

Year 7

Working with units

Within this **week's** unit, students will learn to:

- Record and order measurements using decimal notation
- Estimate and measure:
 - Length in kilometres (km) /metres (m)/ centimetres (cm)/ millimetres (mm)
 - Mass in kilograms (kg) /grams (g)
 - Volume of liquid in litres (l) / millilitres (ml)

Resources available for this unit:

[Ideas for representations](#)

[Further depth tasks](#)

[Coaching](#)

[Workbook](#)

[Departmental Workshop](#)

Question prompts

L1: What does ascending/descending mean?
What do these measure?
Which is the smallest/largest unit?
What information can you use to estimate ...?
Why is estimating useful?
How could comparing estimates improve the accuracy?
What estimates do you know that might help?
What are your estimates? How did you decide these?
How could you get a more accurate measurement without measuring the object itself?
When might we not be able to fully measure an object? Why?
How do you measure accurately using a ruler/measuring tape?
How can you use the measurements to find new estimates?

L2: How can you measure a straight / curved line?
How many different ways can you segment this measurement?
How can you check the accuracy of your measurements?
How many <units> are in <units>?
How can you convert from <unit> to <unit>? Why?
Could there be more than one answer? Why? What are the limitations?
What do the inequality signs mean?

L3: Which side of the scale is heavier? How do you know?
What could the weights be? Why?
How many grams are in a kilogram?
How can I order these coins? Is there more than one way? Why?
How can you tell which is heaviest/lightest? Based on the £1 coin, do these weights represent the / correspond to the value of the coins?
How do you think weight and value should be related?
How do I use 5p to work out the mass of 1p / £1? What is the relationship?
Why might coin masses not be representative of their value?
How can you convert grams into kilograms? Which is the smaller unit?

L4: How many ml in <?> litres? How many litres in <?> ml?
How can we convert between millilitres and litres? Why?
What do we need to do to find out the relative size of the units?
How many different ways can you create 2.5 litres?
Which do you think would be the best to use? Why?
What makes something an appropriate measure? Why?

L5: Which are length/mass/volume measurements / units?
How does this information help with this task?
What unit is most appropriate for this? Why?
How many bottles does he drink in 2 days? 3 days? a week?
How much liquid is this? How can you work this out?
Why is the final answer an estimate?
How have they made these estimations? How close is your estimation to theirs? Is their answer reasonable? Why?
Which object(s) do you think could be 2013 mm?
How can we convert 2013 mm into other units? Why would this help?

Thursday, 04 June 2020

Lesson 1

Estimate and measure length

Key learning

Compare measures

Approximate measurements

Measure length in mm, cm and m



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Do Now

Which unit of measure would be most appropriate for the following?

Metre

Centimetre

Kilometre

Nanometre

Millimetre



Distance of a sprint race

Distance a snail moves in 1 minute



Distance of a marathon

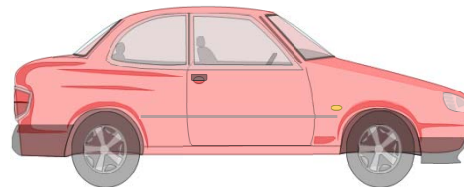
Distance a car travels in a day



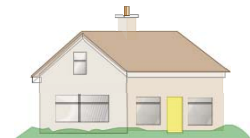
Height of a rabbit



Distance from home to school

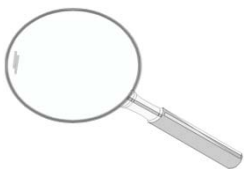


Height of a house



Width of a biological cell

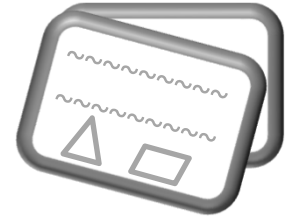
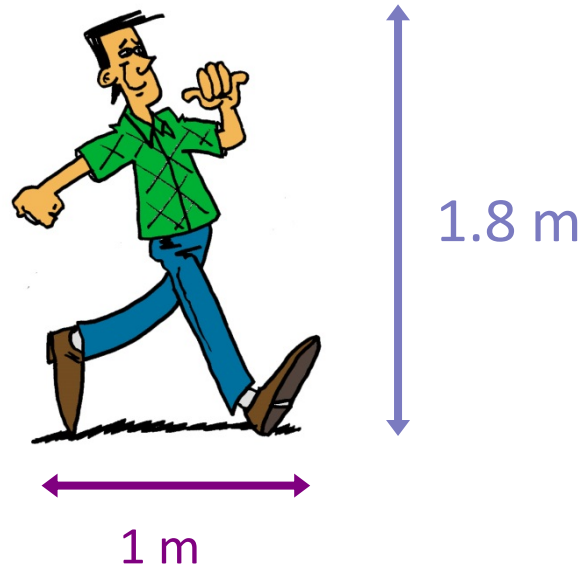
Length of an ant



Can you think of your own examples?



Estimating length



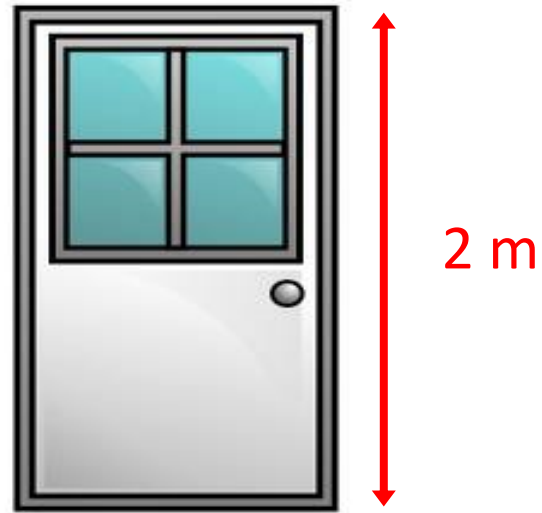
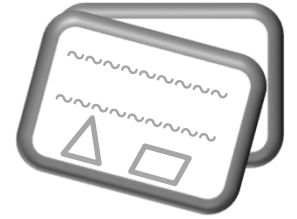
The average height of an adult is between 1.5 m and 1.8 m.

The average length of an adult pace is 1 m.

How tall do you estimate you are?

How long do you think your pace is?

Estimating length



The average height of a door is 2 m.

How high do you think the classroom door is?

Estimating measures

In pairs, using only yourselves as measures (e.g. an **estimate** of your height, stride, arm length, hand span, etc), estimate the lengths of objects around the classroom.

Write down your estimates in a table.

You must write down what and how you estimated, for example:

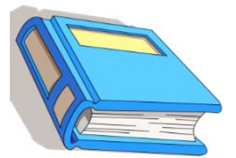
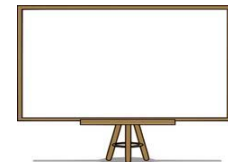
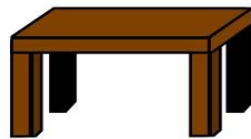
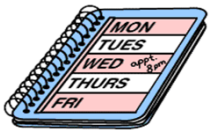
Object	Measurement taken	Estimated length
Table	Two paces	1.5 m

 Can you sketch the classroom with these measurements?

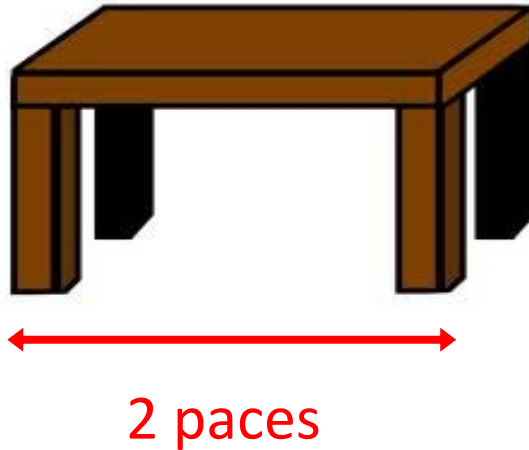
Can you use similar strategies to make **estimates** of measurements around the whole school? 

Estimating measures

Object	Measurement taken	Estimated length



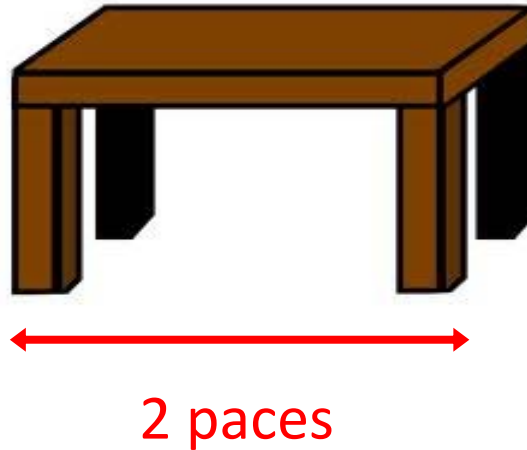
Checking estimates



I estimated that 2 paces was 1.5 m.

How could I check this without measuring the table?

Checking estimates



I estimated that 2 paces was 1.5 m.

My pace measures 0.78 m.

I decide that my estimate is good.

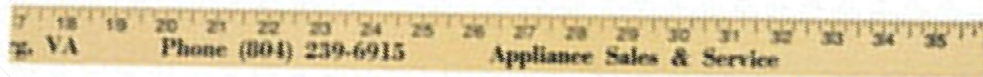
Do you agree?

Checking estimates

Measure the 'tools' (arm length, hand span, etc) that you used to estimate the measurements around the room.

Find the difference between your estimates and the actual answers.

How accurate were your estimates?

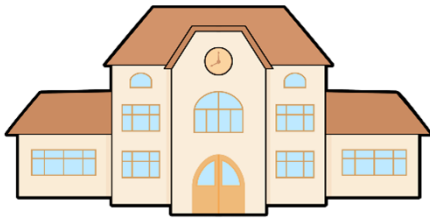


How many decimal places do you think it is sensible to write down when estimating a length in metres? Why?
Can you think of a way to test this?

Which is greater?

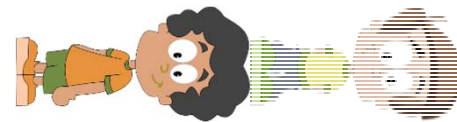
Estimate these lengths and decide which is greater.

The distance you walk in a day or a half-marathon?



All the hand-spans in Year 7 or the tallest part of your school building?

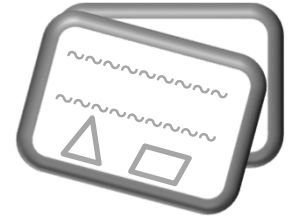
The perimeter of your school or the combined height of all Year 7?



Come up with your own 'which is greater' statements.



Longer, shorter or equal in length?



Fill in the boxes with either $<$, $>$, or $=$ symbols.

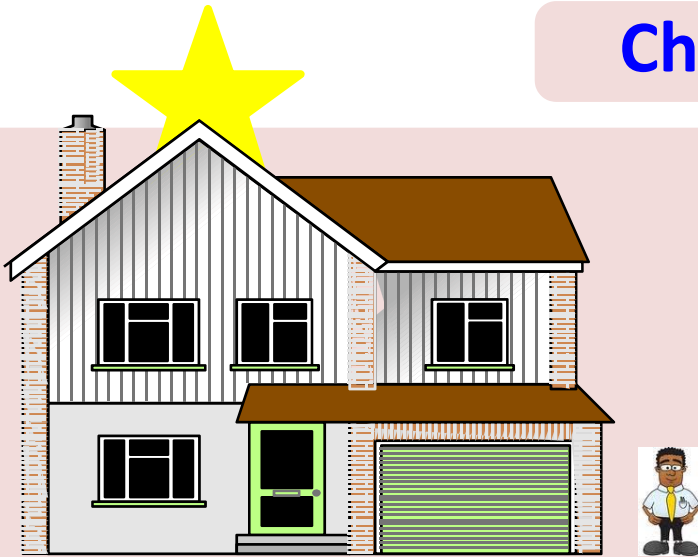
500 km 50 000 m

99 cm 0.099 m

85 000 mm 8.5 m

707 000 cm 70.7 km

Challenge Extra



Using the fact that the man is approximately 1.8m tall, what measurements can you estimate on the house?

The moon is approximately 360 000 km from the earth.
The population of the earth is approximately 7.4 billion (2015 estimate).



If everyone on earth stood on top of each other, how many times would this reach to the moon and back?

How many adults vs children are in your estimate?

Why does this matter?

What is the greatest or smallest reasonable estimate? Why?

Thursday, 04 June 2020

Lesson 2

Convert units of length

Key learning

Understand the relative size of units of measure

Multiply and divide by powers of ten

Order measurements of length

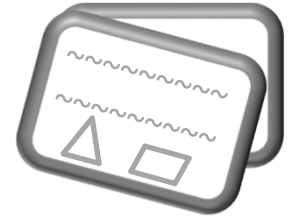
Convert between measurements of length



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Do Now



Which is greater?

100×1000 or $10 \times 100\,000$

$0.01 \times 100\,000$ or 10×100

$10 \times 100 \times 1000$ or $0.1 \times 10\,000\,000$

Complete the sentence below by filling in the blanks

cm is the same as 1000

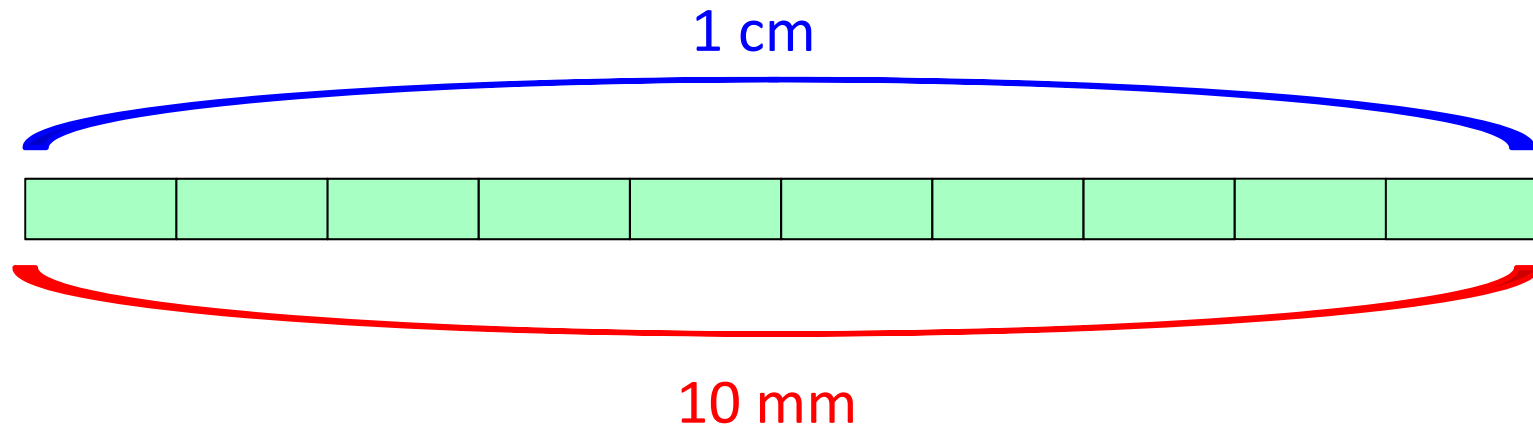
How many different ways can you complete it?

Converting and comparing

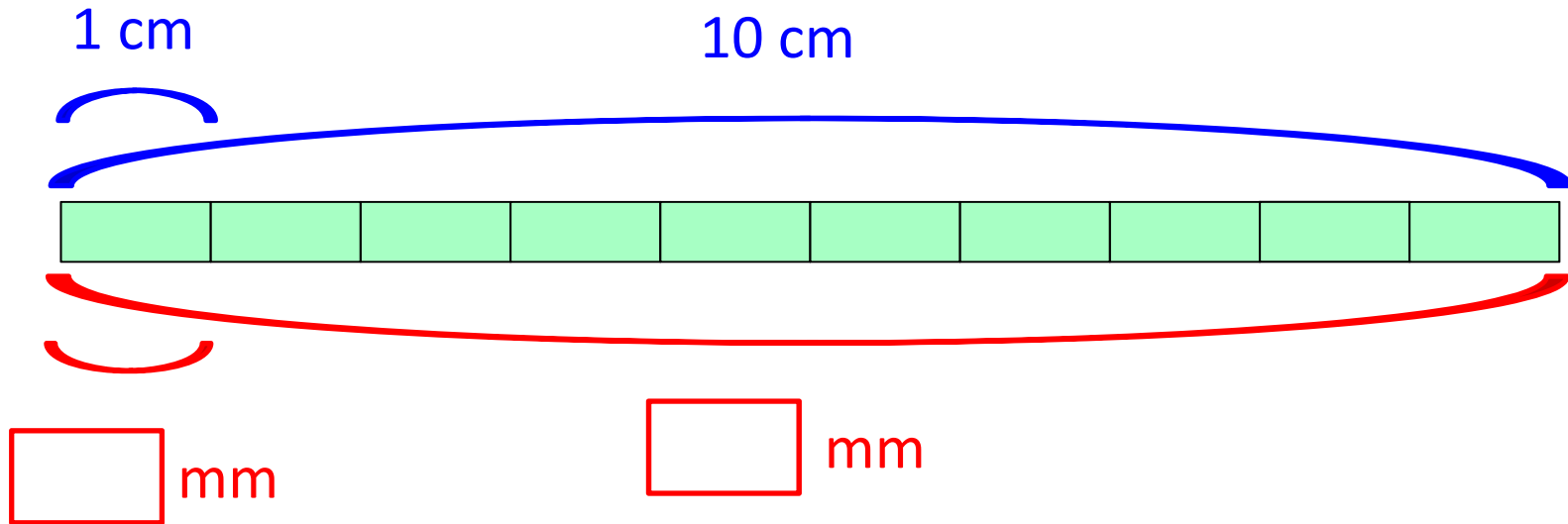
Is 114 mm greater than 8.6 cm?

How do you know?

'There are 8.6 lots of 10 mm in 8.6 cm'

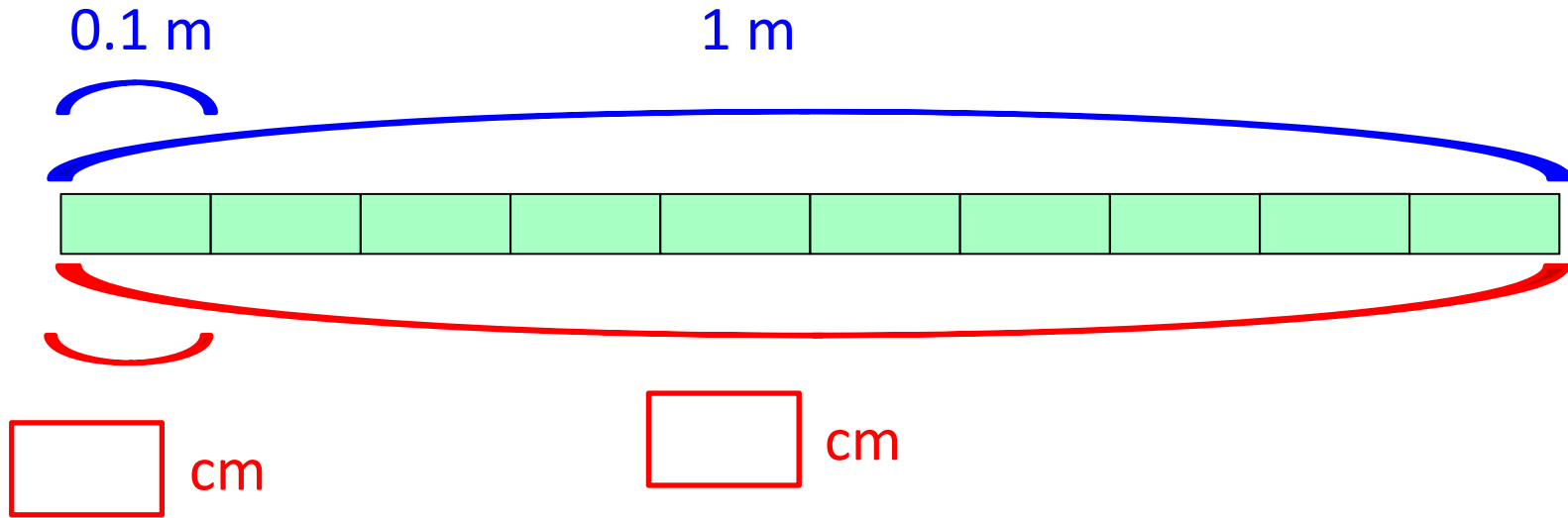


Equivalent measurements



★ What would 355 mm be in cm?

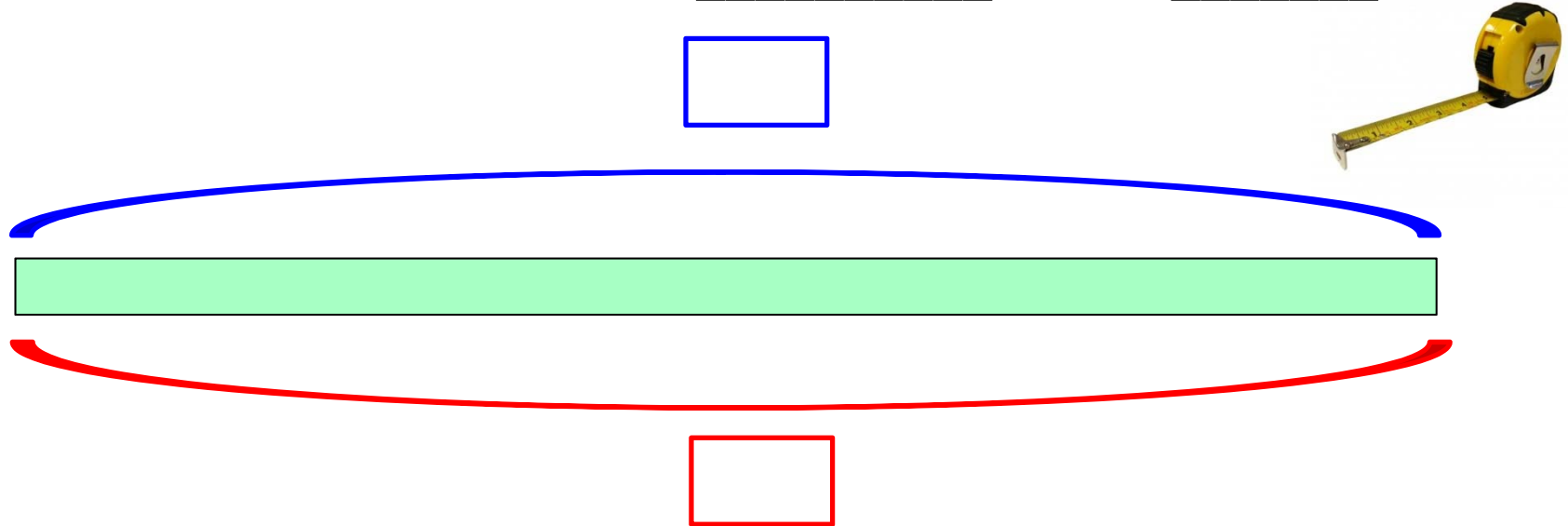
Equivalent measurements



★ What would 209 cm be in metres?

Converting units

To convert _____ into _____ you need to _____ by _____.
I know this because there are _____ in one _____.



How many conversion sentences can you create?

What is the pattern when converting cm into m, and m into cm?

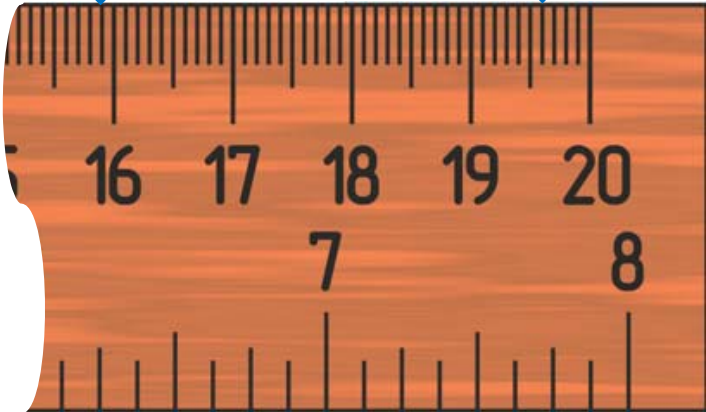
How many conversion sentences can you create where you need to multiply or divide by > 1000 ?

Reading scales



Read the scales below, and write each distance in mm, cm, and m.

Round each to the nearest cm



Matching measures



Pen length



Paper clip length



Crocodile length



Giraffe height



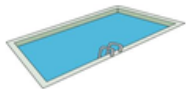
Flight from London to New York



Marathon distance



Distance from London to Paris



Swimming pool length



Butterfly wingspan



Man's height



Violin length



Cat length



Bee length



Fingernail length



Length of the River Thames

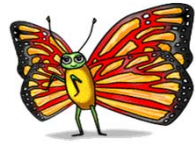
13 mm	17 mm	32 mm	114 mm	14.3 cm
24 cm	60 cm	1.7 m	3.45 m	5.72 m
50 m	42.195 km	340.55 km	346 km	5570.2 km

Match up the objects with the most appropriate length/distance.

Convert each distance into mm, cm, m and km.



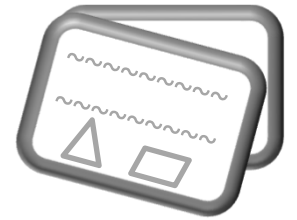
Converting distance



Butterfly
wingspan



114 mm



How many centimetres is this?

How many metres is this?

How many kilometres is this?

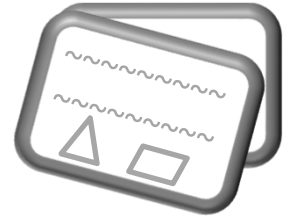
Converting distance



Marathon
distance



42.195 km



How many metres is this?

X

How many centimetres is this?

X

How many millimetres is this?

X

Show me the answer

How many millimetres are in 4.4 cm?

How many metres are in 4.4 cm?

How many kilometres are in 4.4 cm?

How many millimetres are there in 0.00004567 km?

Which is bigger, 10 000 mm or 100 m?

Which is bigger, 10 km or 1 000 000 cm?

How many pieces of string measuring 200 mm do you need to make a length of 100 000 m?

Thursday, 04 June 2020

Lesson 3

Converting units of mass

Key learning

Compare and order decimals

Add and subtract decimals

Compare units of mass

Convert between units of mass

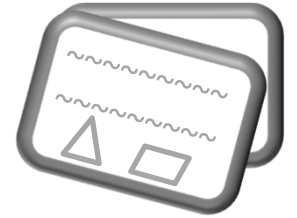


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Do Now

Put these coins in order of value.



Is this different to their order of mass?



Which coin do you think is the heaviest?

Which coin do you think is the lightest?

Money mass



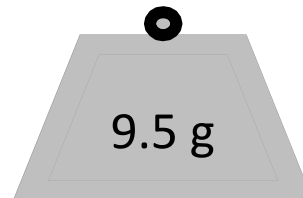
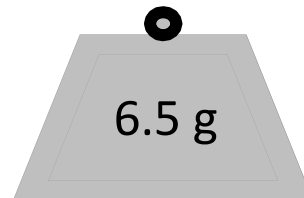
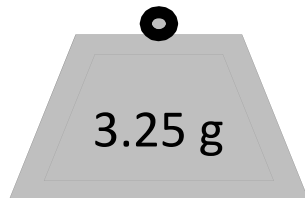
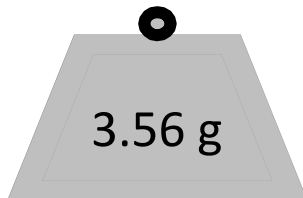
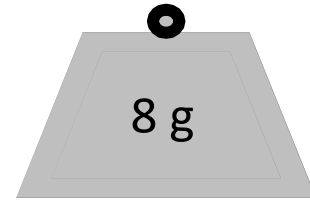
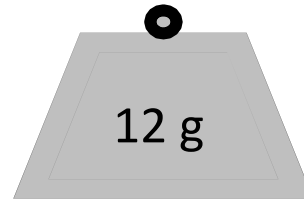
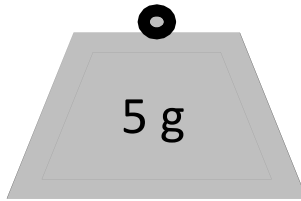
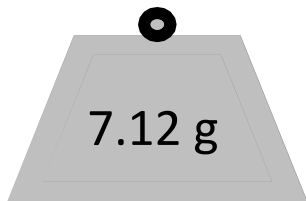
A 1 p coin has a mass of 3.56 g

Using that information, estimate the mass of each of these coins.



Money mass

Can you match the coins to their masses?



Money mass

Are the coins' masses representative of their value? Why?



3.56 g



5 g



3.25 g



7.12 g



8 g



9.5 g



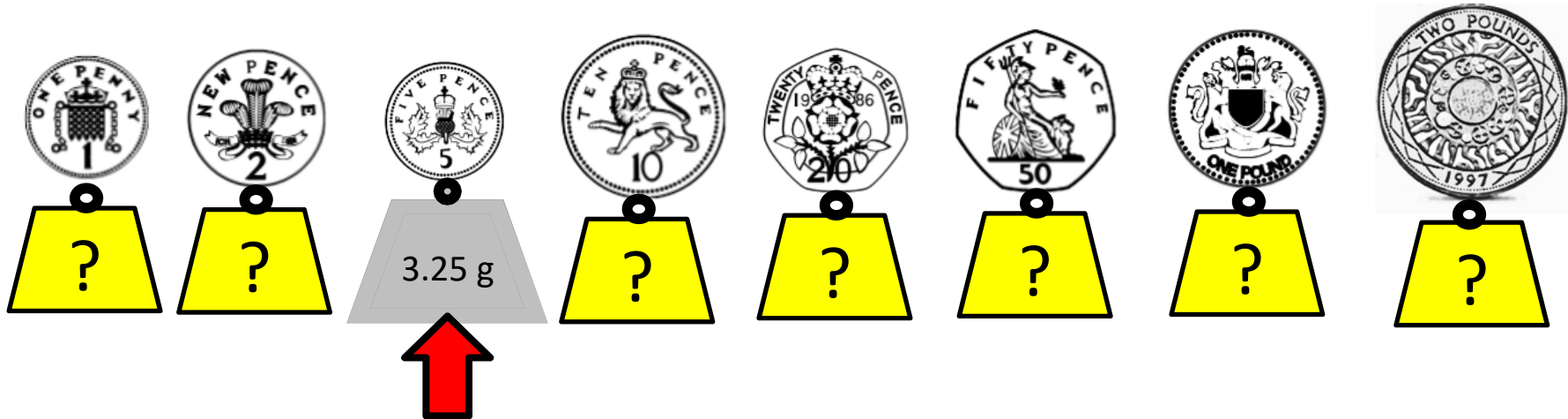
6.5 g



12 g

What do you notice about the values and masses of the 1, 2, 5 and 10 p coins?

Mass according to Value



If we set the 5 p coin's mass as correct, what **should** the mass of the other coins be if their mass is linked to their value? Why?

What would the mass of £3.47 be using your new masses?

Using the actual mass of each coin find a combination of coins that totals £3.47 and is:

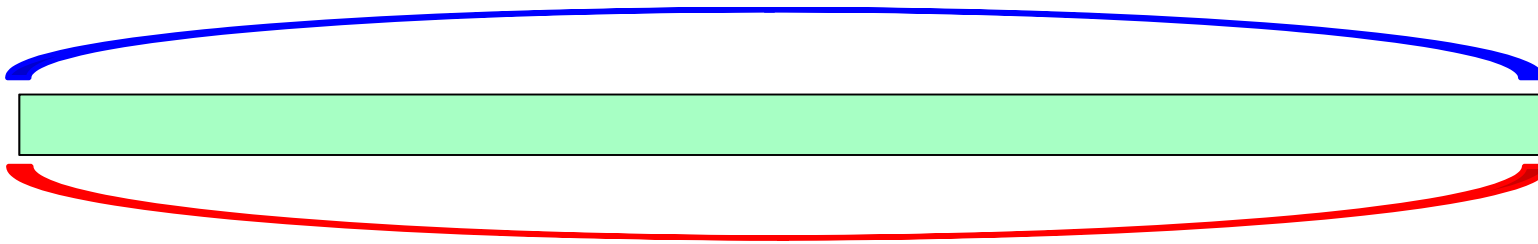
- a) lighter than this
- b) heavier than this

'Why do you think the value of money isn't linked to it's mass?'

Converting measures

How could you convert grams into kilograms?
How could you convert kilograms into grams?

1 kg



1000 g

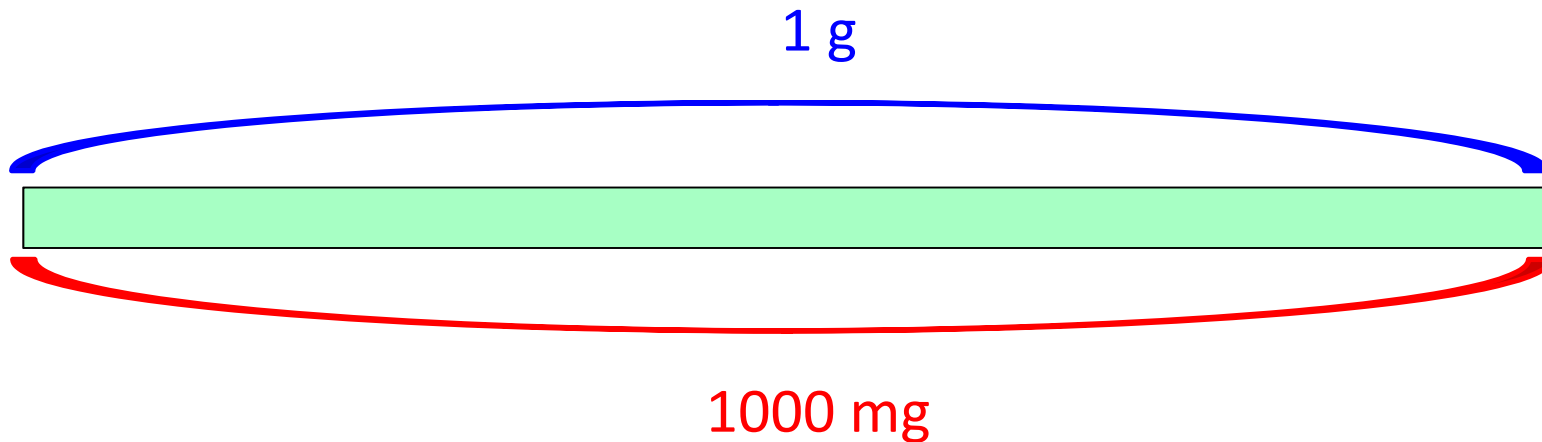
To convert _____ into _____ you need to _____ by _____.
I know this because there are _____ in one _____.

How many feathers of mass 10 mg do you need to make a cushion of mass 10 kg?



Converting measures

How could you convert milligrams into grams?
How could you convert grams into milligrams?



To convert _____ into _____ you need to _____ by _____.
I know this because there are _____ in one _____.

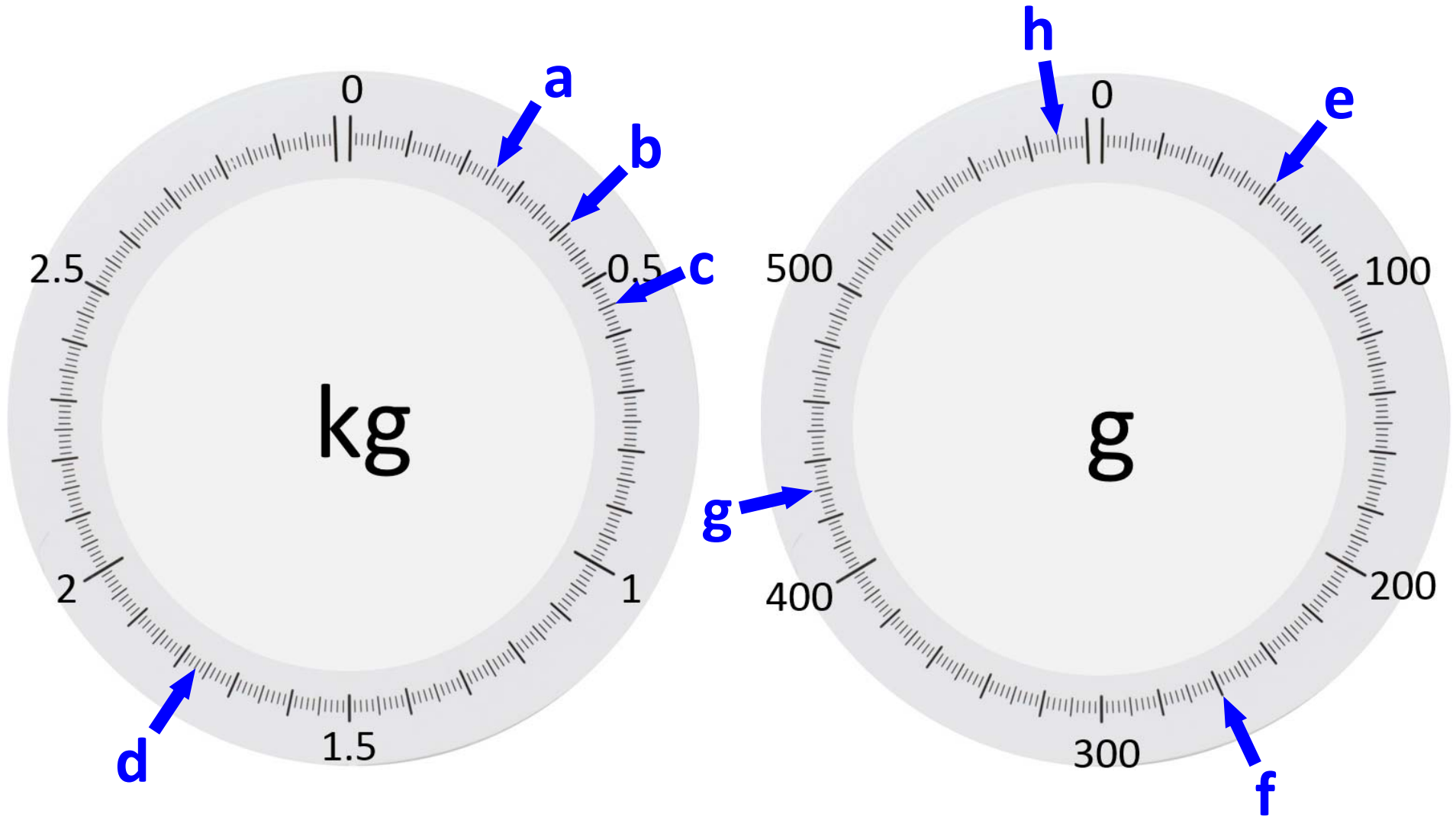
What would £1, 10 p
and 1 p weigh in
milligrams?



Reading scales



Determine each of these masses and put them in ascending order.



Which is greater?

Estimate these masses and decide which is greater.

The mass of food you eat in a month or the mass of an average Year 7 student.



The mass of a car or the mass of food eaten in your school each day.

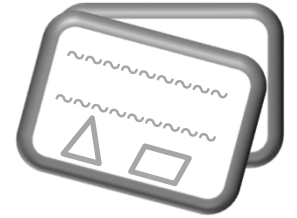
The mass of all the chairs in this classroom or the mass of ten desks.



Come up with your own 'which is greater' statements.



Plenary



True or false:

1000 grams = 10 kilograms

1500 grams = 1.5 kilograms

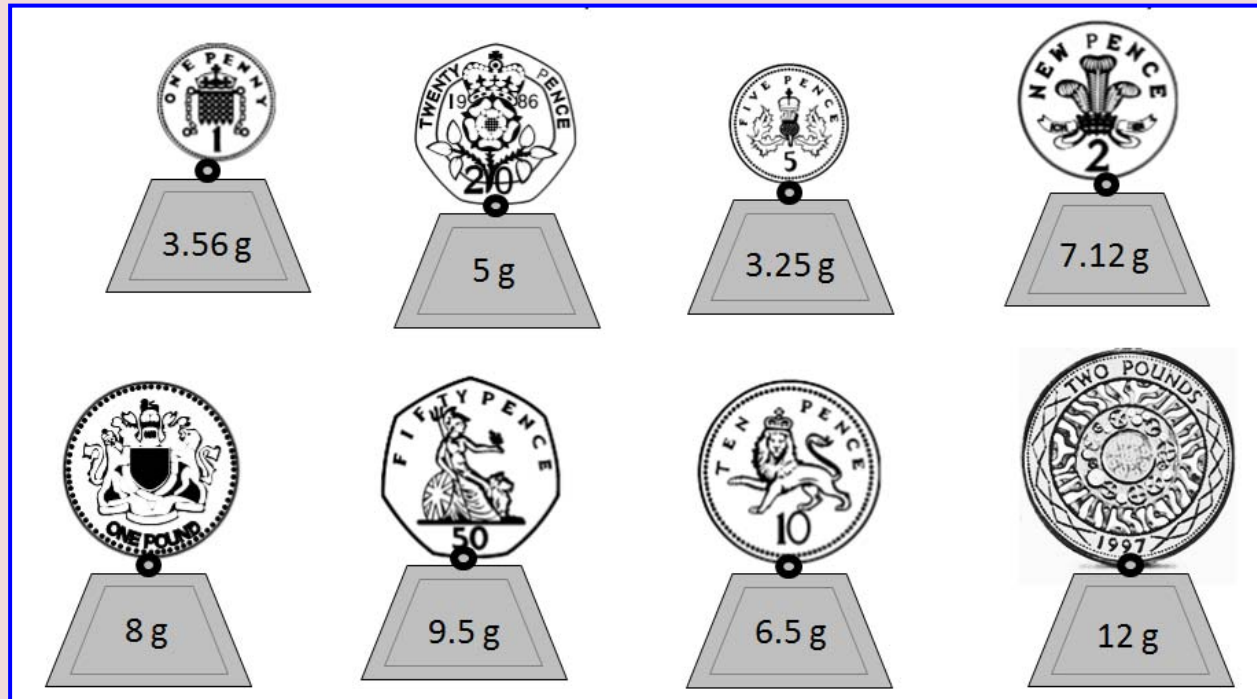
100 milligrams = 0.1 grams

0.1 kilograms = 100 000 milligrams

Can you make up your own true or false statements?



Challenge Extra



What sum of coins would give a total mass of 1 kg? Is there more than one answer?

How could you make a mass of 1 kg if:

- You have to use more than 125 coins
- You have to use more than 200 coins
- You had to use the most / fewest coins possible
- You had to make the highest / lowest total value

Thursday, 04 June 2020

Lesson 4

Using units of volume and capacity

Key learning

Compare and order units of measure

Interpret the meanings of words

Represent relationships between units using bar models

Convert between units of liquid volume



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Do Now

Sort these cards into pairs.

centi

$\times 10$

milli

tenth

kilo

deca

thousandth

deci

 micro

hundredth

$\times 1000$

What is a hectare? How is it linked to a hectometre?



Liquid measures



How much liquid do you estimate each container can hold?

Can you state your estimates in decilitres and kilolitres?



Liquid measures



500 ml



375 ml



1 litre



330 ml



250 ml



125 ml



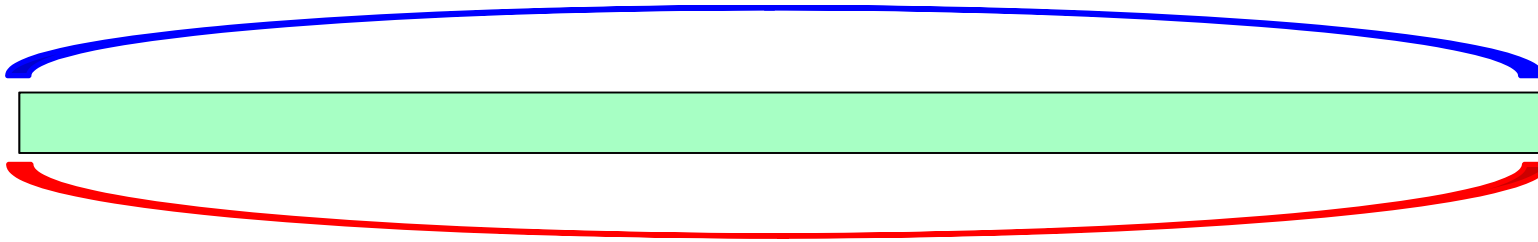
750 ml

How close were your estimates?

Converting measures

How could you convert litres into millilitres?
How could you convert millilitres into litres?

1 litre



1000 ml

To convert _____ into _____ you need to _____ by _____.
I know this because there are _____ in one _____.

Which is greater:
100 x 0.03 litres or 1000 x 30 millilitres?

Converting measures

How many litres are there in:

12 345 ml

2 345 ml

345 ml

45ml

How many millilitres are there in:

1.23 litres

0.123 litres

0.0123 litres

0.00123 litres

How many decilitres do you think there are in 100 kilolitres?

Can you explain your answer?

Volume vs capacity

The capacity of the bottle is 500 ml.

That means the volume of water is 500 ml.

I don't think that sounds correct.



Estimate the **volume** of water in the bottle.

What is the difference between the **volume** of water and **capacity** of the bottle?

Create your own definitions for '**capacity**' and '**volume**'.

Volume or capacity

Complete the statements using '**volume**' and '**capacity**'.

The _____ of tea left in the pot is approximately 200 ml

Buckets have a greater _____ than teacups.

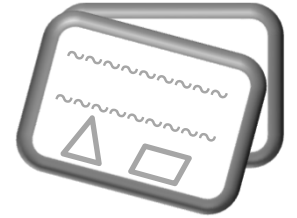
The _____ of water I drink in a day is more than 2 litres.

The _____ of the cola can is 330 ml

The maximum _____ of liquid you can fit in the bottle is 500 ml.
That is the _____ of the bottle.

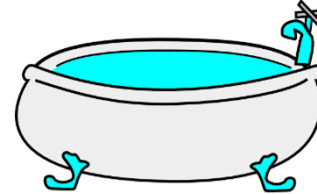
I wish the _____ of my water bottle was greater. The _____ left in there is only 150 ml.

Which is greater?



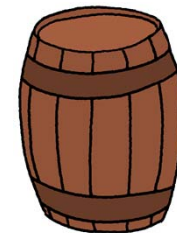
Estimate these volumes and capacities and decide which is greater.

The volume of water you drink in a month or the capacity of a bath tub



The capacity of a bucket or the volume of water used in an average shower.

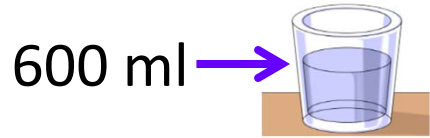
The volume of fizzy drinks this class drinks in one month or the capacity of a barrel.



Come up with your own 'which is greater' statements.

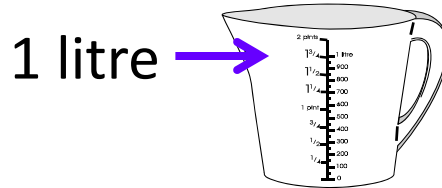


Splish, Splash, Splosh



600 ml

12 splishes



1 litre

4 splashes



3.75 litres

3 sploshes

Which is the largest measure - a splish, a splash or a splosh?

How many splishes make a splash?

How many splashes make a splosh?

How many splishes make a splosh?

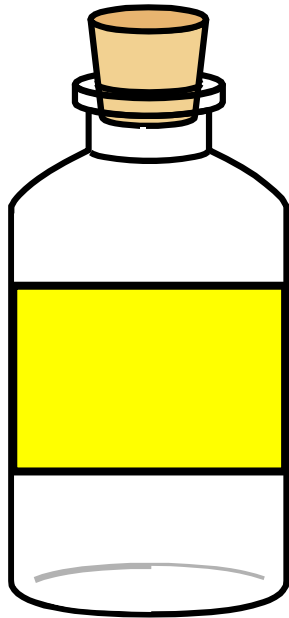
How could you label a 2.5 litre bottle of squash in splish, splash and splosh units? How many ways can you find?

Two and a half litres

1 Splish = _____ ml

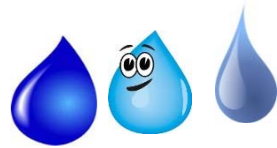
1 Splash = _____ ml

1 Splosh = _____ litres



The bottle has a capacity of 2.5 litres.
What should the label say in splishes, splashes and sploshes?

Can you find a way of labelling it using a combination of splishes, splashes and sploshes?



Splish, Splash, Splosh

1 splish = 50 ml

1 splash = 250 ml

1 splosh = 1.25 litres



500 ml



375 ml



1 litre



330 ml



250 ml



125 ml



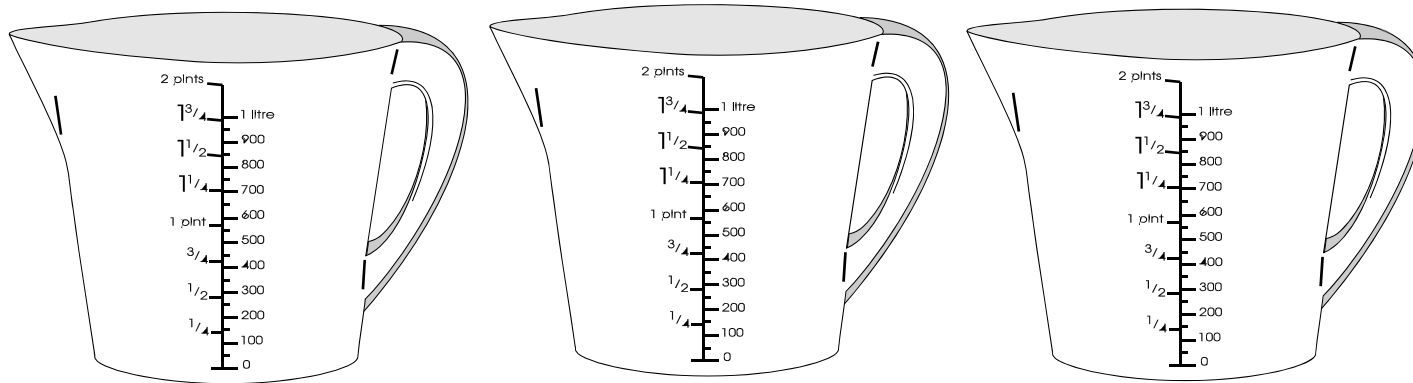
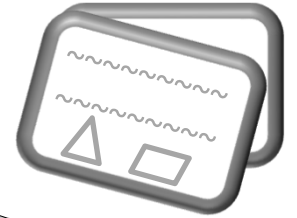
750 ml

What would appropriate labels be for these containers be in the units splish, splash, splosh?

What is the same or different about your answers?
Which splish, splash or splosh label do you think is best? Why?



Filling containers



Mari pours 1 litre of water into 3 containers.

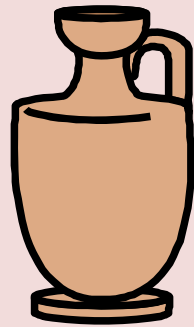
How much water could be in each container (in ml)?

How could you write these measures in litres?

Can you write these in decilitres and kilolitres?



Challenge Extra



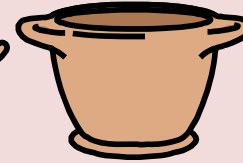
9 litres



7 litres



2 litres



4 litres

A 9 litre jug is full of water.
I have three cups which can hold 7 litres, 2 litres and 4 litres respectively.

Find a way to pour water from the jug between the cups so that I end up with exactly 3 litres in three of the vessels.

Is there more than one way?

Thursday, 04 June 2020

Lesson 5

Estimating with mixed measures

Key learning

Compare and order measurements

Estimate measurements

Convert between units of measure


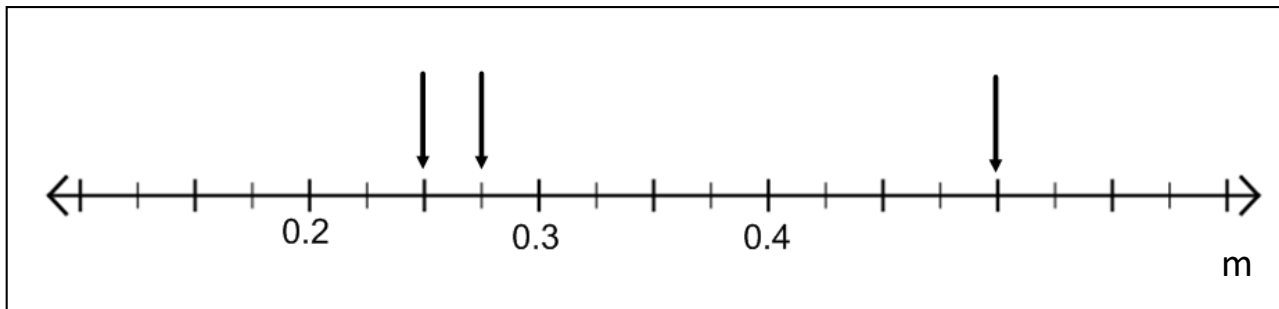
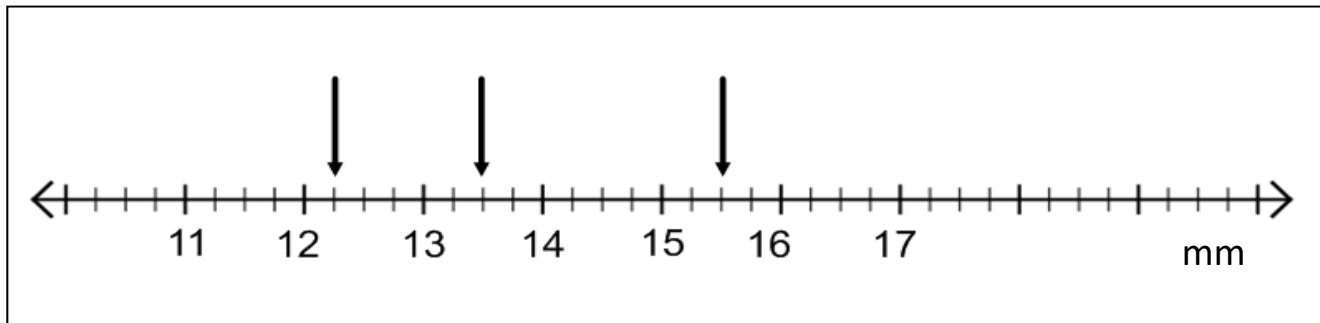
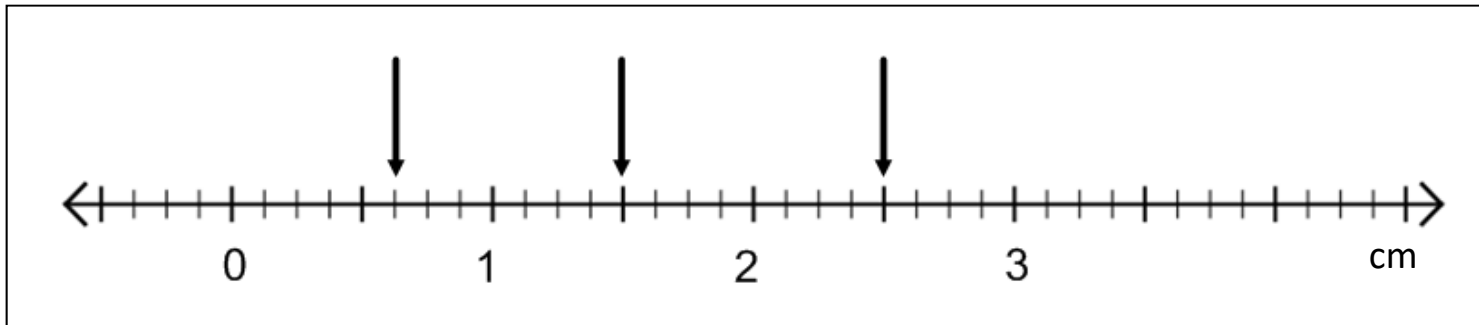


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Do Now

On each scale, determine what number the arrow is pointing to.

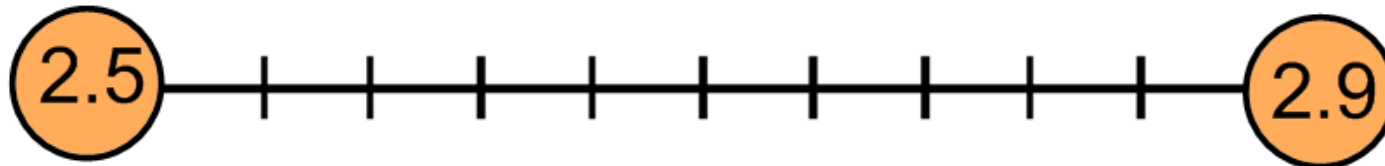
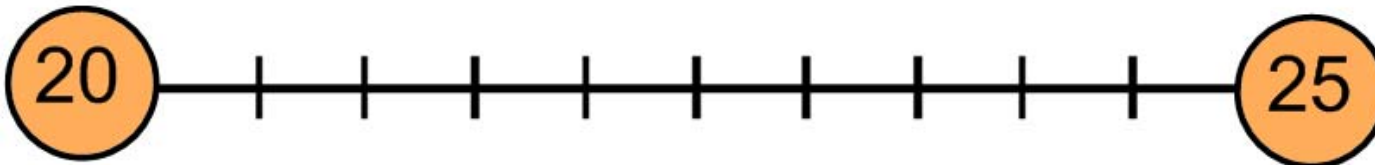
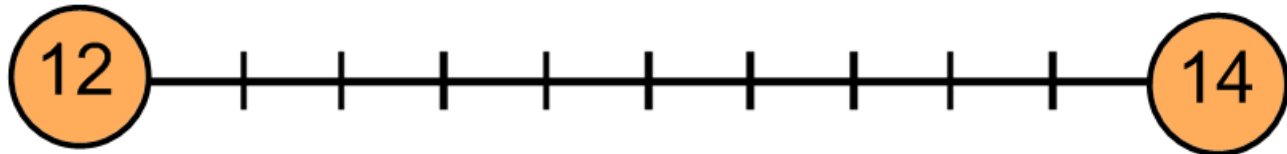
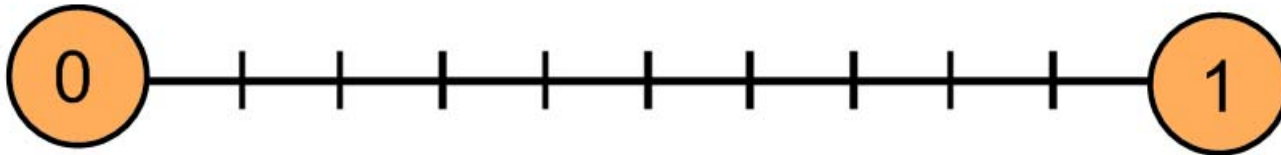


Convert your answers all into:

- Metres
- Centimetres
- Millimetres

Complete the scales (1)

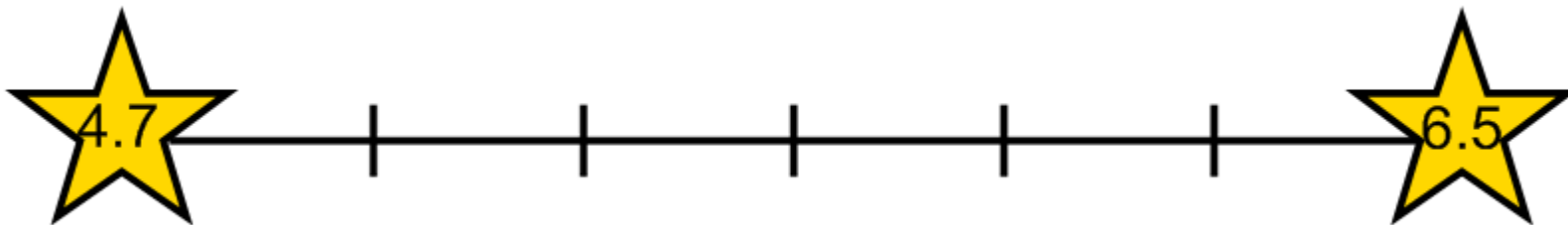
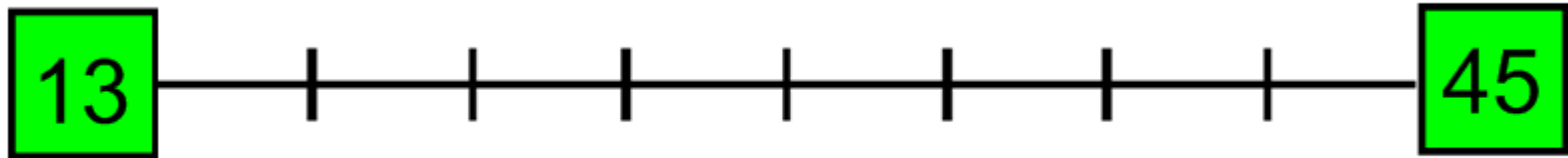
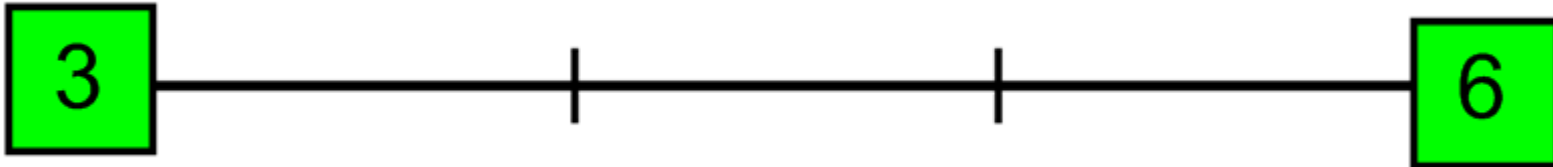
Complete each scale with the missing numbers



Complete the scales (2)

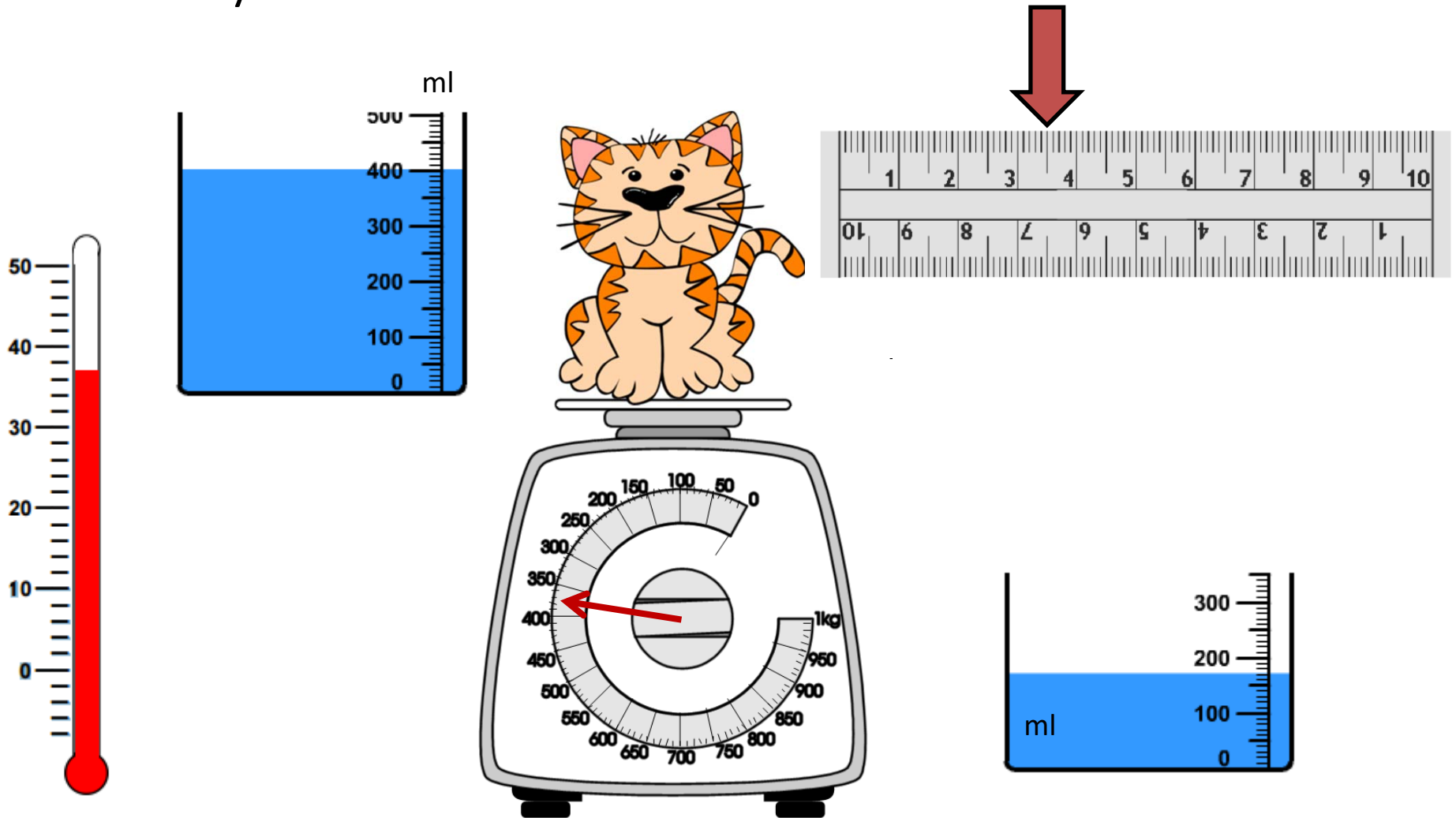


Complete each scale with the missing numbers

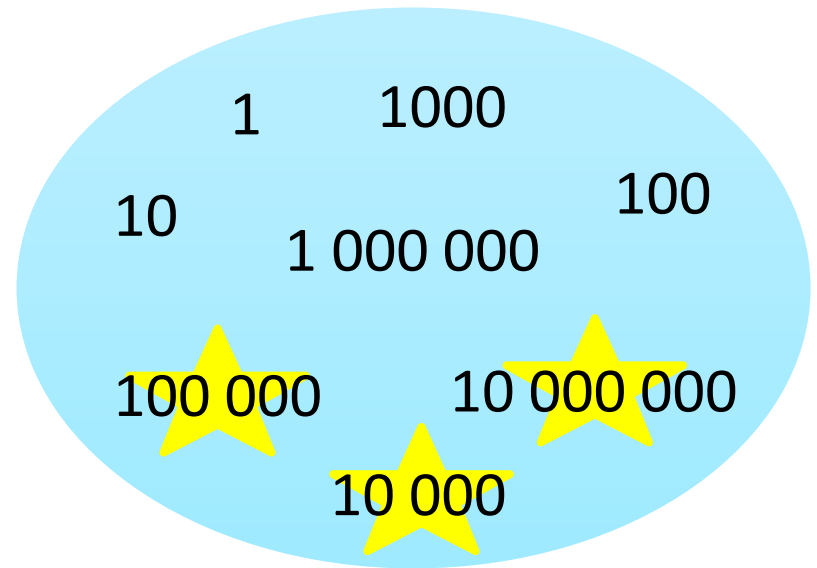
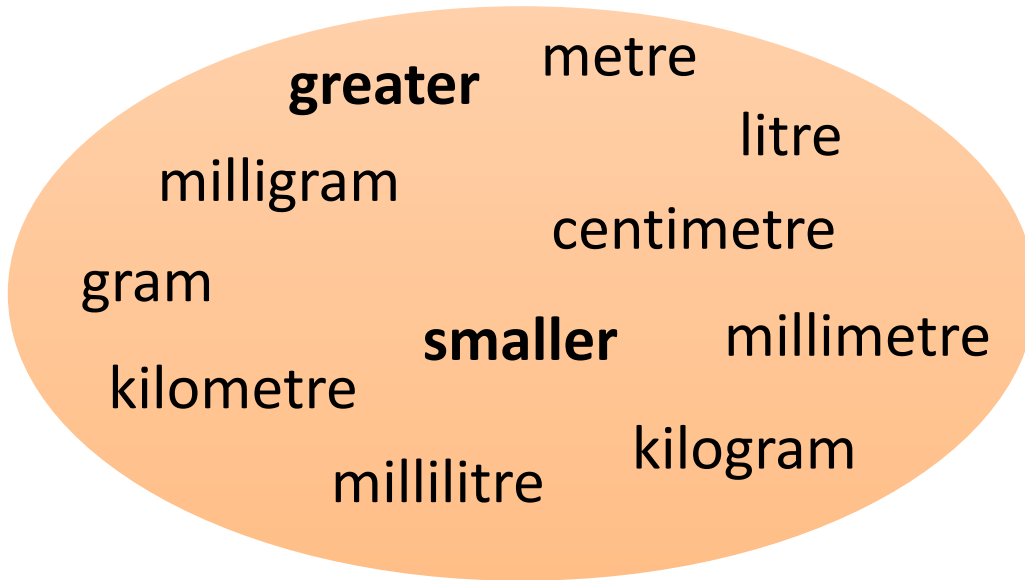


Real life scales

Read off each of the measurements. Don't forget to give the units for your answer.



Worded measures



is times than

Fill the boxes with numbers and words to complete the sentence above in as many ways as possible. An example has been done for you below.

is times than

Is there a pattern between the prefixes **milli**, **centi**, and **kilo**.



Record Measures

Match up the numbers and units to the World Records listed.

Tallest dog (height)

Smallest horse (mass)

Largest egg (mass)

Shortest stuntman (height)

Largest cookie (mass)

Largest bubble gum bubble (width)

Largest ant colony (length)

Largest swimming pool (capacity)

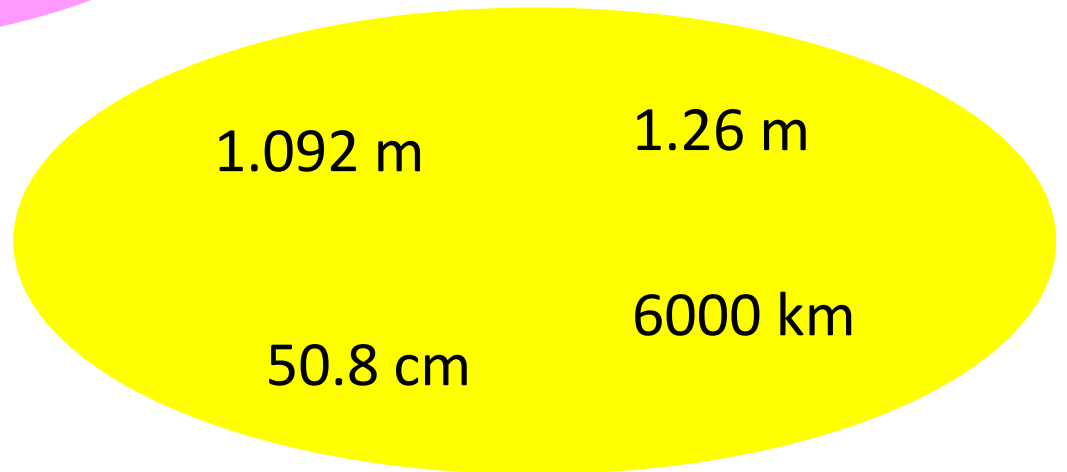
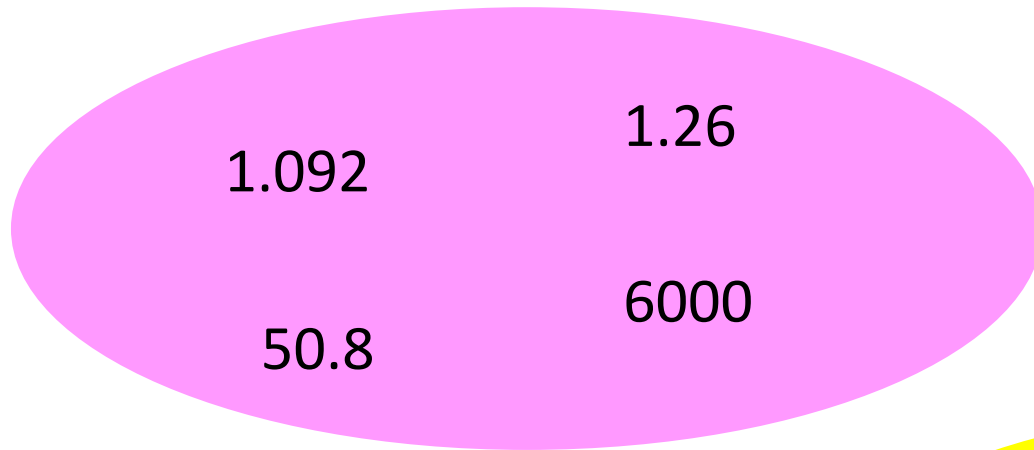
1.092 2.589 18 100
2.7 300 000 000
50.8 1.26 6000

kg km kg
m
litres
cm kg m

Teacher note: Deleting the guidance in brackets can make this activity far more challenging.

Same or different?

Compare how you would put the numbers in the pink and yellow groups in ascending order.



Record measures

Estimate these record measures.

What comparisons is it possible to make from this list?

Tallest dog (height)

Smallest horse (mass)

Largest egg (mass)

Shortest stuntman (height)

Largest cookie (mass)

Largest bubble gum bubble (width)

Largest ant colony (length)

Largest swimming pool (capacity)

X

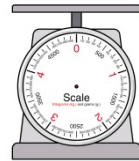


What is the order?



Research these lists and put them in ascending order.

Mass



- Of a standard family car
- Of a million millilitres of water
- Of a team of international male rugby players (15 players)

Distance



- You can hop in 5 seconds
- A car can drive on 1 ml of fuel (hint: cars can travel approximately 15 km per litre of fuel)
- The distance from the penalty spot to the goal on a football field

Number of



- Chocolate bars with the same total weight as your class
- Steps when walking at a leisurely pace for 1 hour
- People at a cup final in a large stadium

Volume of water



- Used in a 10 minute shower
- Used in 5 dishwasher cycles
- Used to flush the toilet 20 times

Can you add to these lists?



Approximate measures



Natalia eats a 30g pack of crisps every break time.
She estimates she eats 11 kg of crisps a year.

<http://nrich.maths.org/7418>

Do you think Natalia's estimate is reasonable? Can you explain why?

Come up with your own estimates for the ideas below?

How many litres of water does an average person drink in their lifetime?

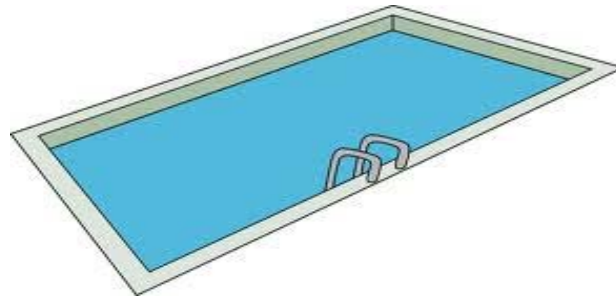
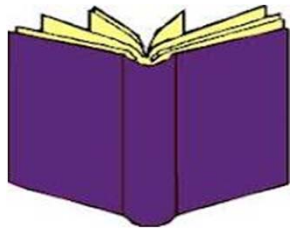
How far does an ant walk in a day?

What mass of sugar do the staff at school use in teas and coffees each term?

Think of some other **measures** like these to estimate.

500

Which of the following could have a length, mass or capacity of 500?
Use any units of measure you like in your answers.



Additional slides

These slides can be adapted and used to provide:

- Depth
- Scaffolding
- Further practice



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