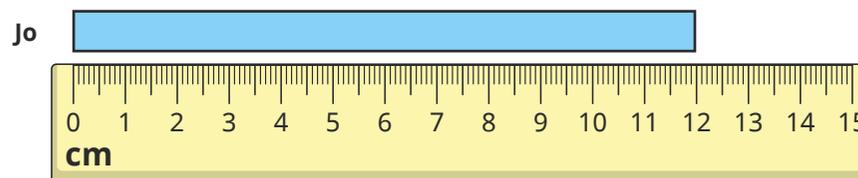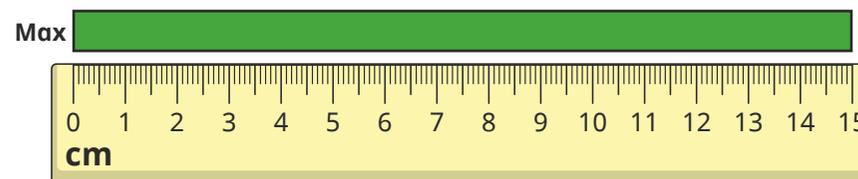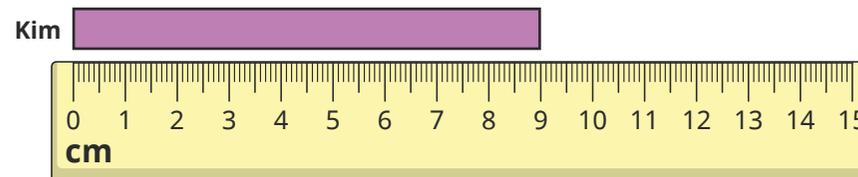
- ▶ Whose ribbon is the longest? Whose ribbon is the shortest?
- ▶ Put the ribbons in order, from longest to shortest.

- Write the lengths in order.

  Start with the shortest length.

  | 25 cm | 7 cm | 10 cm |

Order lengths and heights

White Rose MATHS
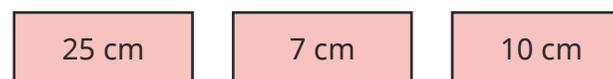
Reasoning and problem solving

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.

I cannot order the lengths, because the units are different.
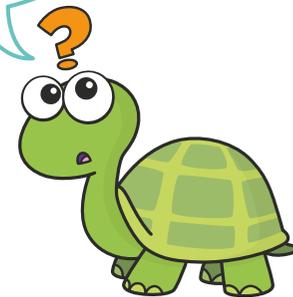
No

Do you agree with Tiny?

Why?

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

Four operations with lengths and heights

Key learning

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

  Kim

  Max

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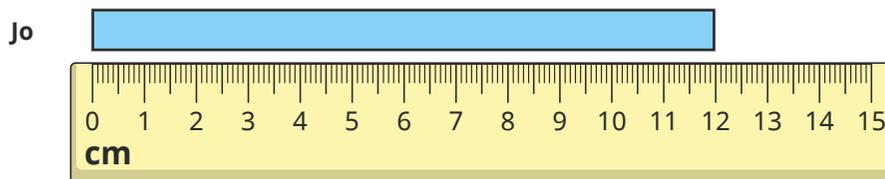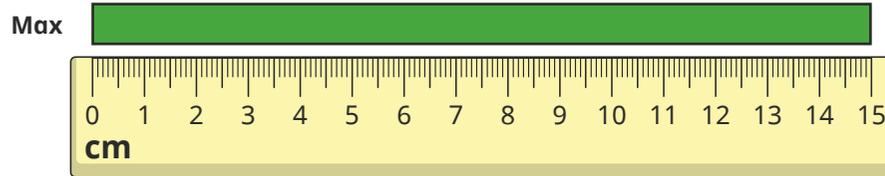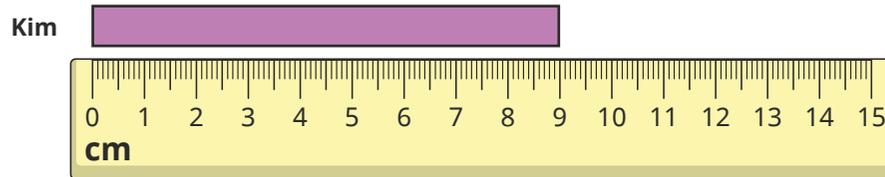
  - How much longer is Max's ribbon than Kim's?
  - Max and Jo put their ribbons together.

    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?

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.

50 cm
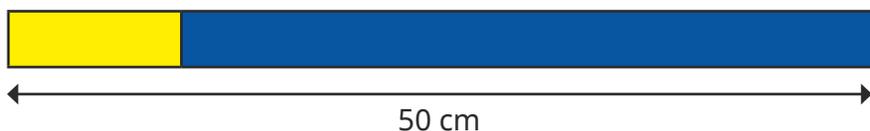
How long is the yellow strip?

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

Spring Block 4

Mass, capacity and temperature

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 MATHS

Small steps

Step 9	Temperature

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 =

Compare mass

White Rose MATHS

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.
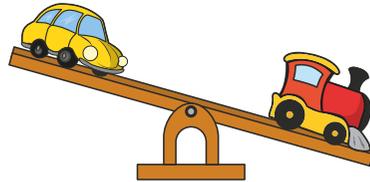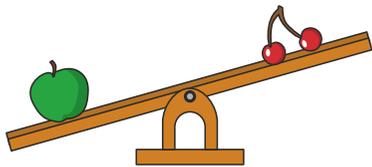
The _____ is heavier than the _____

The _____ is lighter than the _____

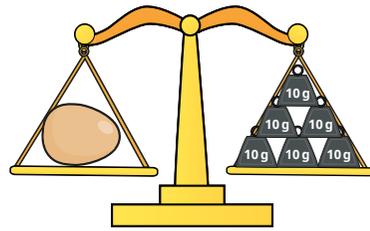- Count the cubes to find the mass of each object.
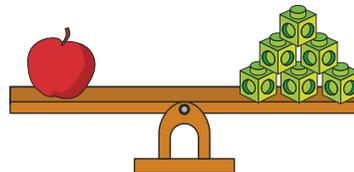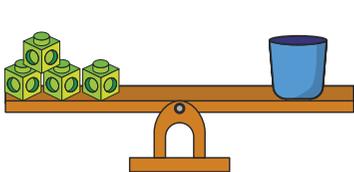
Which object is heavier?

How do you know?

- Count the cubes to find the mass of each object.
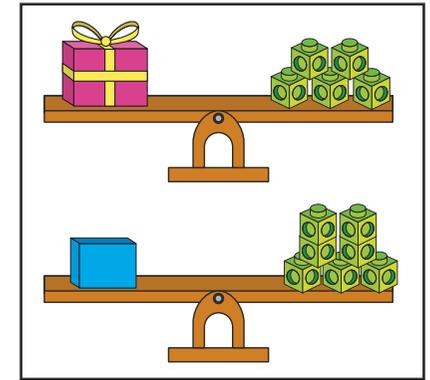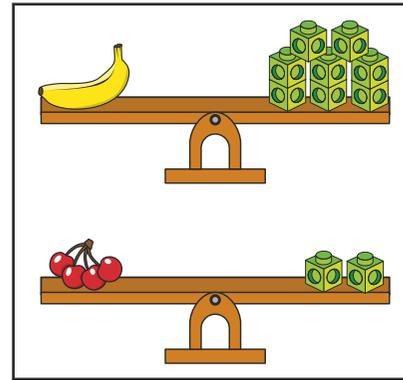
Write <, > or = to compare the masses.
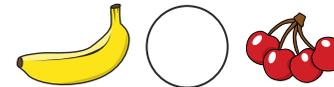
Give children a selection of objects. Ask them to choose three objects and use scales to order them from heaviest to lightest.

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

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

Compare mass

White Rose MATHS

Reasoning and problem solving

Tiny is comparing masses.
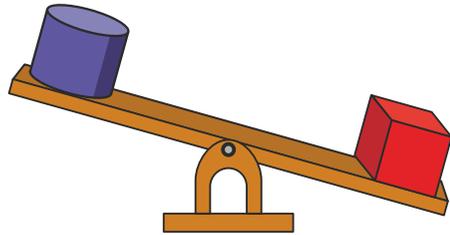
The cube is lower than the cylinder. That must mean that the cube is lighter than the cylinder.
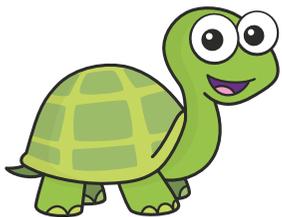
Do you agree with Tiny?

Why?

No

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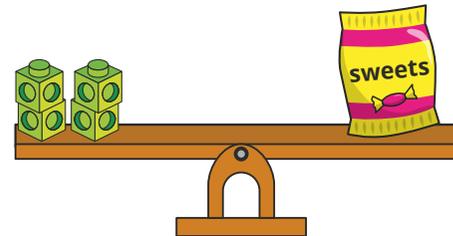
sweets

What is the mass of 2 bags of sweets?

8 cubes

Which object is lighter, a car or a cube?
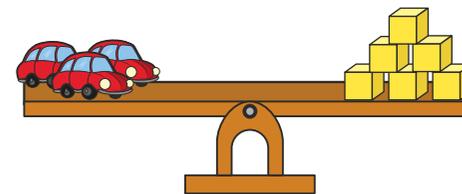
How do you know?

cube

Measure in grams

White Rose MATHS

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

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.
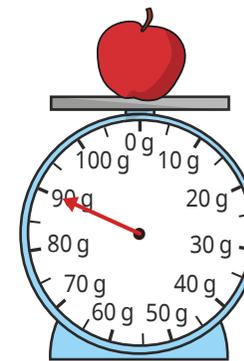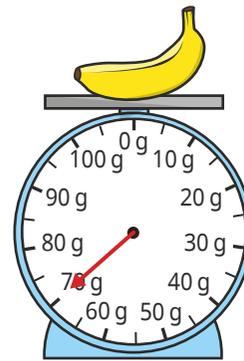
- What is the mass of each object?
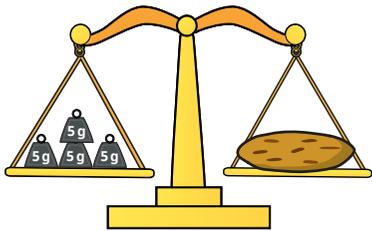
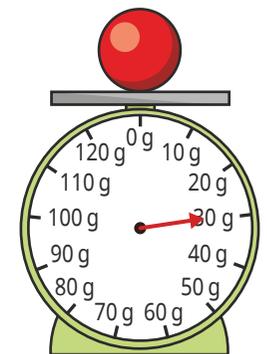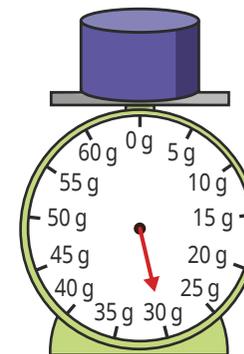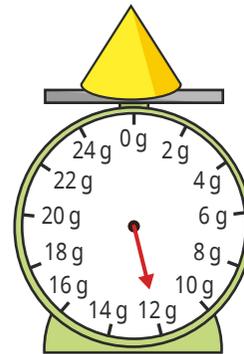How did you work it out?

- What is the mass of each object?
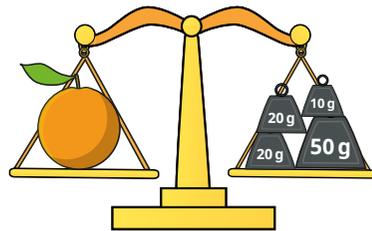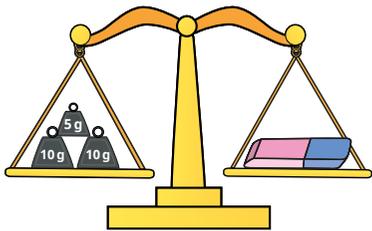
- What is the mass of each object?
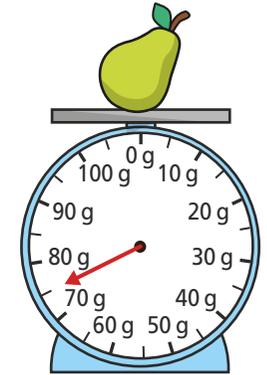
How are these scales different from balance scales? How are they similar?

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

Measure in grams

White Rose MATHS

Reasoning and problem solving

Tiny uses scales to find the mass of a cube in grams.
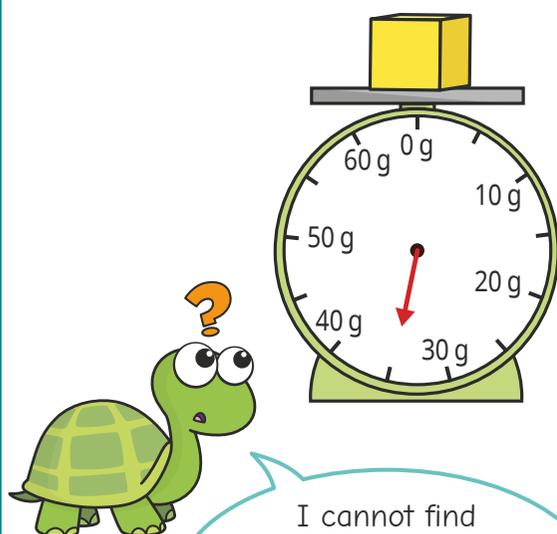
I cannot find the mass of the cube, because the arrow is not pointing to a number.

Do you agree with Tiny?

Why?

No

The cube has a mass of 35 g.

What is the mass of the egg?
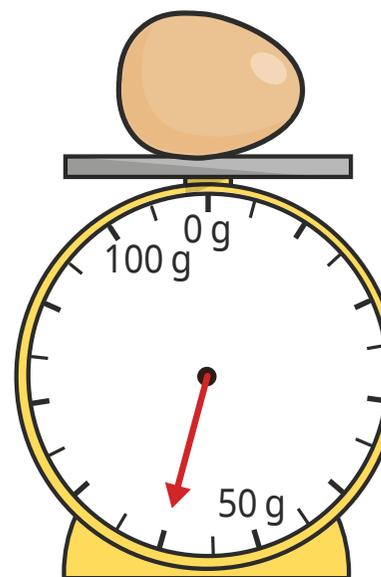
60 g

How do you know?

Measure in kilograms

White Rose MATHS

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

Measure in kilograms
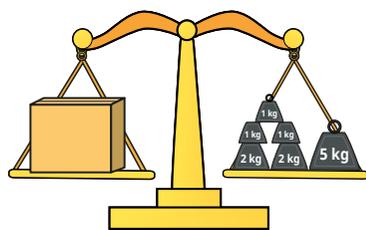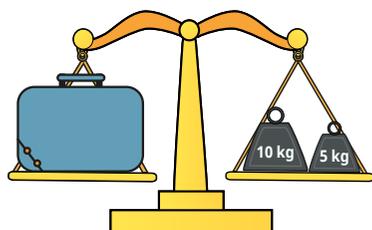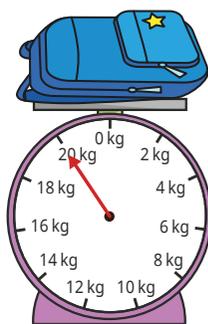
White Rose MATHS

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.

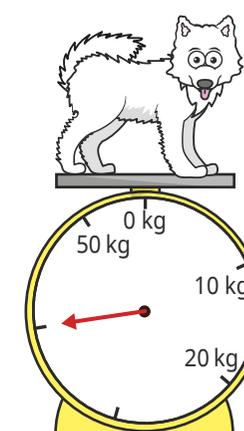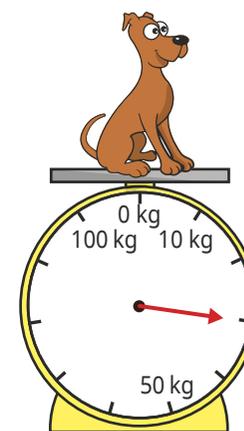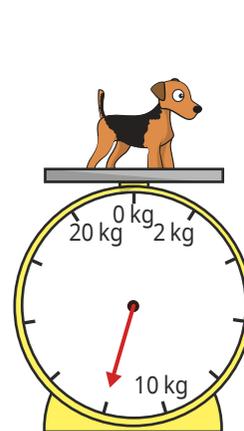Children can use balance scales to check.

- What is the mass of each object?
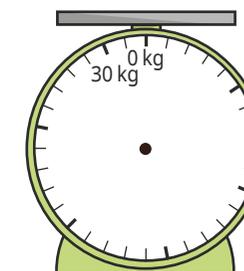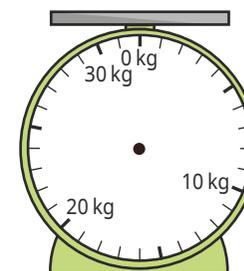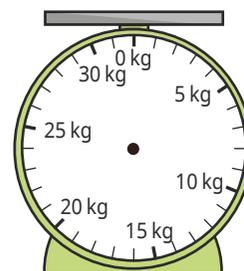

- Read the scales to find the mass of each object.

What do you notice about your answers?

What do you notice about the arrows?

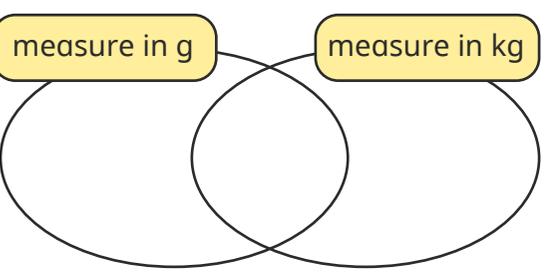- What is the mass of each dog?

- Mark the masses on the scales.

| 5 kg | 12 kg | 17 kg |

Measure in kilograms

White Rose MATHS

Reasoning and problem solving

Sort Whitney and the objects into the groups.

measure in g   measure in kg

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.

0 kg
100 kg
20 kg
80 kg
40 kg
60 kg
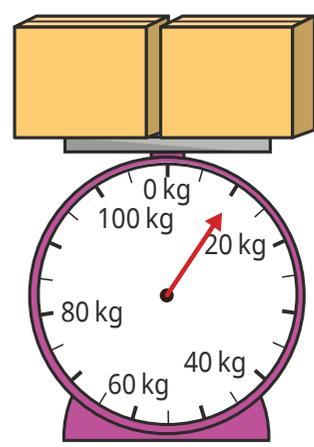
The mass of one box is 20 kg.

No

Do you agree with Tiny?

Why?

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

Four operations with mass

White Rose MATHS

Key learning
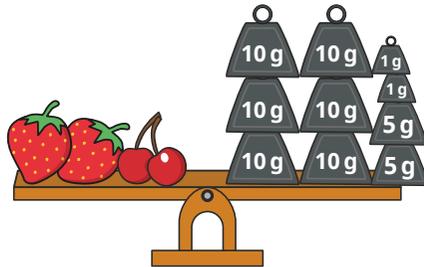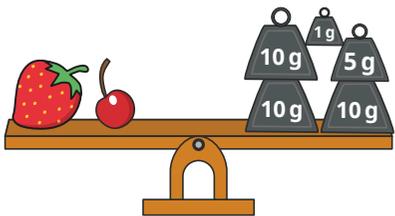
- Complete the sentences.
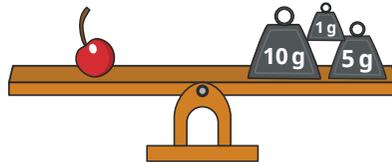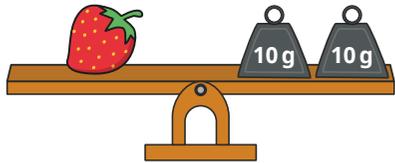
The mass of the strawberry is _____ g.

The mass of the cherry is _____ g.

The total mass of a strawberry and a cherry is _____ g.
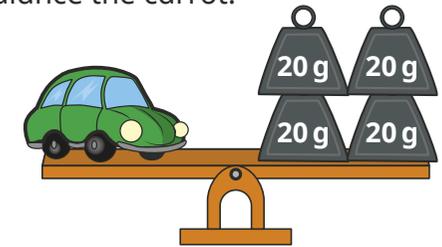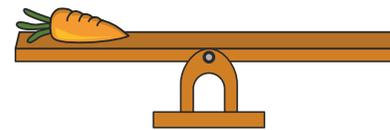
- Complete the sentences.

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

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

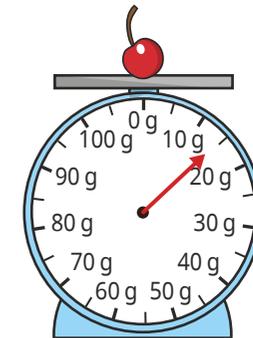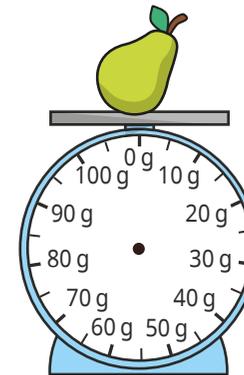How did you work this out? Is there an easier way?

- 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?
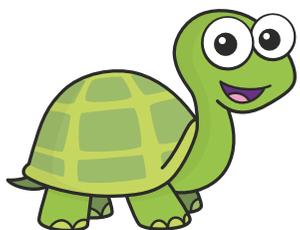
Four operations with mass

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.
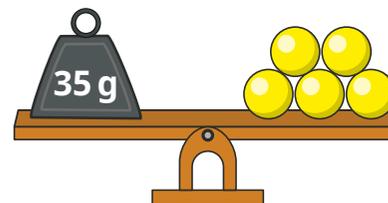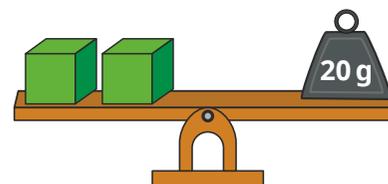
The pear has a mass of 70 g.

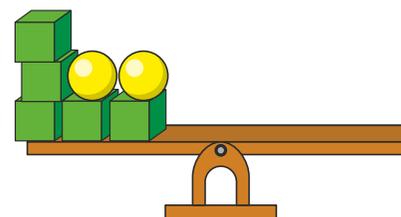> The orange must have a mass of 90 g.

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

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 =

Compare volume and capacity

White Rose MATHS

Key learning

Give children some different containers.

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

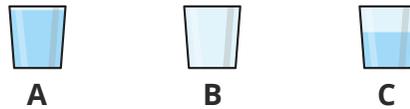Ask them to explore the capacity of the containers using rice or water.

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

- Here are three glasses of water.

  A   B   C
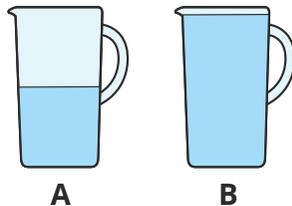
  ▶ Which glass is full?

  ▶ Which glass is half full?

  ▶ Which glass is empty?

- Here are two jugs of water.

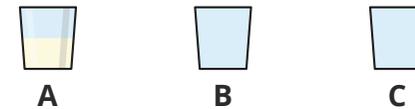 Write "more" or "less" to complete the sentence.

  Jug A has _____ water than jug B.

  A   B

  Write <, > or = to compare the volumes.

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

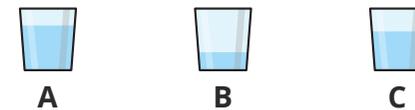- There is some milk in glass A.

  A   B   C

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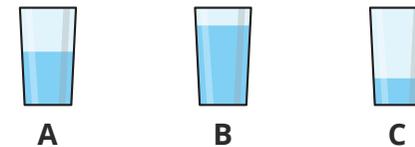
  - glass B has more milk than glass A

  - glass C has less milk than glass A

  Is there more than one answer? Why?

- Which glass contains the most water?

  A   B   C

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

  A   B   C

  Glass C has _____ water than glass B.

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

Compare volume and capacity

Reasoning and problem solving

Here are two cups of water.

A

B

Cup A has a greater capacity and a greater volume than cup B.

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.

A

B

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

How do you know?

glass

Measure in millilitres

White Rose MATHS

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

Measure in millilitres

White Rose MATHS

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.

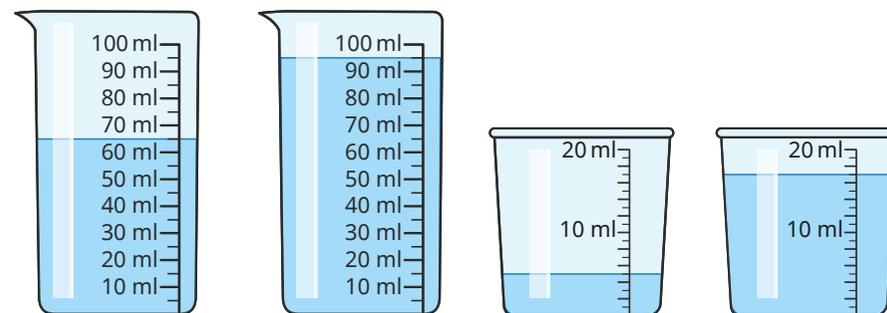Ask children to measure the volume of water in each container.

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?
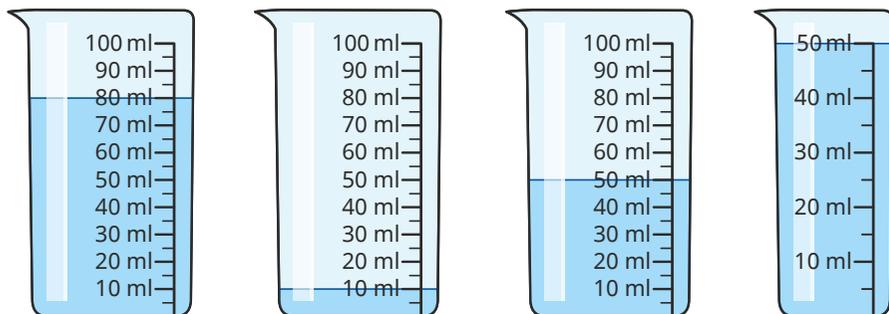
- How much water is there in each container?

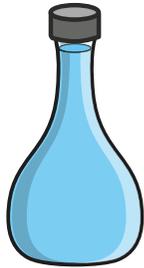- Each container is emptied into a beaker.

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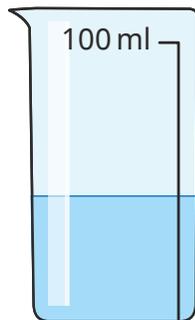
Measure in millilitres

White Rose MATHS
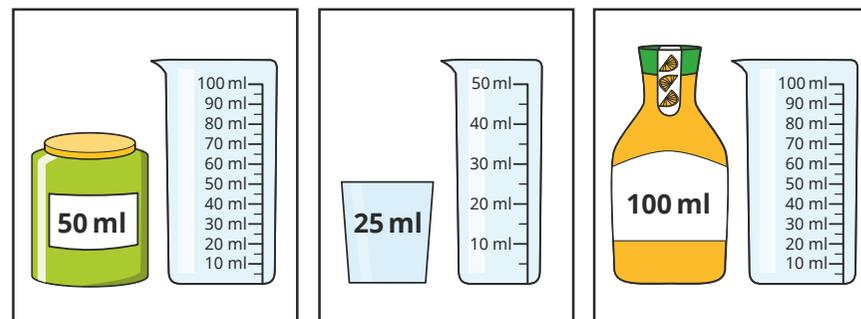
Reasoning and problem solving

How can you measure the capacity of the container?

Pour the liquid into a measuring jug.

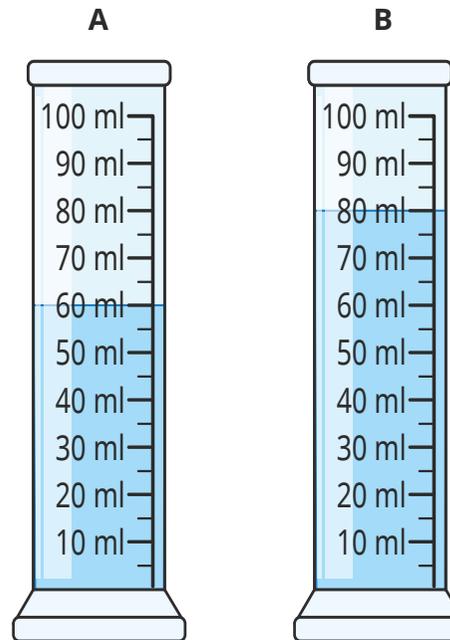Estimate the amount of water in the container.

100 ml

approximately 45 ml

Explain your answer.

A teaspoon holds 5 ml.

How many teaspoons of liquid are there in each container?

A   B

A: 12

B: 16

Measure in litres

White Rose MATHS

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

Measure in litres
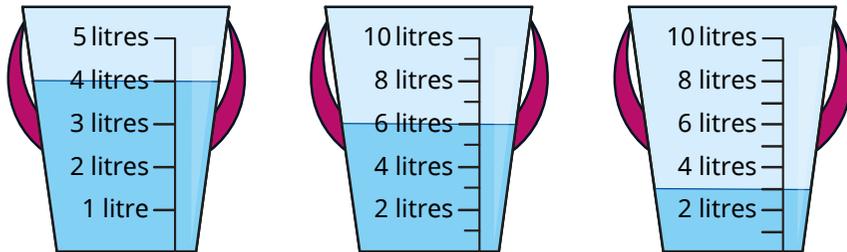
White Rose MATHS

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.
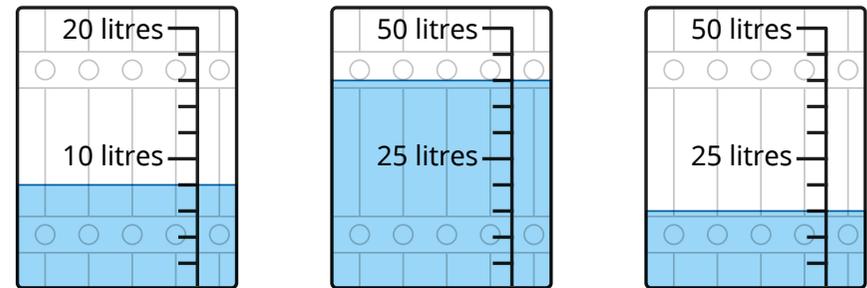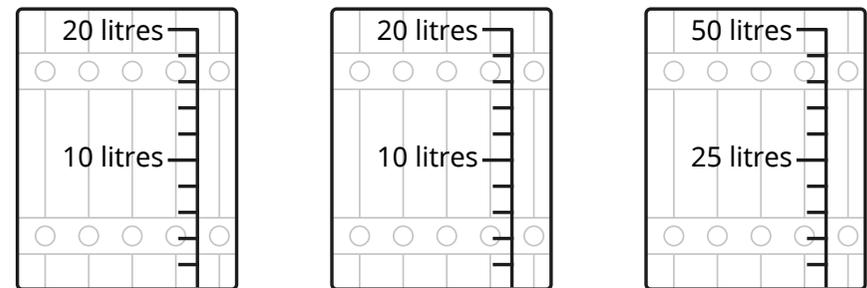
- How much water is there in each bucket?

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

  Draw on the containers to show how much liquid they contain.
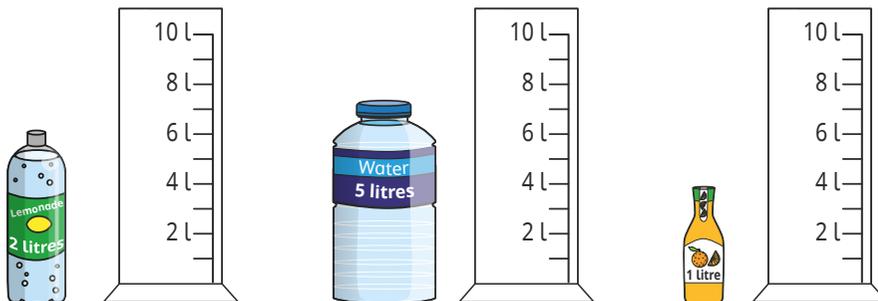
- How much liquid is there in each barrel?

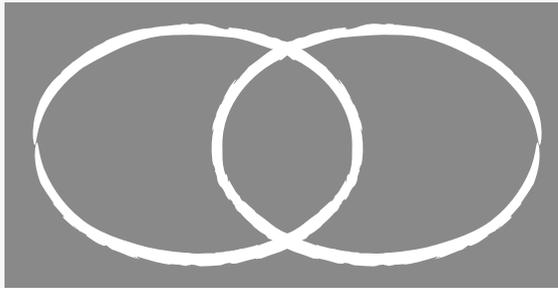- Draw lines on the barrels to match the labels.

| 4 litres | 13 litres | 35 litres |

Measure in litres

White Rose MATHS

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.

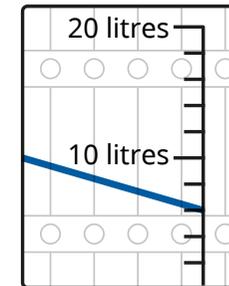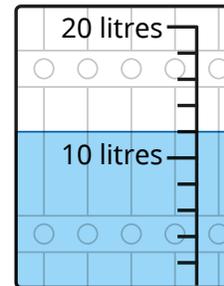How many bottles are needed to hold 9 litres?

5 bottles

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

Mo

Sam

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.

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
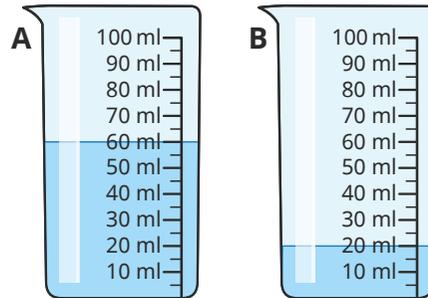
Four operations with volume and capacity

Key learning

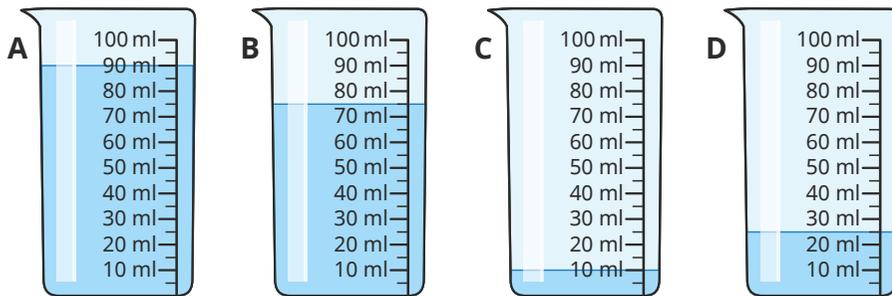- Find the volume of water in each beaker.

  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.

  A — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

  B — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

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

  A — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

  B — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

  C — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

  D — 100 ml / 90 ml / 80 ml / 70 ml / 60 ml / 50 ml / 40 ml / 30 ml / 20 ml / 10 ml

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

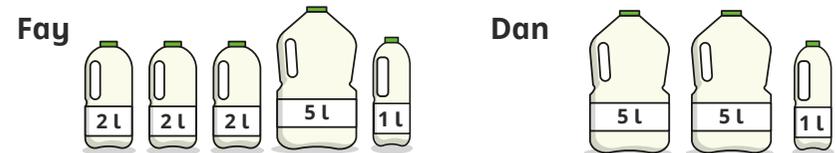- Tom pours 2 litres of water into the barrel 6 times.

  Draw a line to show where the water reaches.

  20 litres

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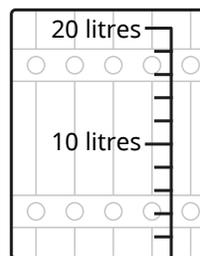
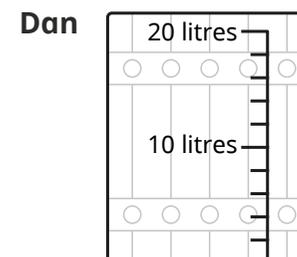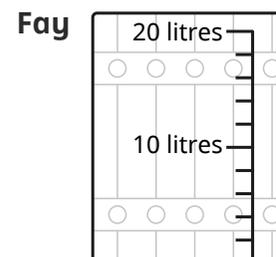- How much milk is there altogether in each set of cartons?

  ▶ 2 l   2 l   2 l   2 l   2 l   2 l

  ▶ 5 l   5 l   5 l   5 l   5 l
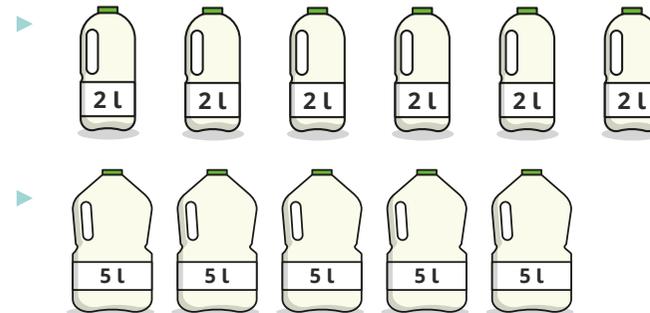
- Fay and Dan both have some milk.

  Fay   2 l   2 l   2 l   5 l   1 l

  Dan   5 l   5 l   1 l

  They each pour their milk into a barrel.

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

  Fay   20 litres   10 litres

  Dan   20 litres   10 litres

Four operations with volume and capacity

White Rose MATHS

Reasoning and problem solving

Will all the juice fit into the jug?
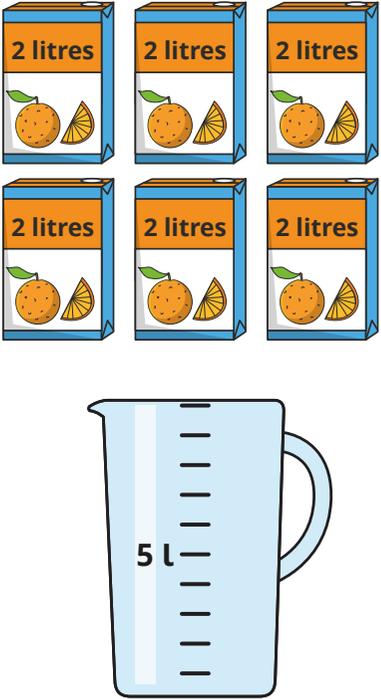
2 litres 2 litres 2 litres
2 litres 2 litres 2 litres

5 l

No

How do you know?

Max and Kim each have some water.

Max   Kim

100 ml   100 ml
90 ml   90 ml
80 ml   80 ml
70 ml   70 ml
60 ml   60 ml
50 ml   50 ml
40 ml   40 ml
30 ml   30 ml
20 ml   20 ml
10 ml   10 ml
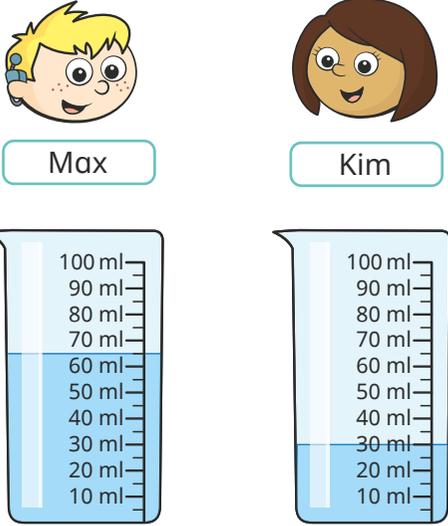
Max pours out 20 ml of his water.

Kim adds 17 ml to her water.

Who has more water now?

How do you know?

Kim

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

Temperature

Key learning

Discuss with children what they think temperature is.
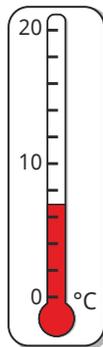
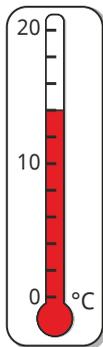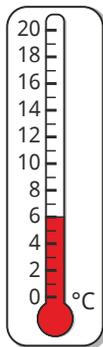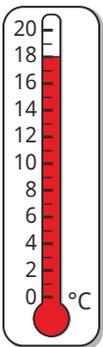Ask them to think of a place that is hot, and then a place that is cold.

Discuss what words they can use to describe temperature.
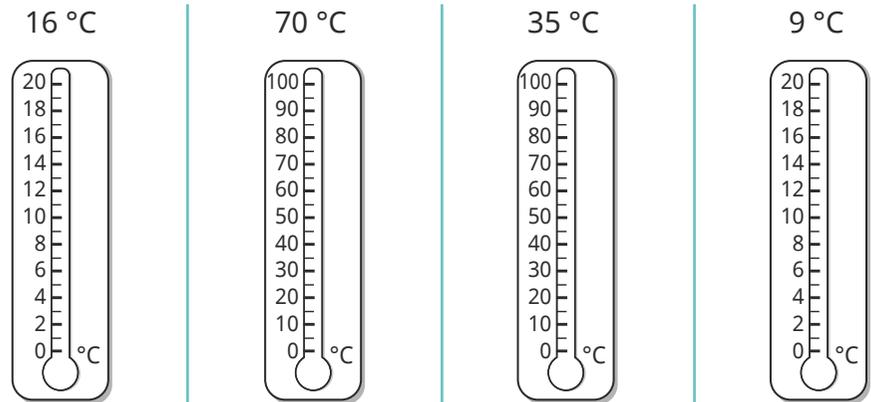
Take temperatures around the school.

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?

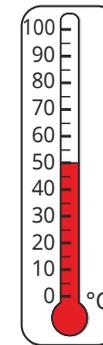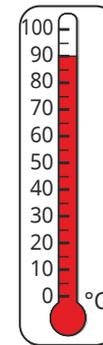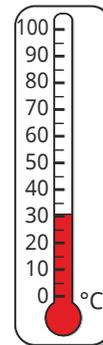Write the temperatures in order, starting with the coldest.

- 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?

Temperature

White Rose MATHS

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.
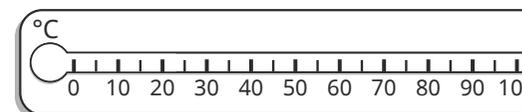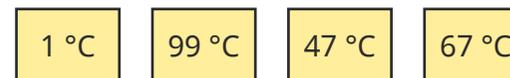
There is a difference of 7 °C.

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 |

°C
0 10 20 30 40 50 60 70 80 90 100

Compare methods with a partner.

arrows drawn to correct positions on the thermometer