White Rose Maths

Spring - Block 4

Converting Units

Overview

Small Steps

1. Metric measures
2. Convert metric measures
3. Calculate with metric measures
4. Miles and kilometres
5. Imperial measures

NC Objectives

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

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 3 dp.

Convert between miles and kilometres.

Metric Measures

Notes and Guidance

Children read, write and recognise all metric measures for length, mass and capacity. They may need to be reminded the difference between capacity (the amount an object can contain) and volume (the amount actually in an object).

They develop their estimation skills in context and decide when it is appropriate to use different metric units of measure.

Mathematical Talk

Which units measure length? Mass? Capacity?

When would you use km instead of m? When would you use mm instead of cm?

Which is the most appropriate unit to use to measure the object? Explain your answer.

Why do you think _____ is not an appropriate estimate?

Varied Fluency

Choose the unit of measure that would be the most appropriate to measure the items.

cm kg km g tonnes ml mm litres

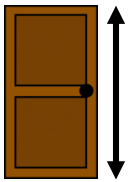
- The weight of an elephant
- The volume of water in a bath
- The length of an ant
- The length of a football pitch
- The weight of an apple

Estimate how much juice the glass holds:

250 ml 2 litres 0.5 litres $\frac{1}{2}$ kg

Estimate the height of the door frame:

20 mm 20 cm 20 m 2 km 2 m 0.2 km

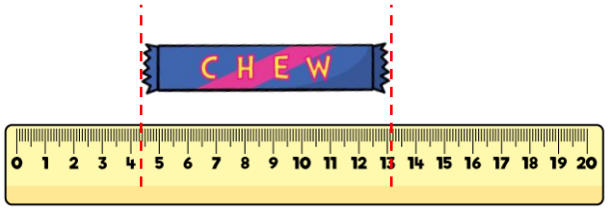


Metric Measures

Reasoning and Problem Solving

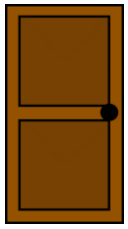
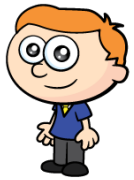
Teddy thinks his chew bar is 13.2 cm long.

Do you agree? Explain why.



Teddy is wrong because he has not lined up the end of his chew bar with zero.
It is actually 8.8 cm long.

Ron's dog is about $\frac{1}{4}$ of the height of the door.
Ron is three times the height of his dog.
Estimate the height of Ron and his dog.

Door = 2 m (200 cm)
Dog = 50 cm
Ron = 150 cm

Here is a train timetable showing the times of trains travelling from Halifax to Leeds.

Halifax	Leeds
07:33	08:09
07:49	08:37
07:52	08:51

An announcement states all trains will arrive $\frac{3}{4}$ of an hour late.
Which train will arrive in Leeds closest to 09:07?

The first train from Halifax, which will now arrive in Leeds at 08:54.

Convert Metric Measures

Notes and Guidance

Children will use their skills of multiplying and dividing by 10, 100 and 1,000 when converting between units of length, mass and capacity.
Children will convert in both directions e.g. m to cm and cm to m. Using metre sticks and other scales will support this step.
They will need to understand the role of zero as a place holder when performing some calculations, as questions will involve varied numbers of decimal places.

Mathematical Talk

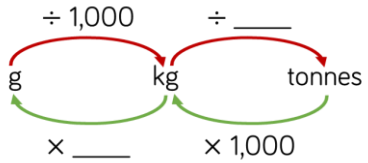
How could you work out what each mark is worth on the scales?
What do you think would be the most efficient method for converting the units of time?
What's the same and what's different between 1.5 km and 1.500 km? Are the zeroes needed? Why or why not?
What do you notice about the amounts in the table? Can you spot a pattern?
What's the same and what's different about km and kg?

Varied Fluency

There are ___ grams in one kilogram.

There are ___ kilograms in one tonne.

Use these facts to complete the tables.



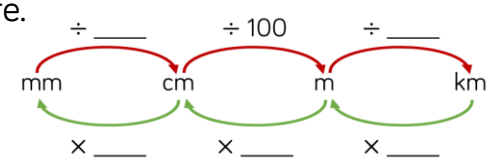
g	kg
1,500	
	2.05
1,005	

kg	tonnes
1,202	
	4.004
125	

There are ___ mm in one centimetre.

There are ___ cm in one metre.

There are ___ m in one kilometre.



Use these facts to complete the table.

mm	cm	m	km
44,000			
	2,780		
		15.5	
			1.75

Convert Metric Measures

Reasoning and Problem Solving

Mo thinks that 12,000 g is greater than 20 kg because 12,000 > 20

Explain why Mo is wrong.

12,000 g = 12 kg, which is less than 20 kg.

Put these capacities in order, starting with the smallest.

3 litres	3,500 ml
0.4 litres	0.035 litres
450 ml	330 ml

0.035 litres
330 ml
0.4 litres
450 ml
3 litres
3,500 ml

A shop sells one-litre bottles of water for 99p each.

300 ml bottles of water are on offer at 8 bottles for £2

Whitney wants to buy 12 litres of water. Find the cheapest way she can do this.

£11.88 to buy 12 one-litre bottles.

12 litres = 40 bottles of size 300 ml.
40 ÷ 8 = 5 so this will cost
5 × 2 = £10
Whitney should buy 40 bottles of 300 ml.

Calculate with Metric Measures

Notes and Guidance

Children use and apply their conversion skills to solve measurement problems in context.

Teachers should model the use of pictorial representations, such as bar models, to represent the problem and help them decide which operation to use.

Mathematical Talk

What operation are you going to use and why?

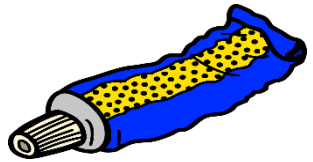
How could you use a bar model to help you understand the question?

How many ___ are there in a ___?

How can we convert between ___ and ___?

Varied Fluency

- A tube of toothpaste holds 75 ml.



How many tubes can be filled using 3 litres of toothpaste?

- A parcel weighs 439 grams. How much would 27 parcels weigh? Give your answer in kilograms.

- To bake buns for a party, Ron used these ingredients:

600 g caster sugar
0.6 kg butter
18 eggs (792 g)
$\frac{3}{4}$ kg self-raising flour
10 g baking powder

What is the total mass of the ingredients?
Give your answer in kilograms.

Calculate with Metric Measures

Reasoning and Problem Solving

Jack, Alex and Amir jumped a total of 12.69 m in a long jump competition.

Alex jumped exactly 200 cm further than Jack.

Amir jumped exactly 2,000 mm further than Alex.

What distance did they all jump?

Give your answers in metres.

Jack jumped 2.23 m.
Alex jumped 4.23 m.
Amir jumped 6.23 m.

Dora made a stack of her magazines.
Each magazine on the pile is 2.5 mm thick.
The total height of the stack is 11.5 cm high.
How many magazines does she have in her pile?

There are 46 magazines in Dora's pile.

Each nail weighs 3.85 grams.

There are 24 nails in a packet.

What would be the total mass of 60 packets of nails? Give your answer in kilograms.

5.544 kg

How many packets would you need if you wanted $\frac{1}{2}$ kg of nails?

6 packets

(554.4 g)

How many grams of nails would be left over?

55.4 g left over

Miles and Kilometres

Notes and Guidance

Children need to know that 5 miles is approximately equal to 8 km. They should use this fact to find approximate conversions from miles to km and from km to miles.

They should be taught the meaning of the symbol '≈' as "is approximately equal to".

Mathematical Talk

Give an example of a length you would measure in miles or km.

If we know 5 miles ≈ 8 km, how can we work out 15 miles converted to km?

Can you think of a situation where you may need to convert between miles and kilometres?

Varied Fluency

5 miles ≈ 8 kilometres

Use this fact to complete:

- 15 miles ≈ _____ km
- 30 miles ≈ _____ km
- _____ miles ≈ 160 km

If 10 miles is approximately 16 km, 1 mile is approximately how many kilometres?

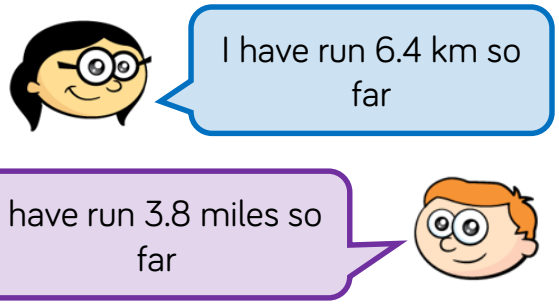
- 2 miles ≈ _____ km
- 4 miles ≈ _____ km
- 0.5 miles ≈ _____ km

In the United Kingdom, the maximum speed on a motorway is 70 miles per hour (mph).
In France, the maximum speed on a motorway is 130 kilometres per hour (km/h).
Which country has the higher speed limit, and by how much? Give your answer in both units.

Miles and Kilometres

Reasoning and Problem Solving

Ron and Annie are running a 5 mile race.



Who has the furthest left to run?

Annie has 1 mile left to run, whereas Ron has 1.2 miles left to run.
Ron has the furthest left to run.

The distance between Cardiff and London is 240 km.

A car is travelling at 60 mph.

How long will it take them to get to London from Cardiff?

240 km ≈ 150 miles
$150 \div 60 = 2\frac{1}{2}$ hours
Or
60 miles ≈ 96 km
$240 \div 96 = 2\frac{1}{2}$ hours

Mo cycles 45 miles over the course of 3 days.

On day 1, he cycles 16 km.

On day 2, he cycles 10 miles further than he did on day 1

How far does he cycle on day 3?

Give your answer in miles and in kilometres.

On day 1 he cycles 16 km / 10 miles.

On day 2 he cycles 32 km / 20 miles.

On day 3 he cycles 24 km / 15 miles.

Imperial Measures

Notes and Guidance

Children need to know and use the following facts:

- 1 foot is equal to 12 inches
- 1 pound is equal to 16 ounces
- 1 stone is equal to 14 pounds
- 1 gallon is equal to 8 pints
- 1 inch is approximately 2.5 cm

They should use these to perform related conversions, both within imperial measures and between imperial and metric.

Mathematical Talk

Put these in order of size: 1 cm, 1 mm, 1 inch, 1 foot, 1 metre. How do you know?

When do we use imperial measures instead of metric measures?

Why are metric measures easier to convert than imperial measures?

Varied Fluency

2.5 cm ≈ 1 inch

1 foot = 12 inches

Use these facts to complete:

2 feet = ___ inches

___ feet = 36 inches

6 inches ≈ ___ cm

4 feet ≈ ___ cm

1 pound (lb) = 16 ounces

1 stone = 14 pounds (lbs)

Use this fact to complete:

2 lbs = ___ ounces

___ lbs = 320 ounces

5 stone = ___ lbs

___ stones = 154 lbs

1 gallon = 8 pints

- How many gallons are equivalent to 64 pints?
- How many pints are equivalent to 15 gallons?
- How many gallons are equivalent to 2 pints?

Imperial Measures

Reasoning and Problem Solving

Jack is 6 foot 2 inches tall.

Rosie is 162 cm tall.

Who is taller and by how much?

Jack is 185 cm tall, he is 23 cm taller than Rosie.

60 gallons of water are drunk at a sports day.

Each child drank 3 pints.

How many children were at the sports day?

60 gallons = 480 pints
480 ÷ 3 = 160 children

Eva wants to make a cake.

Here are some of the ingredients she needs:

- 8 ounces of caster sugar
- 6 ounces of self-raising flour
- 6 ounces of butter

This is what Eva has in her cupboards:

- 0.5 lbs of caster sugar
- 0.25 lbs of self-raising flour
- $\frac{3}{8}$ lbs of butter

Does Eva have enough ingredients to bake the cake?
If not, how much more does she need to buy?

Eva has the exact amount of butter and caster sugar, but does not have enough self-raising flour – she needs another 2 ounces.