

S3.4

Working with measures

objectives

- Use standard units of mass and capacity.
- Suggest suitable units and equipment to estimate and measure mass and capacity.
- Read and interpret scales on a range of measuring instruments.
- Solve problems involving measures.

starter

Vocabulary

units of measurement
metric
imperial
capacity

Resources

OHT S3.4a
one pint milk bottle full
of water
one empty litre
measuring jug or
cylinder
some kilogram and half
kilogram weights
one or more 1 lb
weights (or 1 lb of
dried beans in a
polythene bag)
mini-whiteboards

Show **OHT S3.4a**. Explain that these are all units of measurement.

Q Which of the units are used to measure liquid?

Say that when we measure the space taken up by liquid or air in a container we are measuring the *capacity* of the container. Establish that litres, millilitres, pints and gallons are all units of capacity. Litres and millilitres are part of the *metric* system. Pints and gallons are part of the *imperial* system. Imperial measures are still used in some circumstances: for example, milk is sold in pints as well as litres and half litres. Hold up the litre jug and the pint bottle.

Q Which is more, a litre or a pint?

Pour the water from the pint bottle into the litre jug to show the class that a pint is a more than half a litre but less than one litre. One litre is about one pint plus three quarters of a pint, or $1\frac{3}{4}$ pints.

Tell the class that an ordinary kitchen bucket holds about 2 gallons. Hold up the litre jug and ask:

Q Roughly how many jugs full of water would fill a kitchen bucket?

Establish that an ordinary kitchen bucket would hold about 9 to 10 litres.

Q How many millilitres are there in one litre? (1000) In half a litre? (500) In one tenth of a litre? (100) In one quarter of a litre? (250)

Write on the board: 1 litre = 1000 millilitres. Remind the class of the abbreviations for litres and millilitres (l and ml). Ask pupils to write estimates on their whiteboards.

Q Roughly, what is the capacity in millilitres of a coffee mug? (250 to 300ml) Of an egg cup? (50ml) Of a teaspoon? (5ml)

Repeat the above with units of mass, referring again to **OHT S3.4a**.

Q Which of these units are used to measure weight? (metric: kilogram, gram; imperial: pound, ounce)

Pass a kilogram weight around the class so that pupils can feel how heavy it is.

Q How many grams are there in one kilogram? (1000) In half a kilogram? (500) In one tenth of a kilogram? (100)

Write on the board: 1 kilogram = 1000 grams, pointing out that the abbreviation for kilograms is kg, and for grams is g.

Q Which weighs more, half a kilogram or a pound?

Invite one or two pupils to compare the 1 lb weight with the 500g weight. Tell the class that a pound is just less than half a kilogram (so that a kilogram is just over 2 pounds), and an ounce is about 30 grams.

Ask pupils to write some estimates on their whiteboards.

**Q Roughly, what is the average weight of newborn baby? (3 to 4 kg)
Of a large loaf of bread? (800g) Of an apple? (150 to 200g)**

End the starter by asking:

Q What metric units of length do you know? (kilometres, metres, centimetres, millimetres) Imperial units? (miles, possibly feet and inches)

Q Which is longer, one kilometre or one mile? (a kilometre lies between half a mile and one mile, but is closer to half a mile)

Q How many metres in a kilometre? (1000) How many millimetres in a centimetre? (10) In a metre? (1000)

Write on the board: 1 metre = 100 centimetres = 1000 millimetres and
1 kilometre = 1000 metres.

Q Roughly, what is the height of the classroom door? (2m) The length of a piece of A4 paper? (30cm) The width of the palm of your hand? (10cm)

main activity

Vocabulary

weighing scale
interval
convert

Resources

OHTs S3.4b, S3.4c
ITPs *Weighing scales*
and *Measuring cylinder* (optional)

If you wish, introduce the main activity by using the ITP *Weighing scales*, downloaded from www.standards.dfes.gov.uk/numeracy. Choose a target to reach on the scales. Invite pupils to add the weights to the pan. Observe how the pointer moves on the scale and the decimal reading.

Prepare **OHT S3.4b** and cut out the pointer so that you can position it on the scale. Show this OHT, saying that it represents a weighing scale. Write 0 at the '12 o'clock' position and 140kg in the box. Place the pointer on the scale pointing at 0. Explain that the pointer points to 0 when there is nothing on the scale and rotates clockwise. Rotate the pointer so that it points to the first division on the scale.

Q What does this mark represent?

Take responses (e.g. 30kg). Move round the scale, counting in 30s, until you reach the box. If the count results in anything other than 140kg, it is obviously incorrect. Establish that each interval represents 20kg, since there are seven intervals, and $7 \times 20 = 140$. Repeat the count from zero, this time counting in 20s.

Rotate the pointer to different positions on the scale, such as 46kg. Ask pupils to estimate the weight by first stating the interval that contains the weight (for example: 'The weight lies between 40 and 60kg, but is nearer to 40kg than to 60kg. My estimate is 45kg.')

Repeat the above by writing 35kg, then 700g, in the box.

Show **OHT S3.4c**, and work through the two problems with the class. Remind pupils of the relationship 1 litre = 1000 millilitres, referring to it on the board.

In the first problem, stress that the empty container is marked in litres. There are two ways of tackling the problem. They can either convert each of the first two readings

in millilitres to litres, then add them together, or they can add the readings in millilitres to find the total, then convert the total in millilitres to litres.

In the second problem, ask:

Q What do the labels of 500 really mean? (500ml and 1500ml)

Q What does each interval represent? (100 millilitres or $\frac{1}{10}$ of a litre)

Stress that the answer needs to be given in millilitres.

You could if you wish supplement the main activity by using the ITP *Measuring cylinder*.

other tasks

Springboard 7 Unit 11

Unit 11 section 1: Mass

2 Grams and kilograms

page 366

Star challenge 2: The metal button appeal

page 367

Star challenge 3: In order of weight

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Unit 11 section 2: Units of mass

Star challenge 5: Metric and imperial equivalent weights

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Star challenge 6: Meet the heavyweights

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Unit 11 section 3: Capacity

1 Metric units of capacity

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3 Capacity problems

page 376

Star challenge 7: What would you use to measure ...?

page 377

plenary

Resources OHT S3.4d

Remind the class of the relationships written on the board:

1 litre = 1000 millilitres

1 kilogram = 1000 grams

1 kilometre = 1000 metres

1 metre = 1000 millimetres

Q What is one quarter of a litre in millilitres? Half a kilogram in grams? Three quarters of a metre in millimetres?

Q What is 500 metres in kilometres? 1250 grams in kilograms? 4750 millilitres in litres?

Display **OHT S3.4d**. Explain that the first panel shows a recipe to make one fruit cake. Ask:

Q What do we have to do to solve the problem? (multiply each quantity by 10)

Invite different pupils to complete the lines of the table, stressing that each quantity has to be expressed in grams and in kilograms.

Remember

- The metric system uses multiples of 10, 100 and 1000.
- *Kilo* means 1000, *centi* means one hundredth, and *milli* means one thousandth.
- One kilogram is just over 2 pounds (2 lb). One litre is about $1\frac{3}{4}$ pints. One kilometre is just over half a mile ($\frac{5}{8}$ of a mile).

litre

kilogram

pint

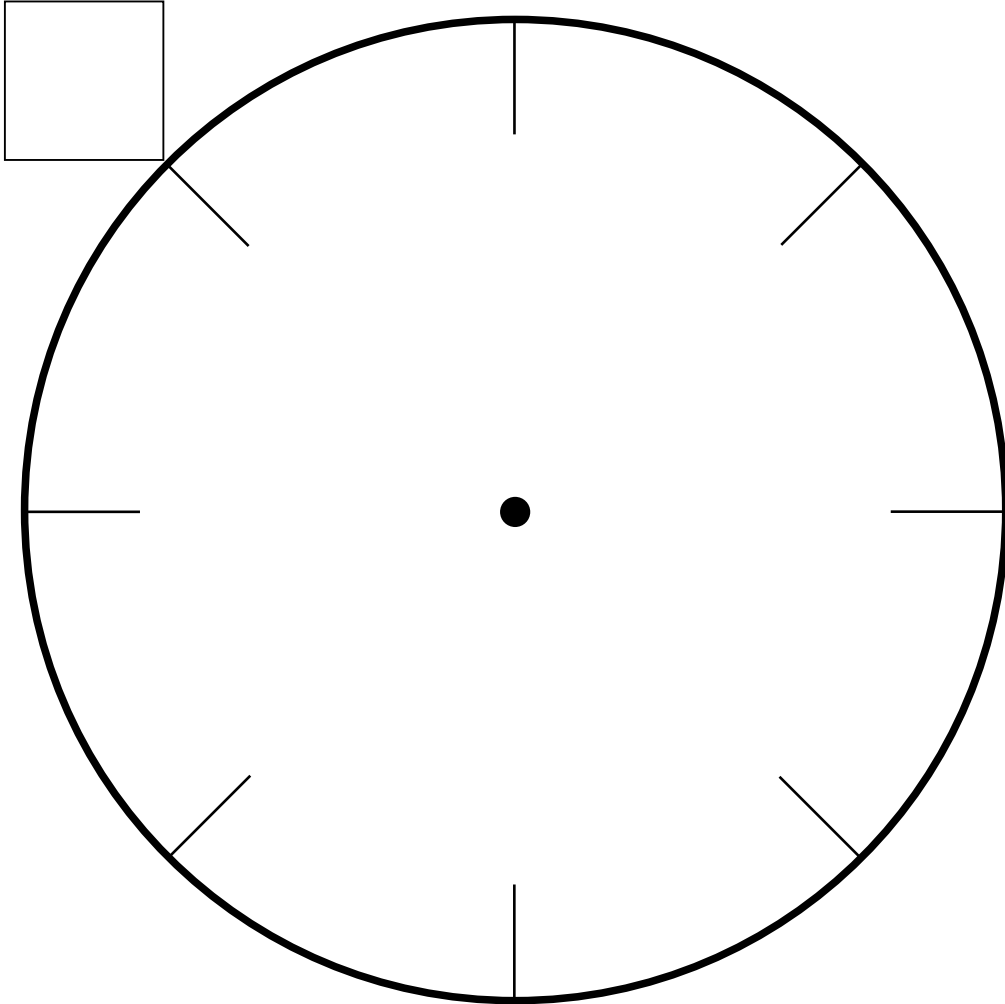
millilitre

pound (lb)

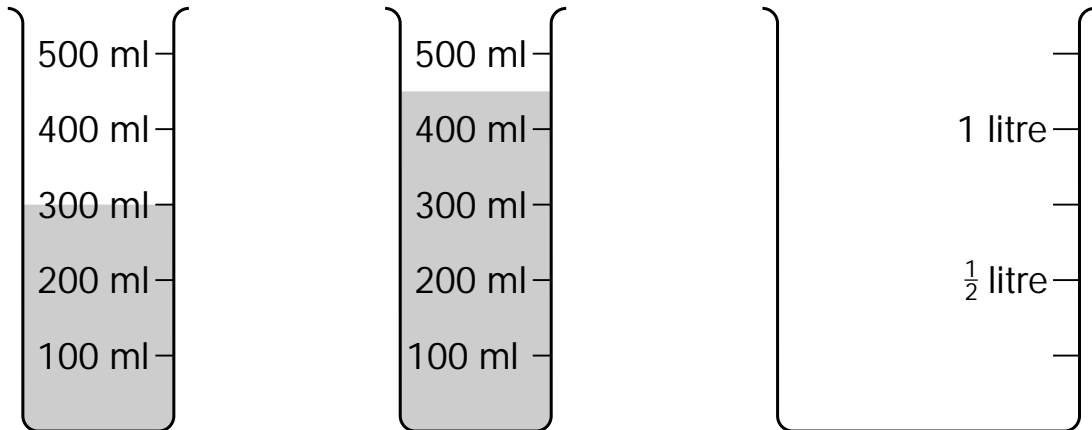
gallon

gram

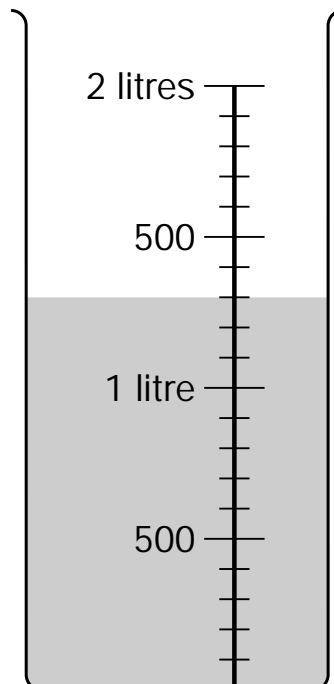
ounce (oz)



All the water in the two jars is poured into the empty jar.
Draw the water level in the empty jar.



There is some water in the measuring jar. How much more water is needed to make 2 litres? ml



Here are the ingredients for one fruit cake.

1 fruit cake

200 g	self-raising flour
100 g	caster sugar
150 g	margarine
125 g	mixed fruit
3	eggs

Complete the table to show how much you need in grams and in kilograms to make 10 fruit cakes.

10 fruit cakes

.....2000 g	= kg	self-raising flour
..... g	= kg	caster sugar
..... g	= kg	margarine
..... g	= kg	mixed fruit
30			eggs