

Measures

Key NC Statement

Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate

Convert between miles and kilometres

Related NC Statements

- multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places

Key Concepts

Throughout years 3, 4 and 5, pupils have explored measures including converting between metric units. This knowledge may need to be checked and recapped briefly to ensure fluency and accuracy, for example ensuring pupils remember quickly and accurately that $100\text{cm} = 1\text{m}$ and $1000\text{ml} = 1\text{L}$.

Pupils have already explored multiplying and dividing numbers by 10, 100 and 1000 in 6LS2 and will have used this skill to complete basic conversions ($1.45\text{m} = \square \text{cm}$). The focus there was on simple conversion, rather than problem solving or application. The Year 4 sequence (4LS10) and Year 5 sequence (5LS19) include some helpful teaching ideas for pupils who are not yet secure with converting measures.

This sequence starts with a recap using all their prior knowledge, to check that this is secure and can be retrieved quickly. This is then applied to problems involving measures with more than one step.

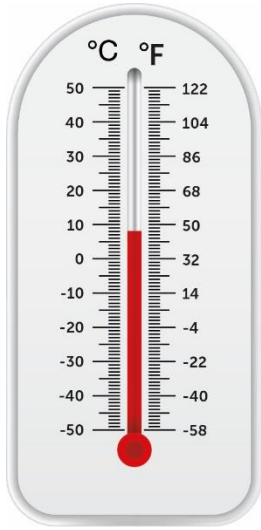
The final part of the sequence explores the link between miles and kilometres, looking at metric and imperial units of length.

Steps within the Learning Sequence

Step 1: Clarify what is known about measures and converting them

Step 2: Apply knowledge of measures and conversions to solving problems

Step 3: Explore the link between miles and kilometres (imperial and metric units of length)

Destination Questions 		
1  Mina says $2005\text{ml} = 2.05\text{L}$ Is she correct? Explain how you know.	2  Spot and correct the mistake: $0.3\text{cm} = 0.003\text{m}$ $1.05\text{kg} = 105\text{g}$ $210\text{ minutes} = 3\frac{1}{2}\text{ hours}$	3  A bag of flour holds 1.5kg. Each week Mike bakes a batch of cupcakes, using 200g of flour. How many weeks will the bag last? Does this use all of the flour, or will there be some left over?
4  If we know: $5\text{ miles} \approx 8\text{ km}$, then complete the gaps: miles $\approx 24\text{km}$ $25\text{ miles} \approx$ km miles $\approx 4\text{ km}$	5  It takes Sam 2 hours to drive 80km. What was his average speed in km/h? What would this be in miles per hour?	6  The thermometer shows temperatures in both $^{\circ}\text{C}$ and $^{\circ}\text{F}$.  Use the scales: What is 10°C in $^{\circ}\text{F}$? What is 15°C in $^{\circ}\text{F}$?

Step one

Clarify what is known about measures and converting them

Display a series of measures such as: 2L, 0.5kg, 3 hours, 2.65m.

They all measure different things and are therefore measured in different units.

What do you know about these measures?

Which is length, mass, volume, time?

What is the base fact for each? (e.g. $1\text{m} = 100\text{cm}$)

What might be an appropriate piece of equipment to measure each of these amounts?

Metric measures have conversions linked to 10, 100 or 1000. Non-metric units often don't. Which one of these is not a metric measure?

Draw out core knowledge that pupils should have already secured and check that there are no gaps or misconceptions at this stage.

Create a prompt sheet (for example on flipchart paper for the working wall), providing helpful base facts ($1000\text{ml} = 1\text{L}$) and key terms (volume). This can scaffold the first step, but explain that pupils will need to remember these. Most pupils should already be able to recall these.

Provide a new set of similar measures, such as; 305ml, 2400g, 45mm, 4 hours.

What conversion calculation did you need to carry out?

How many other ways can you write each of these? (By making conversions)

Encourage pupils to explain how to make the conversion:

To convert from ____ to ____ you need to...

If pupils need further practise to rehearse these sorts of conversions, then allow time for this.

For pupils finding this tricky, 4LS10 and 5LS19 provide some helpful teaching points and scaffolds.

1 

2 

When exploring destination questions 1 and 2, encourage clarity and precision in pupils' reasoning.

2005ml is made up of 2000ml and 5ml. $2000\text{ml} = 2\text{litres}$. $5\text{ml} = 0.005\text{L}$ not 0.05L .
The conversion should read $2005\text{ml} = 2.005\text{L}$, not 2.05L .

Step two

Apply knowledge of measures and conversions to solving problems

In this step, pupils use knowledge of measures and conversions to solve problems.

3 

How would you approach this problem?

*A bag of flour holds 1.5kg. Each week Mike bakes a batch of cupcakes, using 200g of flour.
How many weeks will the bag last? Does this use all of the flour, or will there be some left over?*

Model solving destination question 3 and answering both parts of the question. Clarify that, in these types of problems, there will often be a conversion and a further step.

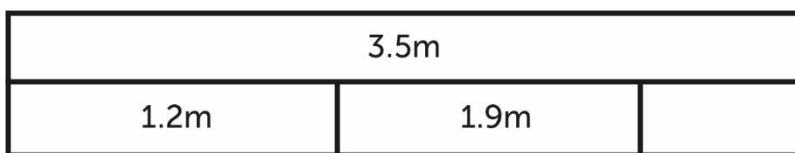
What was the conversion required?

What was the other step or steps?

Explore a further problem:

*Adam is measuring the furniture along one wall of his bedroom, to see if a new bookcase will fit.
The wall is 3.5m long. His chest of drawers is 1.2m and the bed is 1.9m long.
If the bookcase is 60cm, will it fit along the same wall?*

This is a problem in which bar modelling might help. Ask pupils to try using this, if it is helpful. Model that you can't note the 60cm on the bar model yet, as you don't know if it will fit.



Use handout_6LS26_step 2_measures_problems to provide pupils with practise in solving problems.

The first three questions are similar to those modelled above. Questions 4 - 6 have additional steps or conversions required. Some problems have a bar model indicated, if this strategy might support unpicking the problem.

Activities for exploring ideas at greater depth

Harry is making popcorn to sell for charity.

The corn to pop costs £1.20 per 500g. Sugar for the topping costs 60p per 500g. 20 plastic bags to put the popcorn in costs £2.20.

He uses 4 kg of corn and 500g of sugar to make 60 bags full of popcorn.

1. Calculate the total cost to make all 60 bags of popcorn.
2. How much does this work out per bag?
3. If he sells the bags for £1 each, how much **profit** will be made to give to charity?

BUFFER ZONE

Step three

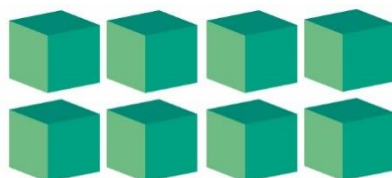
Explore the link between miles and kilometres (imperial and metric units of length)

Clarify that our system for measuring now uses largely metric units. Some imperial units remain such as miles, for talking about distance or speed. The approximate conversion is $5 \text{ miles} \approx 8 \text{ km}$. Use different coloured cubes to show this relationship.



5 miles

≈



8 km

If we know this, what else do we know?

Challenge pupils to generate as many related facts as they can in 2 minutes.

I know 10 miles ≈ 16 km.

I know 20 miles ≈ 32 km.

Explore the calculation you would need to convert from one measure to the other.

If you know 10 miles ≈ 16km, would miles $\times 1.6 \approx \text{km}$?

For the facts already gathered, calculate or use a calculator to test if this works.

For example, 20 miles ≈ 32. So is $20 \times 1.6 = 32$?

Explore what the conversion calculation would be to convert from km into miles. Provide pupils with time and a calculator to test ideas, before agreeing that $\text{km} \div 1.6 \approx \text{miles}$ would be a sensible inverse. Practise a few calculations, if pupils need this.

To convert from ___ to ___ you need to...

What would 12 miles be in km?

Set pupils the following challenges:

- We talk about speed in either miles per hour (mph) or kilometres per hour (km/h). If you are allowed to travel at up to 30 mph on normal roads with street lighting, and 70 mph on the motorway.
- What would these be in km/h?
- In Germany, the speed limit on most motorways is 130 km/h. Which is faster 70 mph or 130 km/h? Explain how you know.



Note: Destination question 6 refers to units of temperature, but relies on reading a simple scale.

Activities for exploring ideas at greater depth

Another common approximate conversion is cm and inches. $1 \text{ inch} \approx 2.5 \text{ cm}$ (2.54cm).

Create a list of facts you now know and a way of converting from one to the other easily.

What would you multiply or divide by to convert from inches to cm and vice versa?