Mathletics

Series C Student

Measurement

My name _____

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Series C – Measurement

Contents

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Length – language of length

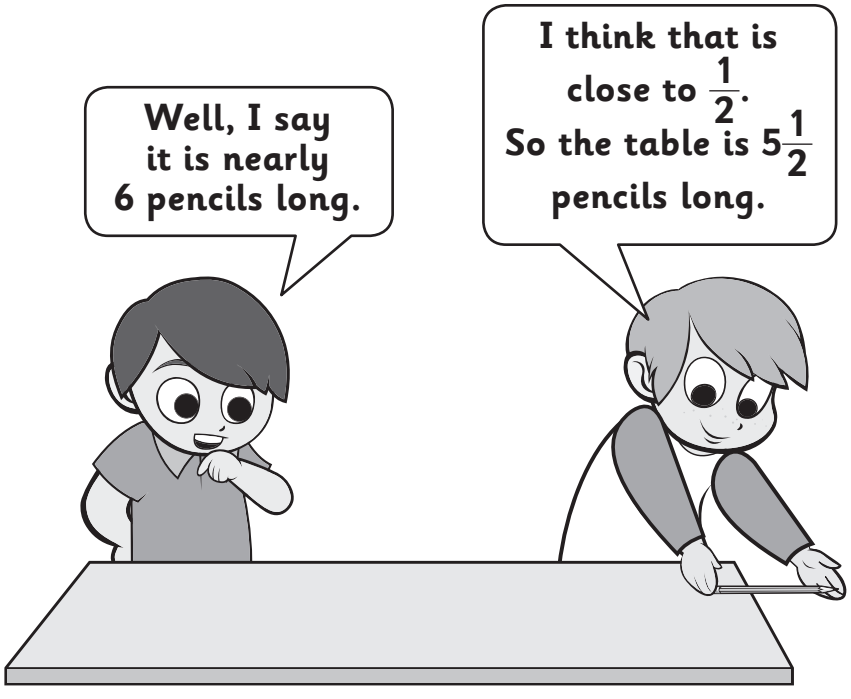
You will need: a partner

1 What are some words we use when we measure and talk about length? Brainstorm with a neighbour and record.

longer than

shorter than

2 How many pencils long is this page?
Was your answer a whole number or was it between 2 numbers?
What are some different ways we can deal with this when it happens?



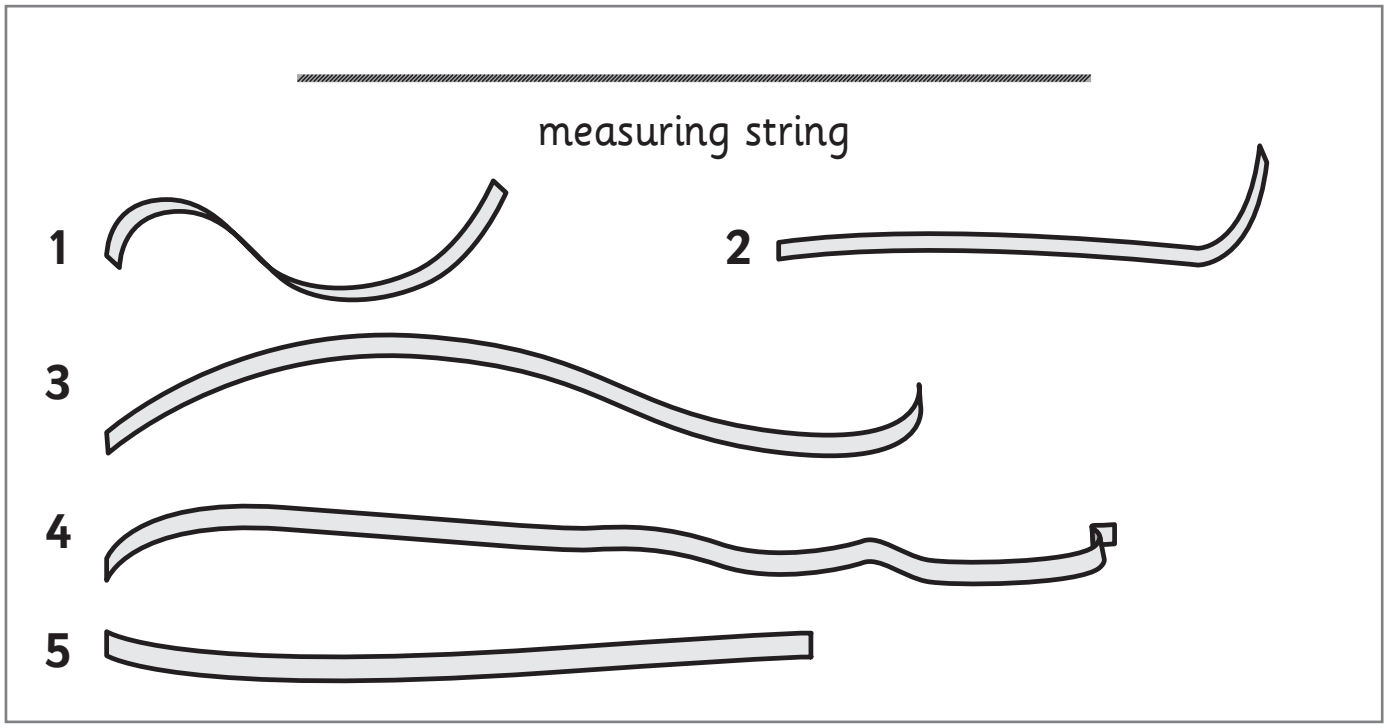
Length – compare and order lengths

You will need: string scissors

What to do:

Look at the measuring string below. Now look at streamer 1. Write 1 in the box where you think it belongs. Do the same for the other pieces of streamer.

Longer than the string.	Shorter than the string.	Same length as the string.



1 Compare the lengths of the streamers, using the < and > symbols.

a streamer 1 ☐ streamer 4 **b** streamer 5 ☐ streamer 2

c streamer 3 ☐ streamer 1 **d** streamer 2 ☐ streamer 3

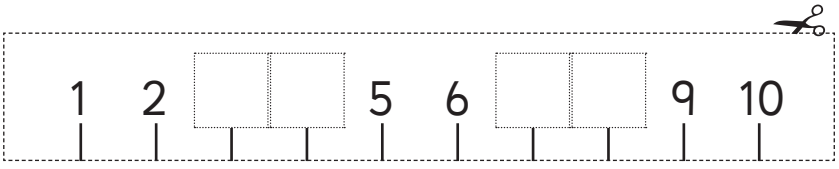
Length – centimetres

Sometimes it is important for everyone to use exactly the same measuring unit. We can't use hands or feet because they are all different. And not everyone in the world has the same counters or building blocks.

To solve this problem we invented units that are the same EVERYWHERE. One of these is the **centimetre**. We can write this as **cm**.

1 Cut out the ruler below. Finish labelling the cm markers. Find 5 things around the classroom that are shorter than the ruler and measure them.

	Item	Estimate	Measure
a		cm	cm
b		cm	cm
c		cm	cm
d		cm	cm
e		cm	cm

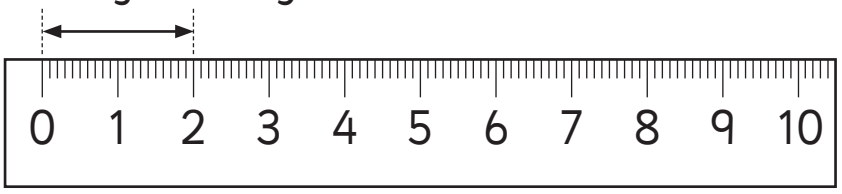


Length – centimetres

When we measure with rulers we are measuring the cm **spaces** between the numbers. The numbers count the spaces.

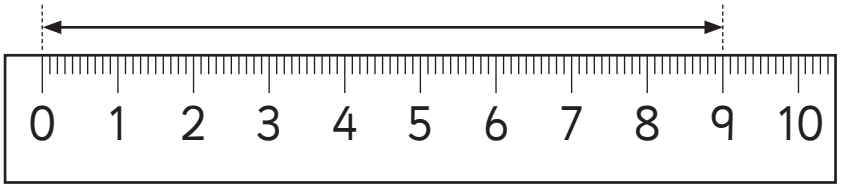
1 How many cm long is each arrow?

a



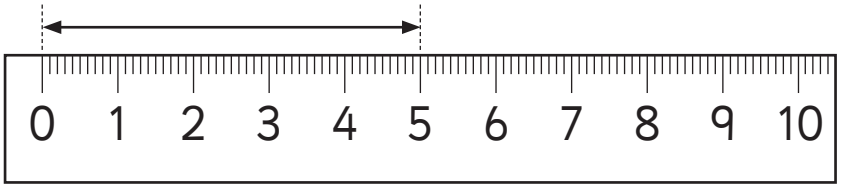
cm

b



cm

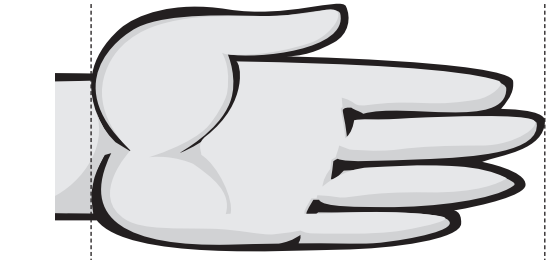
c



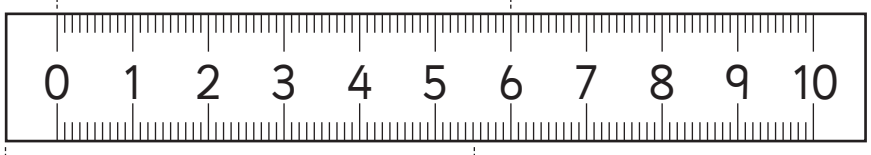
cm

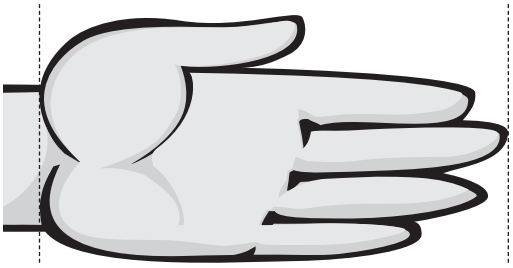
Look at a ruler. The numbers start a little bit past where the actual ruler starts and end a little bit before where the ruler ends. We measure from the 0, not from the start of the ruler.

2 ☑ the person who has ruled accurately.



6 cm ☐





$5\frac{1}{2}$ cm ☐

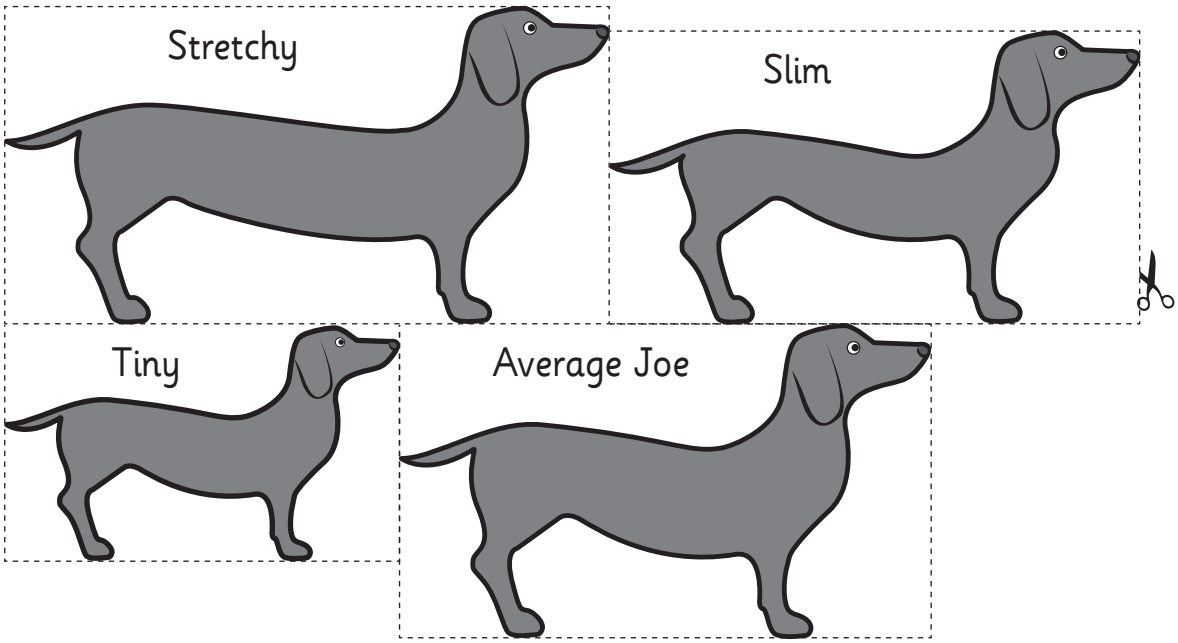
Length – centimetres

You will need: a ruler cut-out dogs

What to do:

copy

Cut out these sausage dogs.



What to do next:

a Measure Average Joe with a ruler to the nearest cm. How many cm long is he?

cm

b Now using Average Joe's length as your guide, estimate how long you think each of your other sausage dogs will be. Measure them.

Dog	Estimate	Measure
Tiny	cm	cm
Stretchy	cm	cm
Slim	cm	cm

Length – centimetres

You will need:  a partner  a ruler  a pencil  your foot

What to do:

Take off one shoe and sock and stand in the box below. Ask your partner to trace around your foot with a pencil. Measure the length of your foot with a ruler to the nearest cm.

My foot is ☐ cm long.

What to do next:

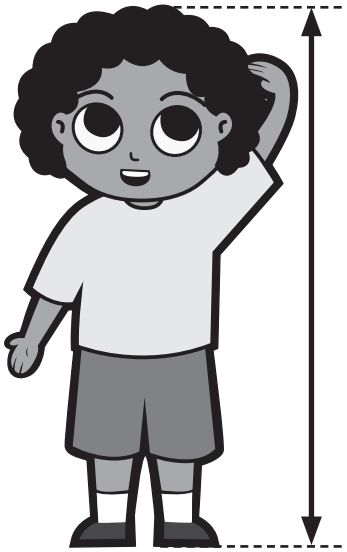
Find 5 partners. Compare and order your feet, standing in line from shortest foot to longest foot.

Length – centimetres

You will need:  2 partners  metre stick (marked in cm)

 chalk  paper and pencil

What to do:



Go outside into the playground with your two partners, a metre stick and some chalk. Find a wall. Two children hold the metre stick against the wall while the third marks off lines with the chalk on the wall every 5 cm. Then you write multiples of 5 against each chalk mark from 0 to 100. Each child takes turns to stand with his/her back to the wall while another child holds the pencil across the top of his/her head, pointing at the wall, and the third child reads off the nearest multiple of 5. The child being measured then records his/her height in centimetres on the piece of paper. Repeat until all of the children have been measured.

What to do next:

Write your name and height in cm in the first box below. Write your partners' names and heights in the other two boxes. Then insert the correct < or > sign in the boxes between your names.

Name _____ Height _____ cm	☐	Name _____ Height _____ cm	☐	Name _____ Height _____ cm

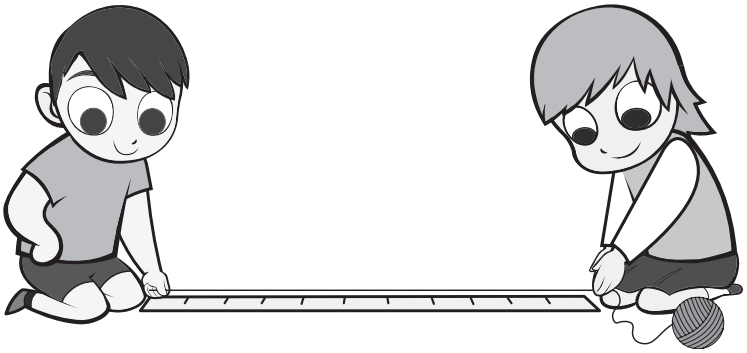
Length – metres

Would you like to measure the distance from your classroom to the office in cm? Why or why not?

Measuring distances like that in cm would take a long time and it would be easy to get confused. We use the unit **metre** for longer distances. We can write this as **m**. A metre is 100 cm.

You will need: a partner, a metre ruler, string, scissors

What to do:



a Measure a piece of string against a metre ruler and cut it. Look at your piece of string – it is 1 metre long.

b Find 3 lengths or distances you think your string metre would be the right unit to measure with. Measure them and record your findings below.

What to do next:

Did you find some of your lengths were parts of a metre? How did you choose to record these? Compare your way with that of another group. Would you use your way again?

Length – metres

You will need: a partner, a trundle wheel, your string metre

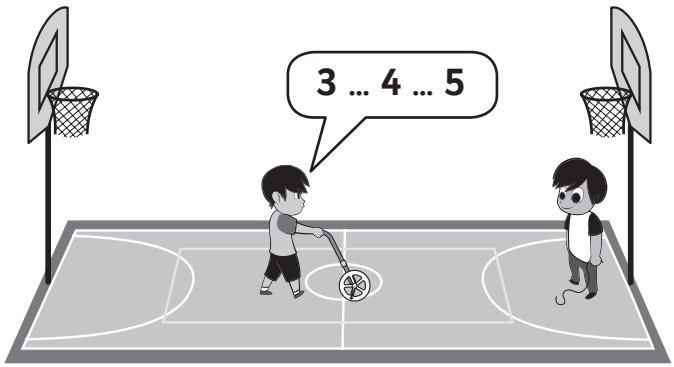
What to do:

Carefully wrap your metre piece of string around the wheel. What do you find?

What to do next:

a Measure the length of the school hall using the string metre. How many metres is it?

b Now measure the school hall with the trundle wheel, making sure you start with the zero placed correctly and that you count the clicks. What do you find?



c Try another distance and measure it with both the string and the trundle wheel. Record your results.

Length – metres

You will need: a partner, a trundle wheel, a ball or Frisbee

What to do:

a Think about how far it is from your classroom to the playground. Measure the distance to the nearest metre. Record your findings here.

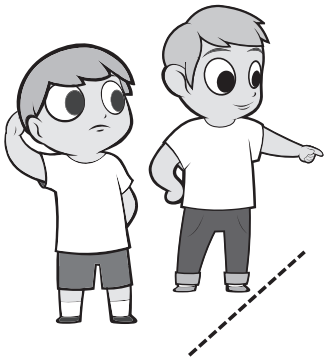
The distance between my classroom and the playground is _____ m.

b What is another distance you and your partner think would be about the same? How close were you?

_____ is _____ m.

What to do next:

From a starting line throw a ball or Frisbee. Predict how far away you think it is. Measure the distance with the trundle wheel.



Throw the ball or Frisbee 3 more times. Do your estimates get closer with practice?

a	estimate	m	measure	m
b	estimate	m	measure	m
c	estimate	m	measure	m
d	estimate	m	measure	m

Length – centimetres and metres

You will need: a partner, sting/s, a metre ruler, scissors

What to do:

Measure, cut and label each piece of sting.

a 1 × 1 metre piece of sting

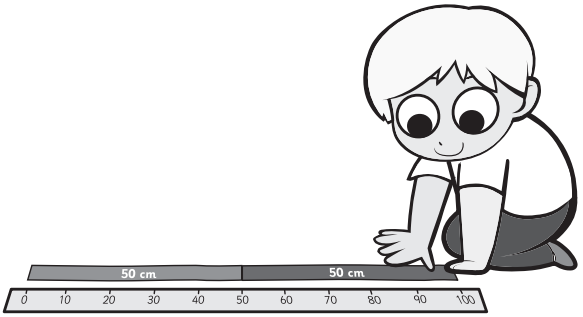
b 5 × 10 cm pieces of sting

c 2 × 50 cm pieces of sting

d 5 × 20 cm pieces of sting

What to do next:

Tape your 1 metre piece of sting to the floor. Use your other pieces of sting to find combinations that equal 1 metre. Record them below.



Try:

Can you cut some different lengths of stings that when added together, also equal 1 metre?

Length – word problems

What to do:

a There are two playgrounds at Joe's school. One is 23 m long. The other is 15 m long. How much shorter than the big playground is the smaller one?

b Sally finds three beans on her bean plant. She measures them and finds they measure 12 cm, 8 cm and 7 cm. If she laid all three end-to-end, how long would they be?

c In a relay race, a team of 5 children run 10 m each. How far does the whole team run?

d Alex wants to share his strawberry laces fairly with his 2 friends. If his laces measure 30 cm, how long a lace will he and each of his friends get after they have been cut?

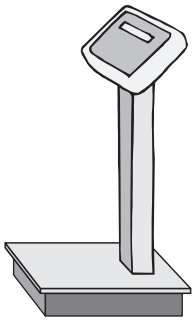
e Charlie is making a bird table with his Dad. He has a 100 cm piece of wood and needs to cut 4 pieces that are 20 cm long each to make the top. Has he got enough wood? How much will he have over?

Mass – language of mass

We find the mass of something by measuring how heavy it is.
The more mass something has, the heavier it is.

1 If you used these to measure something, what would you be measuring?





_____

2 Look at the words below. Colour any words you might use when you measure and talk about mass.

heavier than

edges

more mass than

volume

less mass than

exactly

a bit more

shorter than

weigh

long

different

area

heavy

lighter than

vertex

about the same

capacity

Mass – measure by estimating

You will need:  a partner  objects  a bag

 a balance scale

What to do:

Put 10 classroom objects in the bag.

Take two objects out and draw one in each box.

Take turns holding the objects. Which one do you think is heavier? Put a tick in the box next to it. If you think they are the same, write = (equals) in the box between them.

Place the objects on a balance scale and compare them. Which is heavier? Circle it.

Do this until you have compared all the objects.

☐	**Object 1**	⋯	**Object 2**	☐
☐	**Object 3**	⋯	**Object 4**	☐
☐	**Object 5**	⋯	**Object 6**	☐
☐	**Object 7**	⋯	**Object 8**	☐
☐	**Object 9**	⋯	**Object 10**	☐

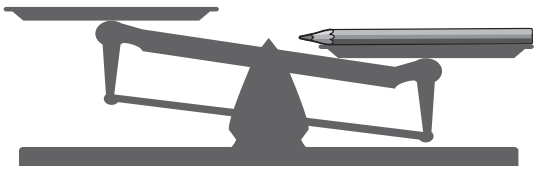
Mass – measure with balance scales

You will need: a partner, objects, a balance scale

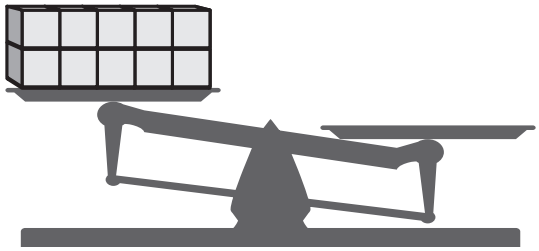
What to do:

Find things in the classroom to put on the other side of the scales to make them look like this. Draw the objects on the scale.

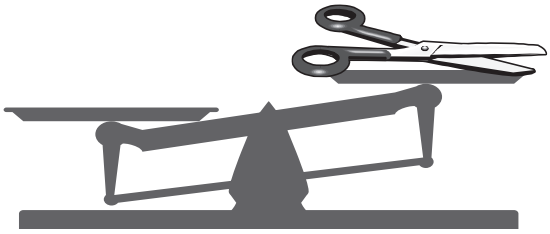
a



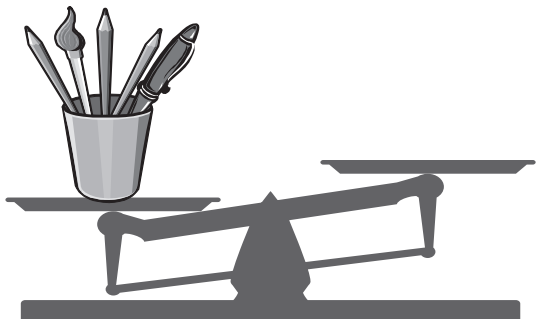
b



c



d



e

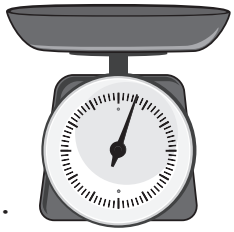
f

What to do next:

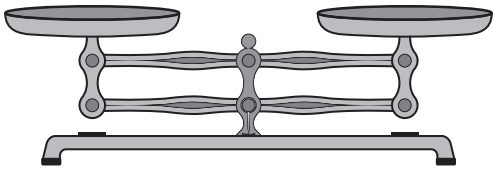
Choose one of your finished scales and write a sentence comparing the mass of the two objects on it.

Mass – measure with balance scales and weights

Just as we can measure length in metres and centimetres, we can measure mass in grams (g) and kilograms (kg): 1000 g = 1 kg. One gram is so light you could hardly feel it if you held it in your hand. One kilogram is as heavy as a standard bag of flour.



There are two main types of scales used for measuring mass. One type has a tray on top into which you put the item to weigh, and a display on the front to show its mass.



The other type is a balance scale, which is used with a set of weights. You put the item to weigh on one side and weights on the other side until the two are balanced.

You will need: a partner, objects, a balance scale, weights

What to do:

With a partner, find three items in the classroom that you think have quite different masses. Estimate the mass of each and then measure its mass using the balance scale and weights.

	Item	Estimate	Measure
a			
b			
c			

Mass – measure with balance scales and weights

You will need:  a partner  objects  a balance scale  weights

What to do:

Get these weights: 10 g, 20 g, 50 g, 100 g, 200 g. Your task is to find items in the classroom that have masses approximately the same as each of these weights. You will need to use a lot of trial and error to find the closest items.

	Item	Mass	Check
a		10 g	
b		20 g	
c		50 g	
d		100 g	
e		200 g	

What to do next:

Swap your items with those of another pair. Using your measuring scales and weights, check their work to make sure the items are close to the required masses. Mark their tables correspondingly with a tick or a cross.

Mass – compare and order 3 or more masses

You will need:  a partner  3 classroom objects  a balance scale

What to do:

Compare the masses of the objects using the scale and then order them in the boxes from lightest to heaviest. Use the < and > signs between each.

lightest ☐ ☐ ☐ ☐ ☐ **heaviest**

Explain how you decided on your order.

What to do next:

Choose two books from your library shelf that are about the same size but have different masses. Use the scale to check.

Now choose another book that you think would be heavier than the lighter book but lighter than the heavier book. In other words, the one that would fit in the middle!

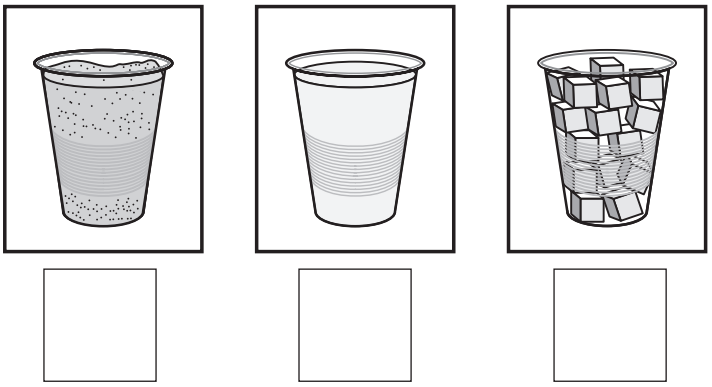
Use the scale to check. How did you get on?

Mass – compare and order 3 or more masses

You will need: a partner, 3 plastic cups, sand, water, base-10 ones

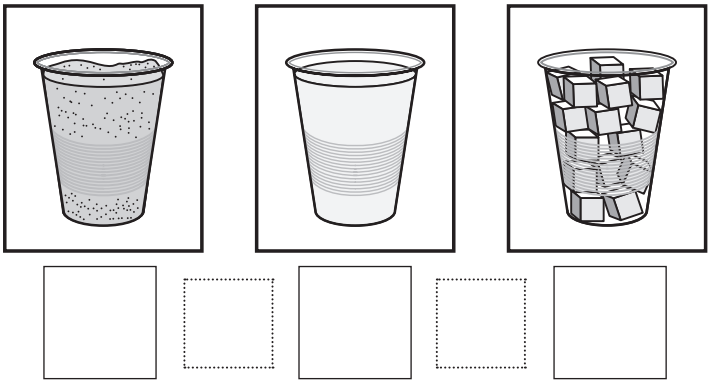
What to do:

a Fill 1 cup with sand, 1 with water and 1 with ones blocks. Predict their order from lightest to heaviest and label the cups to match your predictions.



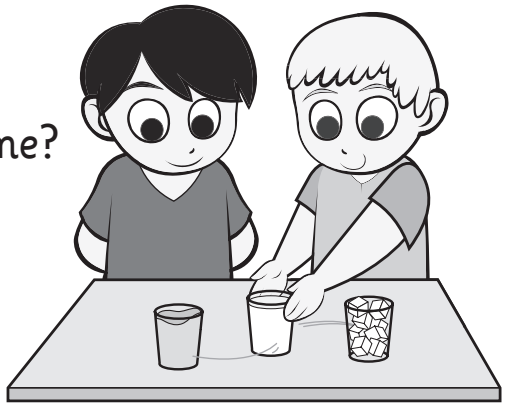
b Use the balance scales to measure and compare the cups. Label the cups. How did you go with your prediction?

Write the correct < or > sign between them.



What to do next:

Why do you think they have different masses? They are all a cup full. Why aren't they the same?



Mass – size and mass relationship

Are big things always heavy? Are small things always light?

1 Draw or write something that you think is:

a **big and heavy**

b **big and light**

c **small and heavy**

d **small and light**

2 Can you find something around the school that is smaller than your pencil case or tin but heavier than it? Draw it.

3 You will need 2 containers and a scale for this activity. Fill a cup with sand. Fill another container with base-10 ones so that they both have the same mass. Do think you will you need the same size container? How will you know they have the same mass? Record your findings.

Mass – size and mass relationship

You will need: a partner, modelling clay, a balance scale, centicubes

What to do:

a Divide your modelling clay into 2 balls of equal mass. How will you know that they are equal?

b Now, flatten one of the balls. Do you think they still have equal mass? Tick your answer.

☐ yes ☐ no

c Measure their mass on the scales. What do you find?

d Try it again by making both balls a different shape. Do you get the same result? Tick your answer.

☐ yes ☐ no

What to do next:

Combine both balls of clay and mould them into a cube shape. Build a cube with centicubes that is about the same size. Which cube do you predict will be heavier? Test this out.

Mass – word problems

1 Nancy has three dogs at home. They weigh 8 kg, 11 kg and 9 kg. What is the mass of all three dogs together?

2 Frank buys 100 g of sweets from the shop. He eats 60 g of them. How many grams of sweets does he have left?

3 Tyler is helping his dad with the food shopping. He loves melons. If he puts six melons into the trolley and they have a mass of 2 kg each, what will be the total mass of melons his poor dad will carry home?

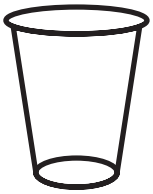
4 Abdul is baking a cake and needs to add 40 g of sugar. He has lots of little 10 g packets of sugar. How many packets does he need to add?

5 Grace has a bag that can hold items with a total mass of up to 3 kg without breaking. If she has $\frac{1}{2}$ kg of carrots, $1\frac{1}{2}$ kg of potatoes and $\frac{1}{2}$ kg of apples, will she be able to carry them all without the bag breaking?

Volume and capacity – capacity of containers

When we find out how much a container can hold, we are measuring capacity.

1 How would you describe how full these containers are? There are some ideas on the help strip below.

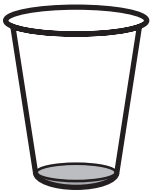
a 

b 

c 

d 

e 

f 

2 What sort of container do you think could be filled with 5 cups of water? Draw it.

full empty half between quarter
a bit three quarters nearly

Volume and capacity – capacity of containers

You will need: a partner, a spoon, a cup, a bucket, sand or water, a box

What to do:

a How many spoonfuls of water or sand will fill your cup?

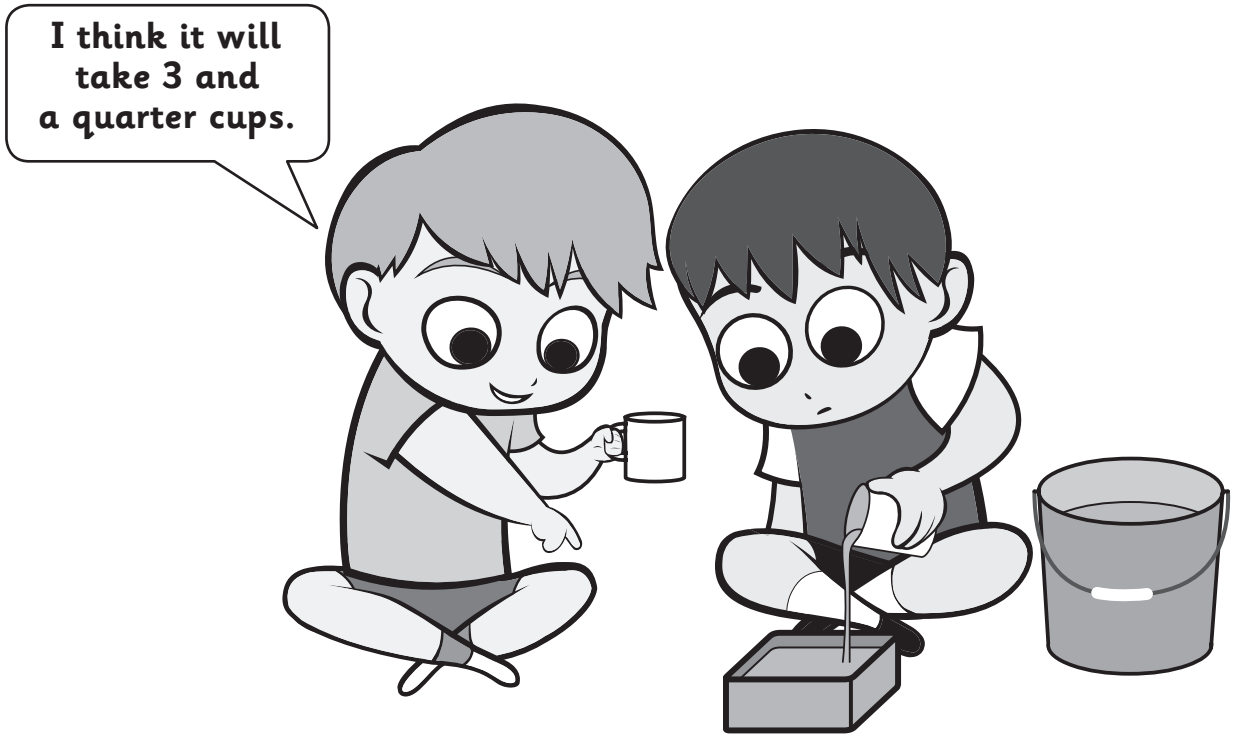
estimate ☐ **measure** ☐

b How many cups of water or sand will fill your box?

estimate ☐ **measure** ☐

c How many boxes of water or sand will fill your bucket?

estimate ☐ **measure** ☐



Volume and capacity – capacity of containers

You will need:  a partner  a cup  a large plastic bottle

 a funnel  sand or  water

 a permanent marker

What to do:

a Can you see the markers on the side of the jug? These tell us how full the jug is and help us if we need a set amount. Can you think of a time we would use them?

b You are going to make your own specially marked container. Pour cups of water or sand into the plastic bottle until the bottle is full. Use a funnel if you have one to make it easier. Each time you pour a cupful in, mark the side of the bottle.

What to do next:

a Pour 2 cups of water or sand out of the bottle. How will you know you have done this correctly?

b How much is left in the bottle? Show how you know.

c Take turns telling each other how much to pour out of the bottle until it's all gone. Check each other's decisions.

Volume and capacity – compare and order

You will need: a partner, a cup, a mug, a jug, sand or water, a box

What to do:

a Order your containers from the one that holds the least to the one that holds the most. How will you prove this?

b Draw the containers in order in the boxes below and explain how you worked it out.

least **most**

Volume and capacity – compare and order

You will need: a partner, cups, boxes, sand or water, jugs or bottles

What to do:

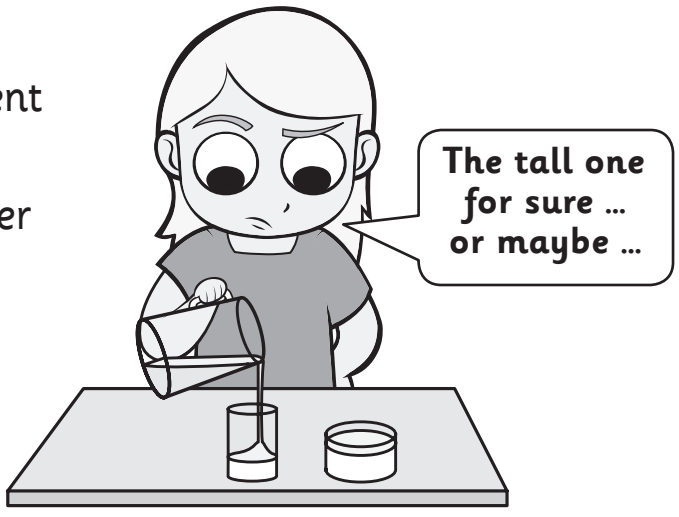
a Fill a container with sand or water. Can you find a different shaped container with the same or nearly the same capacity? Draw the 2 containers in the box on the right.

b Would you have expected that they had the same capacity? Why or why not?

c Write the correct < or > sign relating to their capacity between the pictures in **a**.

What to do next:

Take turns giving each other 2 different shaped containers. Ask each other to predict which one will have the greater capacity. Measure them and see.

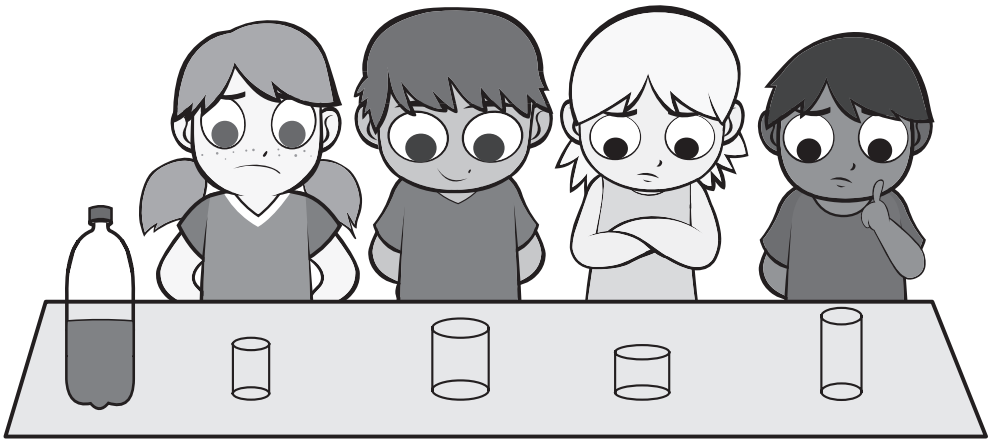


Volume and capacity – compare and order

You will need: a group of 4 kids, a plastic bottle, 4 different sized cups or small containers, measuring equipment, a spoon

What to do:

Half fill the plastic bottle with water. Choose a cup to be your own. Now, find a way to share the water out between the 4 cups so that each of you has a fair share. How will you know you have done it? Are you all happy with your share?



What to do next:

a For this activity you will need water, a spoon and a cup. Half fill the cup using the spoon. How many spoonfuls of water did it take?

b Can you work out how many spoonfuls in a whole cup? Do you have to keep filling spoonful by spoonful or is there a different way to work it out?

Volume and capacity – volume

When we find out how much space a container or object takes up, we are measuring volume. The more space an object takes up, the more volume it has.

One way of measuring volume is to fill it and count how many objects are in it.

You will need:  a partner  cubes  boxes

What to do:

a Estimate how many cubes it will take to fill your box. Write your estimate. **estimate** ☐

b Do you think your box has a greater or smaller volume than your partner's box? Write why you think so.

c Fill your box with cubes. **measure** ☐

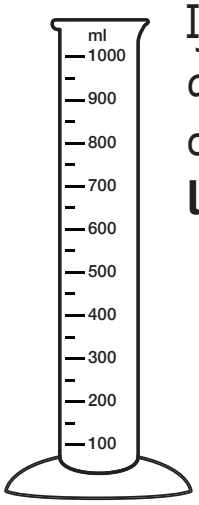
d Whose box had greater volume? Did this surprise you?

What to do next:

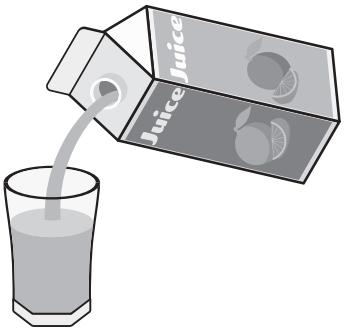
Estimate the volume of a plastic tray in cubes.

estimate ☐ **measure** ☐

Volume and capacity – measuring with litres and millilitres



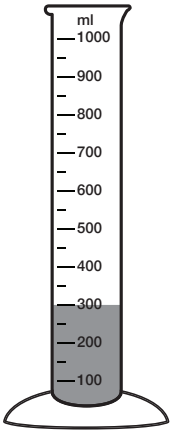
If we want to measure the capacity of a container or an amount of liquid or dry ingredients precisely, we use **litres** (l) and **millilitres** (ml).



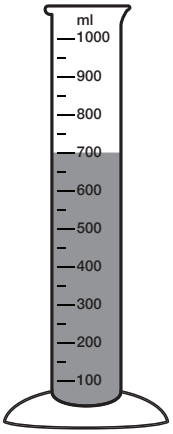
1 l = 1000 ml

One litre is the capacity of a big carton of juice. We use measuring jugs or cylinders to measure capacity.

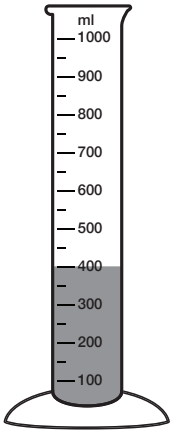
1 How many millilitres of liquid do these measuring cylinders contain?



a _____

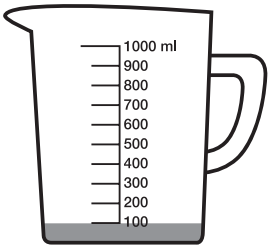


b _____



c _____

2 How many millilitres of liquid do these measuring jugs contain?



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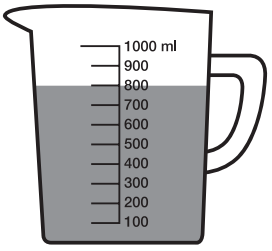

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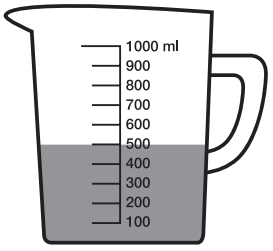

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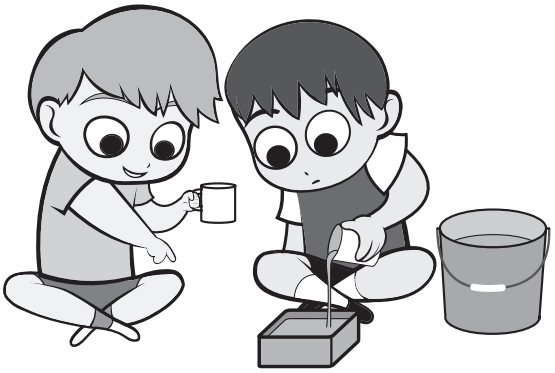
Volume and capacity – measuring with litres and millilitres

You will need: a partner, containers, measuring jug, a bucket of water

What to do:



Your task is to find a container that holds about one litre of water. Take your containers, measuring jug or cylinder and bucket of water into the playground. Fill your measuring jug to the one litre mark.

Now, with your partner, pour water into each of your containers and decide which of them have a capacity closest to one litre. Afterwards, swap your containers with those of another pair and see if you agree with their result.

What to do next:

Can you find the exact capacity of each of your containers? Fill each to the top with water, and then transfer the water to your measuring jug and read the scale on the side. Write down your results. Then swap containers again with another pair and check their results.

What did you do if you found one of your containers had a capacity greater than that of your measuring jug?

Volume and capacity – word problems

1 If I have containers that hold 2 l, 5 l, 8 l and 10 l, what is their total capacity?

2 Mel measures out 700 ml of milk for a recipe, but finds that she only needs 500 ml. How much milk does she pour back into the bottle?

3 Mary needs to make 14 l of fruit punch for her birthday party. How many 2 l bottles of juice will she need to use?

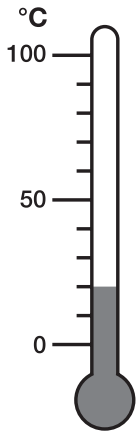
4 When Reuben was ill he had to take five spoonfuls of medicine over five days. If each spoon of medicine is 5 ml, how much medicine did he take in total?

5 Amanda aims to drink 1 l of water a day for a week. On two days she drinks 1 l each day, on three days she drinks only $\frac{1}{2}$ l each day and on the remaining two days she drinks 2 l each day. Has she reached her target? If so, how much more than the target has she drunk?

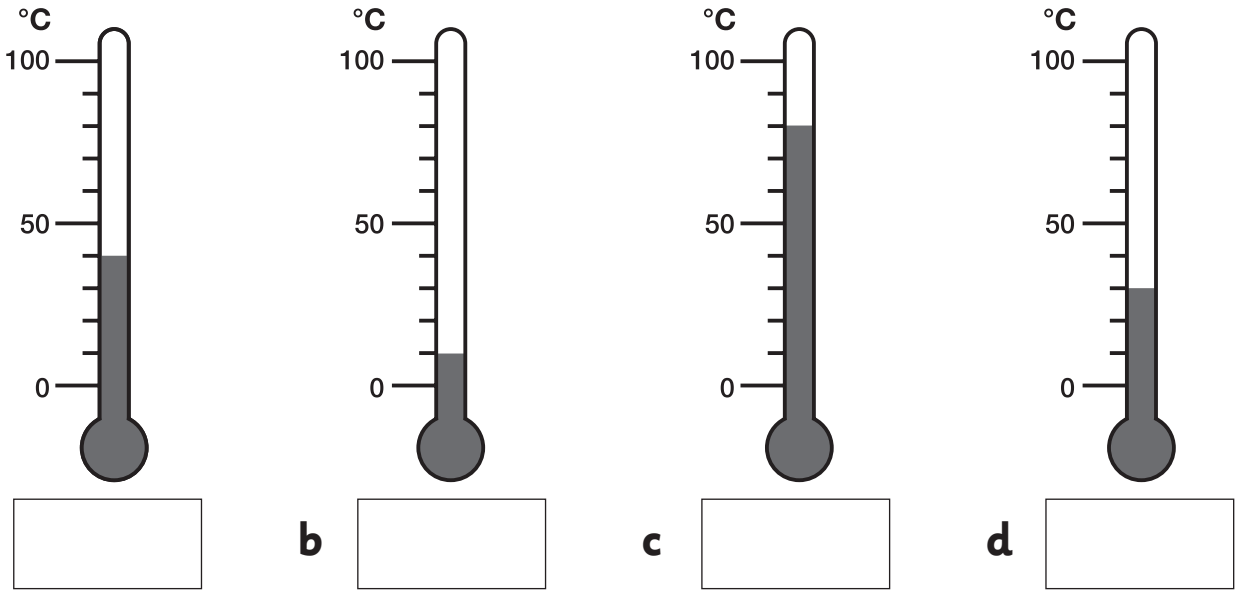
Temperature – measuring in degrees Celsius

Temperature is a measure of how hot or cold something is. We measure temperature using degrees Celsius (sometimes called Centigrade) (°C). 0°C is the temperature at which water freezes; 100°C is the temperature at which water boils. A comfortable room temperature is 20°C. A hot day might be 30°C. Normal body temperature is about 37°C.

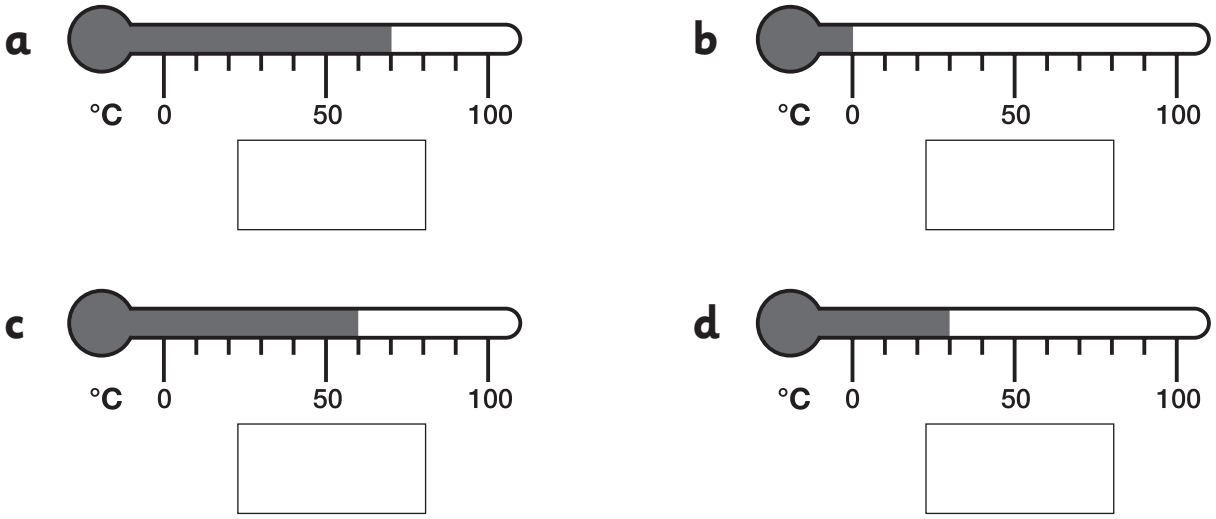
A thermometer is used to measure temperature.



1 What temperature do these thermometers show?



2 What temperature do these thermometers show?



Temperature – measuring in degrees Celsius

You will need:  a partner  thermometer  paper and pencil

What to do:

With your partner, look carefully at your thermometer. Can you see what the temperature is right now in your classroom? Compare your thermometer with that of another pair. Do they show the same temperature?

Your task is to find places around the school (and in the playground) where the temperature is different. Talk to your partner about locations that might have different temperatures than your classroom. Then off you go to measure!

Remember: You need to be patient when measuring temperature – wait for at least 30 seconds for the thermometer to adjust to a new location and temperature.

What to do next:

Compare the temperatures you found to those of another pair. Who found the hottest place? Who found the coldest? Why do you think the temperatures were different in different places?