

# Mathletics

Series



Student



# Measurement

My name \_\_\_\_\_



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# Series D – Measurement

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Series Author:

Nicola Herringer



# Units of length – metres

We use metres to measure length.

There are 100 centimetres in a metre.

$$100 \text{ cm} = 1 \text{ m}$$

## 1 Convert these metres to centimetres:

a  $6 \text{ m} = \boxed{\phantom{000}} \text{ cm}$

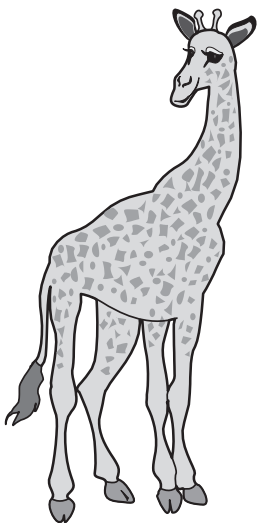
b  $3 \text{ m} = \boxed{\phantom{000}} \text{ cm}$

c  $9 \text{ m} = \boxed{\phantom{000}} \text{ cm}$

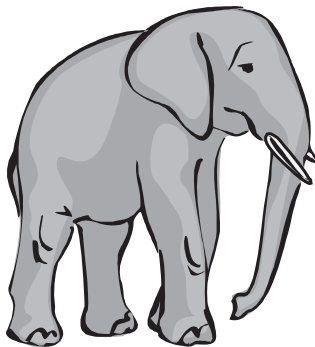
## 2 Estimate and then measure the length and width of these objects:

	Object		Estimate in metres	Measurement in metres
a	classroom	length	<input type="text"/> m	<input type="text"/> m
		width	<input type="text"/> m	<input type="text"/> m
b	whiteboard	length	<input type="text"/> m	<input type="text"/> m
		width	<input type="text"/> m	<input type="text"/> m
c	desk	length	<input type="text"/> m	<input type="text"/> m
		width	<input type="text"/> m	<input type="text"/> m

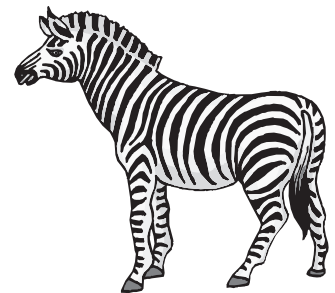
## 3 Find out how tall each animal is to the nearest metre:



a  m



b  m



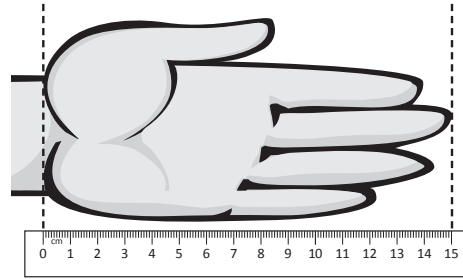
c  m

# Units of length – centimetres

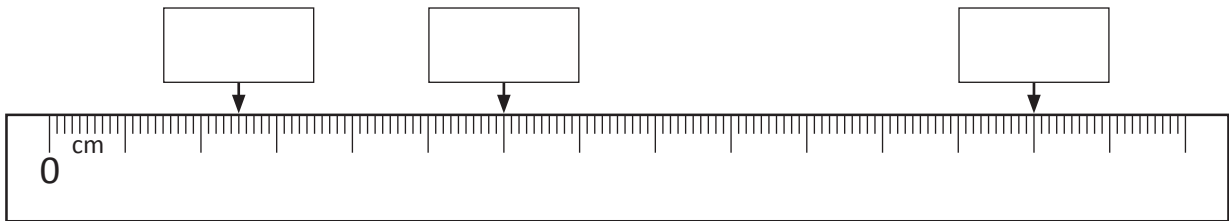
We use centimetres to measure smaller units of length.

There are 100 centimetres in a metre.

$$100 \text{ cm} = 1 \text{ m}$$



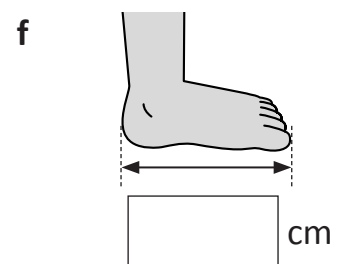
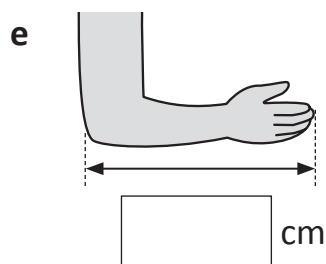
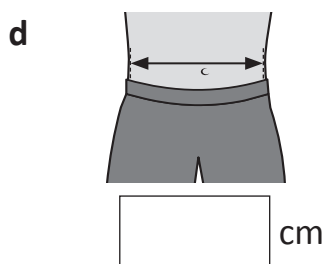
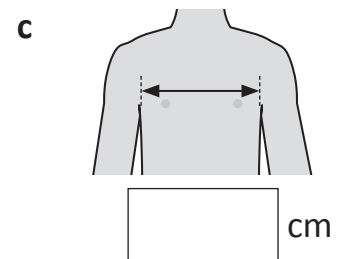
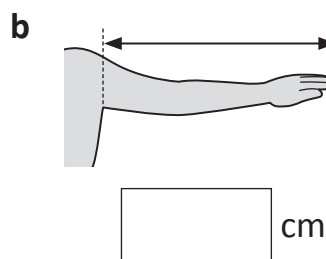
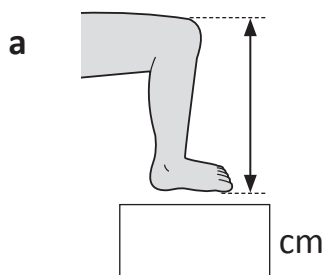
1 Record the lengths shown on this ruler in each box:



2 Use a ruler to draw the following lines. Start at the dot.

- a 7 cm •
- b 8 cm •
- c 11 cm •
- d 3 cm •

3 Measure these parts of your body with a piece of string. Lay the string beside a metre ruler to work out the correct measurement for each.



# Units of length – metres and centimetres

Often we will use both metres and centimetres when measuring length. This length of ribbon is 146 cm. This is 1 metre and 46 centimetres.



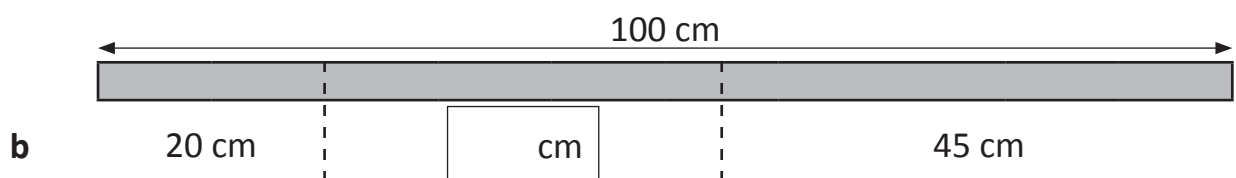
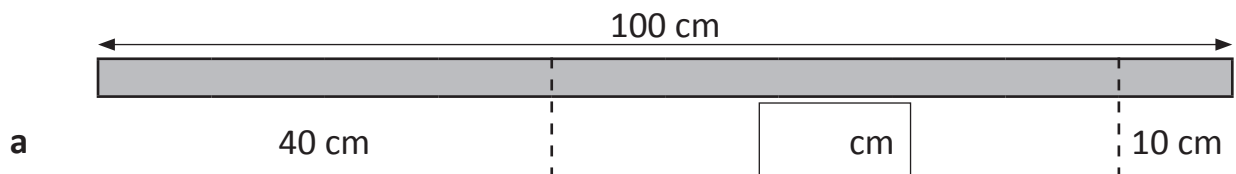
## 1 Write these lengths in centimetres:

- a 1 m 38 cm  cm      b 1 m 67 cm  cm      c 2 m 82 cm  cm  
d 5 m 45 cm  cm      e 4 m 59 cm  cm      f 2 m 90 cm  cm

## 2 Write these lengths as metres and centimetres:

- a 217 cm  m  cm      b 391 cm  m  cm  
c 462 cm  m  cm      d 113 cm  m  cm  
e 835 cm  m  cm      f 194 cm  m  cm

## 3 Work out the missing lengths that make up each metre:

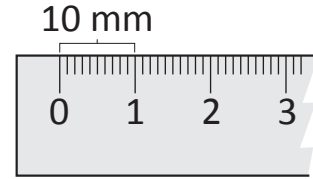


## 4 Fill in the gaps using 'm' or 'cm':

- a Hassan is 113  tall.      b The house is 5  taller than the car.  
c Natasha only lives 79  from school.      d Lisa measured her waist size and it was 64 .

# Units of length – millimetres

When we need a unit of length that is smaller than a centimetre, we use millimetres. There are 10 millimetres in 1 centimetre.  $10 \text{ mm} = 1 \text{ cm}$



## 1 Estimate and measure these objects in millimetres:

Object	Estimate	Millimetres
a Width of your thumb		
b Length of your hand		
c Width of a pencil		

## 2 How many millimetres in:

a  $4 \text{ cm} = \square \text{ mm}$       b  $9 \text{ cm} = \square \text{ mm}$       c  $2 \text{ cm} = \square \text{ mm}$

## 3 Write these measurements in centimetres:

a  $40 \text{ mm} = \square \text{ cm}$       b  $70 \text{ mm} = \square \text{ cm}$       c  $30 \text{ mm} = \square \text{ cm}$

## 4 Record the length of each piece of string in millimetres:

a  mm      b  mm

c  mm      d  mm



# Units of length – millimetres

5 Measure the height of each mini-mathlete in millimetres:

a



Height \_\_\_\_\_

b



Height \_\_\_\_\_

c



Height \_\_\_\_\_

d



Height \_\_\_\_\_

6 Write these lengths in millimetres:

a 1 cm 5 mm =  mm

b 5 cm 7 mm =  mm

c 4 cm 8 mm =  mm

d 1 cm 9 mm =  mm

e 8 cm 3 mm =  mm

f 2 cm 4 mm =  mm

7 Write these lengths as centimetres and millimetres. The first one has been done for you.

a 63 mm =

b 84 mm =

c 27 mm =

d 19 mm =

e 53 mm =

f 36 mm =

8 Measure these parts of the picture in millimetres:



a Height of the door  mm

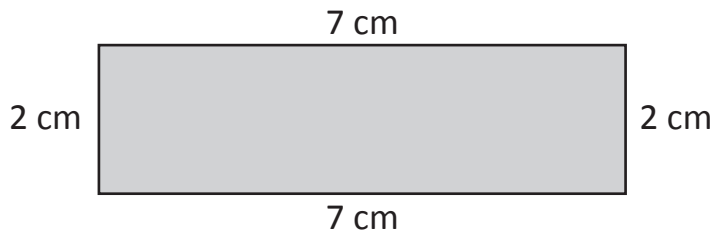
b Width of the house  mm

c Height of the fence  mm

d Width of the garage door  mm

# Units of length – perimeter

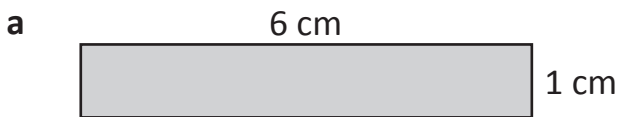
The perimeter is the total length around the outside of an enclosed space. To find the perimeter of this shape, we add the lengths of all the sides.



$$P = 7 + 2 + 7 + 2$$

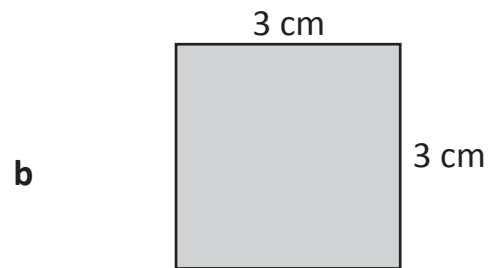
$$= 18 \text{ cm}$$

1 Find the perimeters of these shapes.



$$P = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

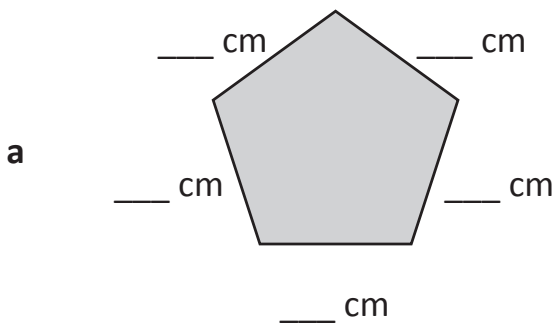
$$= \underline{\hspace{2cm}}$$



$$P = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

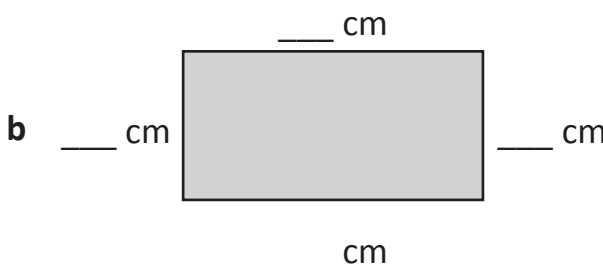
$$= \underline{\hspace{2cm}}$$

2 Measure these shapes and find the perimeter.



$$P = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$= \underline{\hspace{2cm}}$$



$$P = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

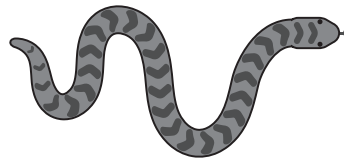
$$= \underline{\hspace{2cm}}$$

# Units of length – comparing

- 1 These snakes are not drawn to scale. Compare their lengths and order them in the boxes below from shortest to longest.



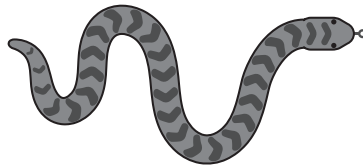
**A**  
1 m 15 cm



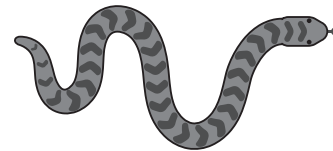
**B**  
 $1\frac{1}{2}$  m



**C**  
105 cm



**D**  
155 cm



**E**  
1 m 45 cm

shortest      longest

- 2 Use a ruler to measure the lines below and order them from longest to shortest in the boxes:



**A**



**B**



**C**



**D**



**E**

longest      shortest

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

a 51 cm 515 mm  $\frac{1}{2}$  m

--	--	--

b  $\frac{1}{4}$  m 230 mm 24 cm

--	--	--

# Units of length – word problems

## 1 Solve these length word problems:

1 m = 100 cm = 1,000 mm

- a James is  $1\frac{1}{2}$  m tall. Joe is 154 cm tall.

How much taller is Joe than James?



**REMEMBER**

- b The perimeter of a square measures 20 cm.

How long is each side?

- c Sid snail travels 5 m each day. His friend Sam travels 5 times that distance every day.

How far does Sam travel each day?

How far will Sam have travelled after 4 days?

- d Steve drew a huge pentagon with sides 2 m long.

What is the perimeter of the shape,  
in metres and centimetres?

- e There boys are arguing about who can jump the furthest. Mark's best distance is  $2\frac{1}{2}$  m, Chris's best is 2,505 mm and Kumar's is 255 cm.

Who has jumped the furthest?

Who jump is the shortest?

- f Three jelly snakes are laid end-to-end. The first is 13 cm long, the second 145 mm long and the third is  $12\frac{1}{2}$  cm long.

What is the total length of all three?



Some people say that the length of one of your arms is the same as the total length of all ten of your fingers. Is that true or false? How could you investigate it?

Work with a partner. Discuss how you can find out the answer?

What equipment will you need? What method will you follow? How will you record your results? What errors might you make if you are not careful?



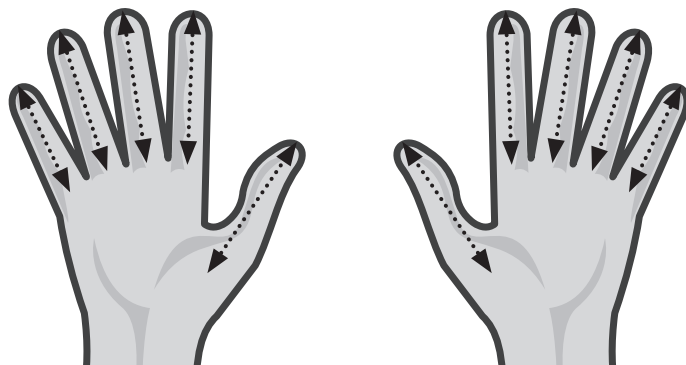
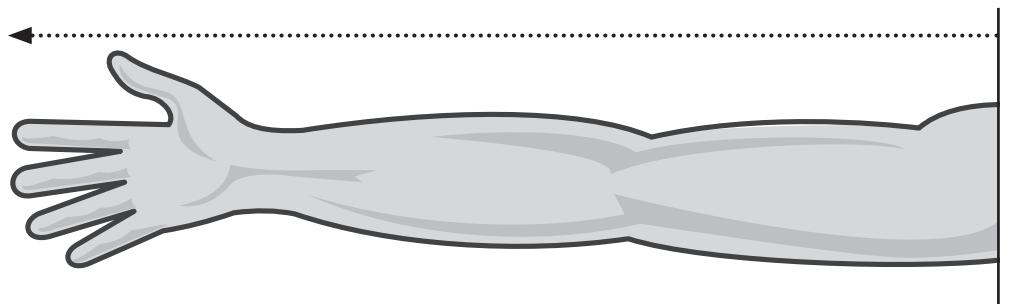
After you have agreed with your partner how you are going to approach the problem, gather together your equipment and start your investigation.

When you are done, did you find that you agreed with the statement or not?

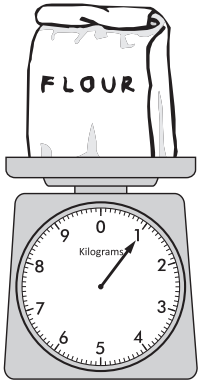
Explain your results and conclusion to another pair. Are your results similar? If not, why not?

Did you make any mistakes?

Do you think the results would be the same if adults tried this activity? Why or why not?



# Mass – kilograms

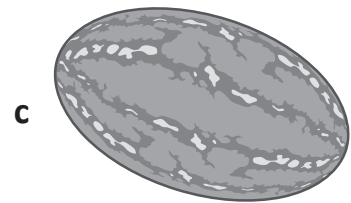
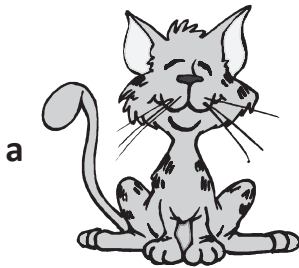


When we measure how heavy something is, we are looking at the mass of an object. We measure mass in kilograms. We say kilo for short and write it as kg.

Flour is something that is sometimes sold in 1 kg bags.

This scale is one that most people use when they are cooking. You might have one in your kitchen at home.

- 1 Use a set of balancing scales to test the mass of the following items. Circle the items that weigh less than 1 kg and underline the items that weigh more than 1 kg.



- 2 For this next task, you will need a class set of exercise books that are all the same.

- a Work with a partner to estimate how many books are needed to balance 1 kg. In the table below, record your team's guess, then ask two other teams and record their guesses.

	Team names	Number of books	More or less than 1 kg
1			
2			
3			

- b After you have found out the number of books that will balance or get the closest to 1 kg, write **more** or **less** next to each guess. Who was the closest?

# Mass – kilograms

3 How much less than 1 kg are the following weights?

a 500 g

b 750 g

c 600 g

d 150 g

e 250 g

f 400 g

4 Ring the 3 weights that combine to give a mass of 1 kg:

a 300 g      400 g      100 g      500 g      = 1 kg

b 200 g      150 g      600 g      200 g      = 1 kg

c 220 g      480 g      550 g      300 g      = 1 kg

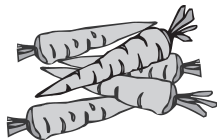
5 When we buy fruit and vegetables, we usually pay by the kilogram. Can you think why this is?

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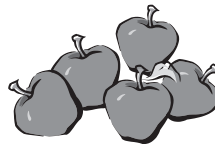
6 When Kim went to the supermarket, she bought carrots, bananas, apples, oranges and lettuce. Can you order the fruit and vegetables from heaviest to lightest?



1 kg



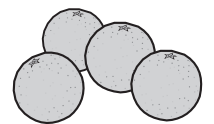
1,550 g



$1\frac{1}{2}$  kg



1,055 g



1,505 g

heaviest

lightest

# Mass – grams

We use grams to measure items that are less than 1 kilogram. We use g for grams.

1 kilogram = 1,000 grams

$\frac{1}{2}$  kilogram = 500 grams

## 1 Write each mass in grams:

a seventy five grams

b eighty two grams


c five hundred grams


d one thousand grams


e Ring the amount that is the same as 1 kilogram.


f Underline the amount that is the same as half a kilogram.

## 2 Which unit of mass would you use for each item – kilogram (kg) or gram (g)?


a 


b 


c 

d 

## 3 Estimate then measure the mass of each item:

a   
Estimate \_\_\_\_\_  
Measure \_\_\_\_\_

b   
Estimate \_\_\_\_\_  
Measure \_\_\_\_\_

c   
Estimate \_\_\_\_\_  
Measure \_\_\_\_\_

## 4 Find items around your classroom that fit into each category. Try and get them as close as possible to the mass in each column.

Item	About 100 g	About 200 g	More than a kg
a			
b			
c			



# Mass – grams

5 All these items have a mass between 200 g and 500 g. Estimate the mass of each.



a

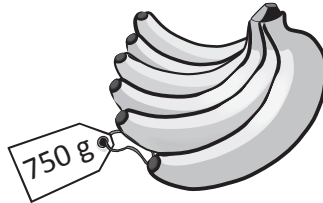
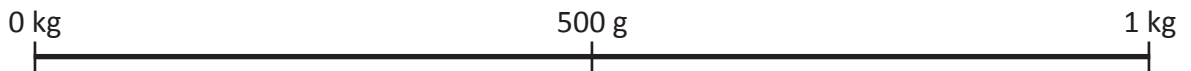


b



c

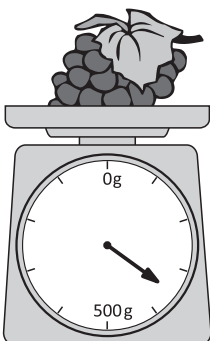
6 If the length of this line represents 1 kg and the marker in the middle is 500 g, where would these items go? Draw a line to connect them to the right place:



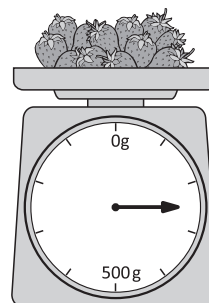
7 Decide whether the combined mass of the items pictured above weighs more or less than 1 kg.

- a baked beans and bananas                      more or less
- b tub of yogurt and an egg                      more or less
- c bananas and the yogurt                      more or less
- d egg and bananas                      more or less

8 Write the mass of each type of fruit:



a



b

# Mass – word problems

## 1 Solve these mass word problems:

- a Samira bought 6 apples from the greengrocer.

Each had a mass of 50 g.

How much did they weigh altogether?

- b I baked 3 cakes for the school cake sale. The chocolate cake had a mass of  $\frac{1}{2}$  kg, the walnut cake weighed 300 g and the carrot cake was 350 g.

What did all 3 cakes weigh together?

- c Aaliyah weighs 25 kg, which is 3 kg 200 g more than her little brother.

How much does her brother weigh?

- d Tasty Chews are on special offer at 3 for 30 p. Fruity Chews are on sale at 5 for 40 p.

Which chews are the best value?

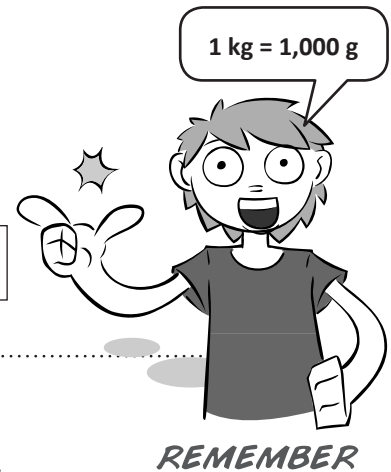
What is the difference between the price of 1 fruity chew and 1 tasty chew?

- e A sheep weighs 50 kg. A pig weighs 4 times as much as a sheep. A cow weighs twice as much as a pig.

How much would 2 cows weigh?

- f A ship is sinking and the crew need to throw into the sea the 3 heaviest boxes it is carrying. Box A weighs 9 kg 510 g, Box B weighs 9,490 g, Box C weighs 9 kg 50 g, Box D weighs 9,005 g and Box E weighs  $9\frac{1}{2}$  kg.

Which 3 boxes should they throw overboard?



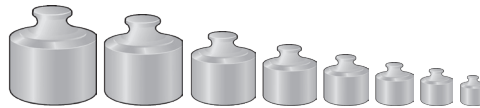
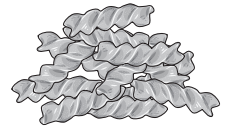
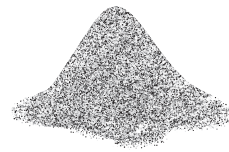
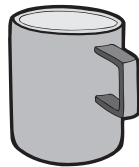
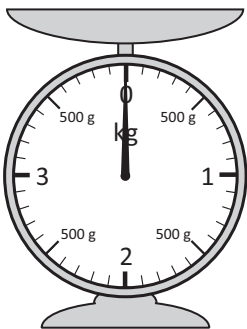


Getting ready

“A filled mug always weighs the same whatever it contains.”  
Always true? Sometimes true? Never true?

What do you think? Discuss this as a class. How could you test this statement?

Get into small groups for this task. Each group will need a mug, weighing scales or balances with gram weights of different sizes and different items to fill the mug (such as sand, rice, pasta, counters, salt).



What to do

Agree on your method with your group and think carefully about how you'll make sure your investigation is carried out fairly.

Fill your mug to the brim with each item and record its mass.

Discuss your results with your group and decide whether you believe the statement to be always true, sometimes true or never true. Did you encounter any problems? How did you make sure your results were accurate?

Each group can then present its results and conclusion to the class and everyone can discuss whether an overall conclusion can be reached.

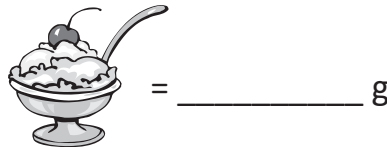
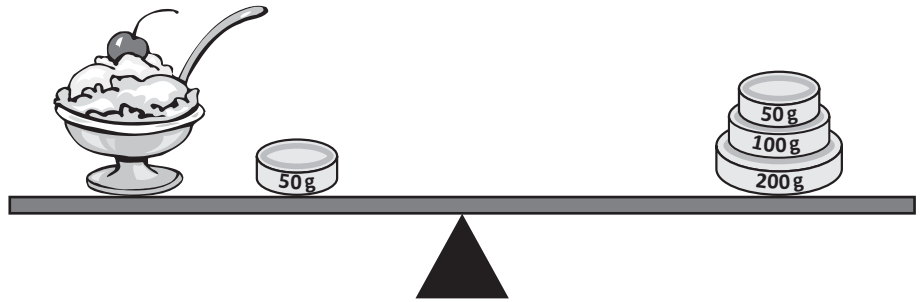
What are the differences between the items used to fill the mug that could have caused the results to be as they were?



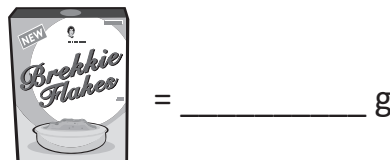
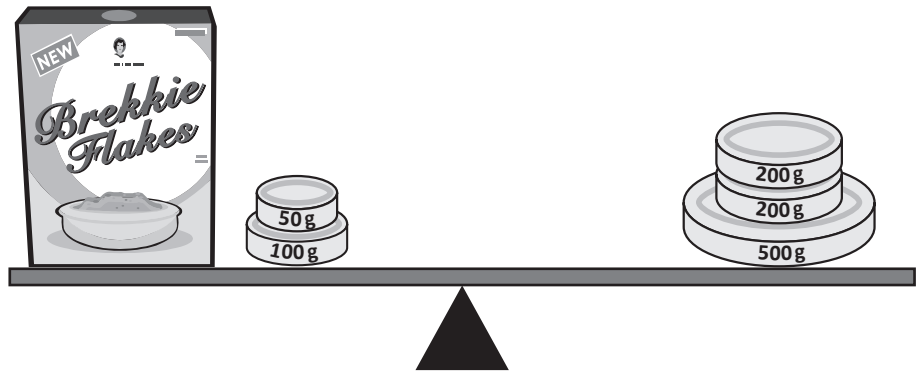
What to do

Find the mass of each of these items.

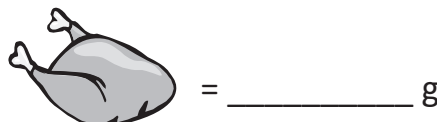
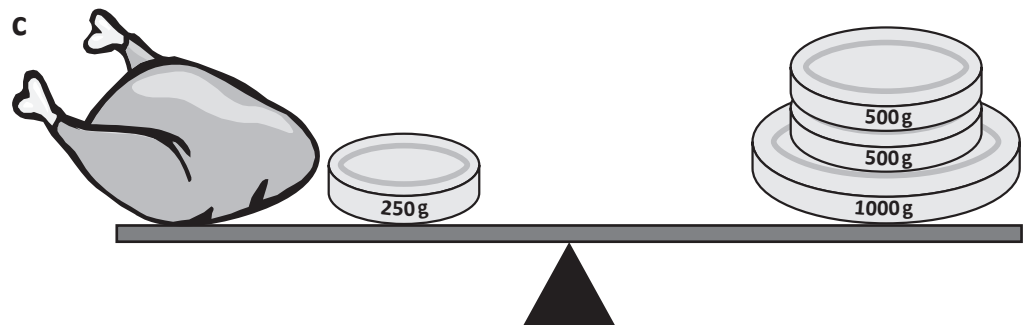
a



b



c



# Volume and capacity – litres

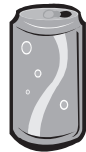
Capacity refers to how much liquid a container can hold. Capacity can be measured in litres. We use the symbol 'l'. Next time you go to the supermarket, look out for all the different items that have 'l' for litres on the label. For example, fruit juice is are often sold in litres.



**1** Here is a selection of containers. Work out how many times each container can be filled from a 1 litre carton, such as a fruit juice carton.



a



b



c



d



e



f



g



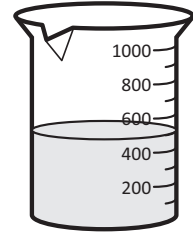
h

**2** Use a 1 litre carton to estimate and measure the capacity of these containers in litres.





	a waste bin	b saucepan	c watering can	d bucket
Container				
Estimate				
How many litres?				

# Volume and capacity – millilitres






To measure the capacity of smaller containers we use millilitres. The symbol for millilitres is 'ml'. There are 1,000 ml in 1 litre. This litre jug is filled half way so it contains 500 ml of liquid.




1 How many of each container is needed to fill a 1 litre jug?


Container size	a mug 250 ml 	b glass 200 ml 	c egg cup 50 ml 	d a raindrop 1 ml 
Number needed to fill a 1 litre jug				


2 Order these containers from smallest to largest according to their capacity.


Container	a  1 Litre	b  300 ml	c  250 ml	d  100 ml	e  110 ml
Order					


3 What is the most appropriate unit of capacity for each of these objects – millilitres (ml) or litres (l)?


a 

b 

c 

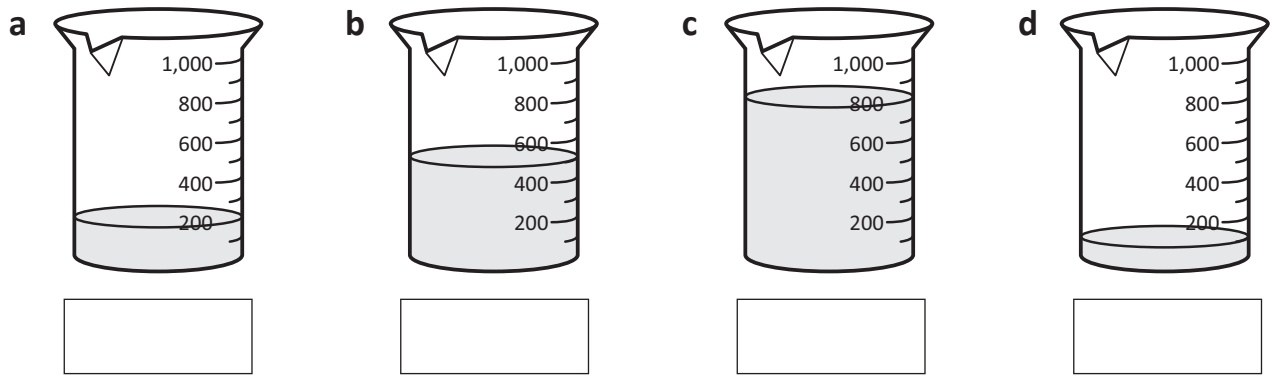
d 

e 

f 

# Volume and capacity – millilitres

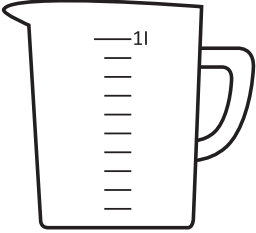
**4** Label each of these containers with the amount of water in each:




**5** Answer the questions based on the amount of water in the containers above.

- a Which container has the most liquid in it? \_\_\_\_\_
- b Which container has the least liquid in it? \_\_\_\_\_
- c How much more liquid is there in container c than in container a? \_\_\_\_\_
- d Which three containers, when added together, would not overflow? \_\_\_\_\_

**6** Mark the level of liquid in these jugs according to each problem.

a  Bec pours herself a glass of orange juice from this jug that was full to the 1 litre mark. If the glass she uses is 300 ml, how much is left in the jug?

b  Cam is mixing cordial for a party. He pours in 200 ml of cordial and then adds twice as much water. How much mixed cordial is now in the jug?

# Volume and capacity – word problems

## 1 Solve these volume and capacity word problems:

- a I have two glasses of water. One contains 300 ml, the other contains 200 ml.

How much do they contain together in litres?

- b I have a jug containing 1 litre of juice. I pour out 400 ml.

How much is left?

- c My garden pond holds 330 litres of water. My neighbour's contains 450 litres.

How much more does my neighbour's pond hold than mine?

My dad's pond is three times bigger than mine.

How much does it hold?

- d Mia's recipe asks for 30 ml of vanilla essence. She has a spoon that holds 5 ml.

How many spoonfuls does she need?

- e Three friends are making jam. Emma makes 450 ml, Leah makes 600 ml and Fred makes 350 ml.

How much jam have they made altogether?

- f An explorer takes a 10-litre container of water on a 3-day trip through the jungle. He drinks 1 l 500 ml on the first day, twice this on the second day and 4 l 200 ml on the last day.

How much water does he have left at the end of the trip?

1 litre = 1,000 ml



**REMEMBER**





Getting ready

How much do you know about capacity? Is it easy to tell whether one container will hold more or less liquid than another? Can you measure capacity accurately?

For this investigation you need to work in a pair or a small group. Gather together 5 different containers. You will also need one measuring jug marked in millilitres.

Your task is to order the containers by capacity and to then accurately measure and record their capacity.



What to do

Discuss with your partner or group how you are going to approach the investigation. What steps will you take in what order? How will you record your findings? You need to record your estimate of the order of the containers by capacity, your estimate of the capacity of the containers in millimetres, and your measurements of their capacity in ml.

Assign different members of your group different jobs, and complete the investigation.

How accurate were your predictions? Were there any surprises? Did you face any difficulties?

Join up with another group and explain your method and results to them. They can then do the same for you. Were there differences in how the groups approached the problem? Whose method do you think was best? Why?