

Mass –Tonnes, Net, Gross.

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Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

MASS –TONNES, NET, GROSS.

EXPLICIT TEACHING PLAN OVERVIEW PAGE

THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: LANDSCAPE BROCHURE WITH ITEMS FOR SALE IN TONNES, FOODS LABELLED WITH NET MASS, PENCIL, PAPER

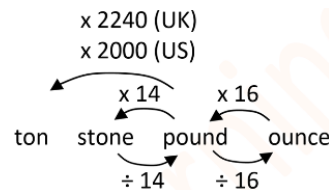
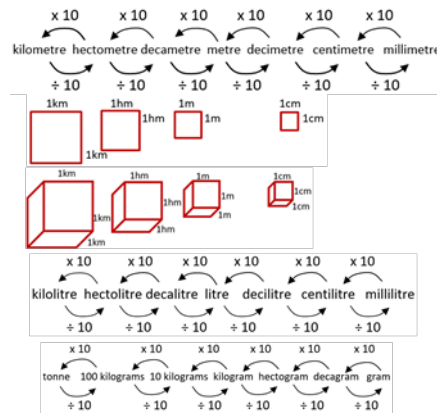
WHAT COULD WE DO?

Children:

- review metric length, area, volume and capacity and mass units, for example,
- extend mass to tonnes, for example,
- convert between kilograms and tonnes, for example, 4 tonnes, 500 kilograms = $4\frac{1}{2}$ tonnes
 $250 \text{ kilograms} = \frac{1}{4} \text{ tonne}$
 $1150 \text{ kilograms} = 1 \text{ tonne and } 150 \text{ kilograms}$

- explain net and gross mass, for example,
 Mass of can of spaghetti = 230 grams
 Mass of spaghetti = 130 grams
 Gross mass = 230 grams
 Net mass = 130 grams
 difference between gross and net mass = 100 grams
 Mass of can = 100 grams

- investigate imperial system units of mass, for example,



WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children

- ask one another questions about mass, for example:
 - what is mass?
 - how are metric length, liquid volume and capacity, and mass units based on multiplicative place value?
 - how can we convert between kilograms and tonnes?
 - how many grams / kilograms in a tonne?
 - what fraction of a tonne is 500 / 250 / 750 kilograms?
- how could we measure the mass of a can of spaghetti?
- how could we measure the mass of the spaghetti?
- what is the net / gross mass?
- what is the mass of the can?
- what is the Imperial system's units of measurement for mass?

MASS – TONNES, NET, GROSS.

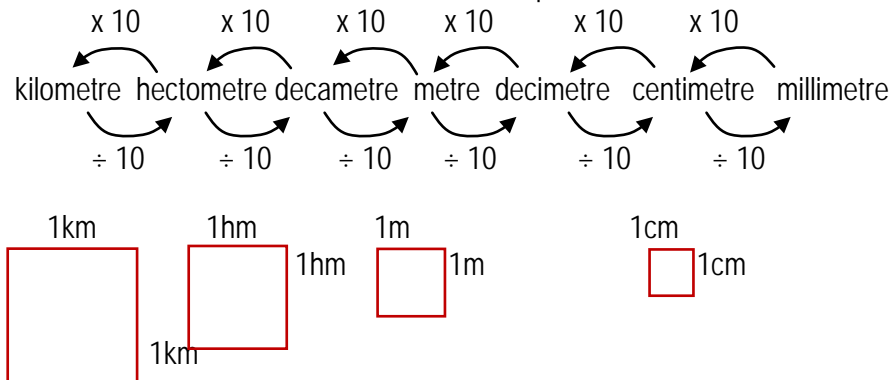
EXPLICIT TEACHING PLAN

FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

WHAT COULD WE DO?

Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Display a metric measurement chart with representations of millimetres, centimetres, metres and kilometres, for example,



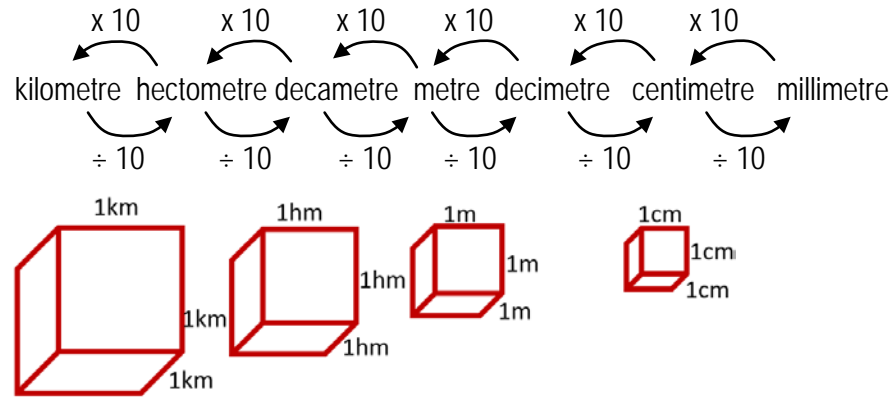
WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

- ▶ Today brings an investigation mass.
- ▶ What do you know about mass?
- ▶ Talk about mass with a friend.
- ▶ Is anyone ready to share what they are thinking about mass?

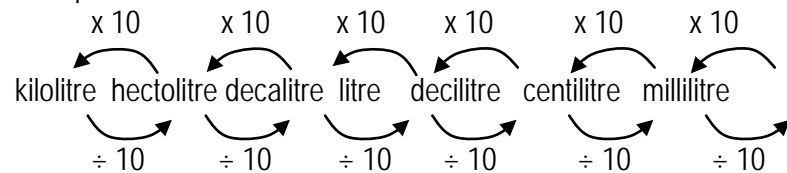
- ▶ We've investigated mass.
- ▶ And we found that we cannot see mass.
- ▶ We found that mass is how heavy or light an object is.
- ▶ We've investigated measuring the mass of objects using metric units of measurement on a set of scales.
- ▶ We found that the metric measurement system is based on multiplicative place value.
- ▶ To measure length, we've investigated metres, decimetres, centimetres and millimetres, and decametres, hectometres and kilometres.

- ▶ We've investigated length units being turned into squares by adding a second dimension, to measure area.

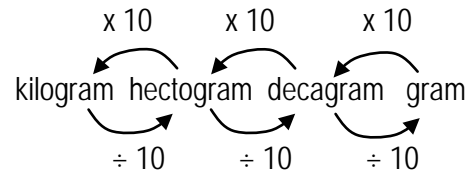
Record a representation of centimetres, metres, hectometres and kilometres as cubes, for example,



Display a metric measurement chart with representations of liquid units, for example,



Display a metric measurement chart with representations of mass units, for example,



► And we've investigated turning length and area units into cubes by adding a third dimension, to measure volume and capacity.

► We found that cubes are great to measure 3 dimensions of an object or container with faces and edges.

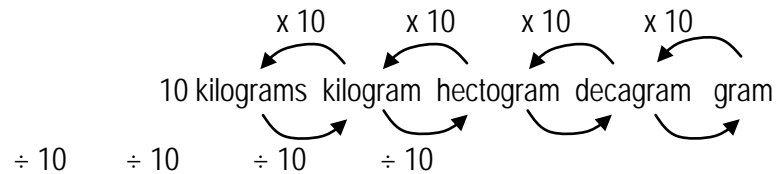
► But to measure volume and capacity of an object with curved surfaces, we found units of measurement of water are used.

► To measure volume and capacity, we've investigated litres, decilitres, centilitres and millilitres, and decalitres, hectolitres and kilolitres.

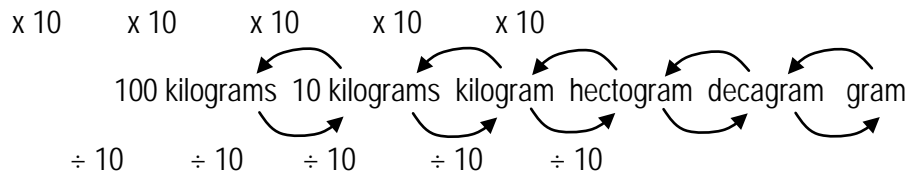
► And to measure mass, we've investigated grams, decagrams, hectograms and kilograms.

► **Today we're going to investigate what units of measurement we**

Record an arrow with 'x 10' going to the left of the 'kilogram' and '10 kilograms' at the end of the arrow, and an arrow going to the right and $\div 10$ below it, for example,



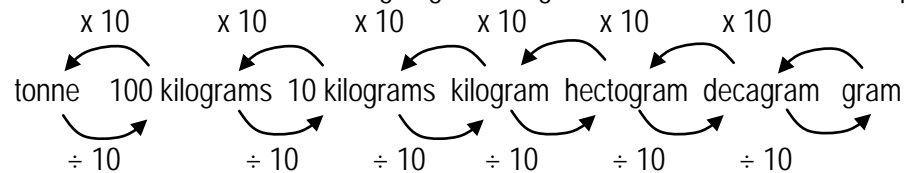
Record an arrow with 'x 10' going to the left of the 'kilogram' and '10 kilograms' at the end of the arrow, and an arrow going to the right and $\div 10$ below it, for example,



could use to measure the mass of really heavy objects.

- ▶ If we want to measure the mass of objects that are heavier than a kilogram, could we make a unit of measurement that is 10 times heavier than a kilogram?
 - ▶ Could we multiply the kilogram by 10?
 - ▶ If we multiply the kilogram by 10 will we have 10 kilograms?
 - ▶ We don't use a different prefix for 10 kilograms – we just say 10 kilograms.
 - ▶ If we divide 10 kilograms by 10, do we have a kilogram?
-
- ▶ If we want to measure the mass of something that is much heavier than 10 kilograms could we make a unit of measurement that is 10 times heavier than 10 kilograms?
 - ▶ Could we multiply 10 kilograms by 10?
 - ▶ If we multiply 10 kilograms by 10 will we have 100 kilograms?
 - ▶ We don't use a different prefix for 100 kilograms – we just say 100 kilograms.
 - ▶ If we divide 100 kilograms by 10, do we have 10 kilograms?
-
- ▶ If we want to measure the mass of something that is much heavier than 100 kilograms could we make a unit of measurement that is 10 times heavier than 100 kilograms?
 - ▶ Could we multiply 100 kilograms by 10?
 - ▶ If we multiply 100 kilograms by 10 will we have 1000 kilograms?
 - ▶ Is 1000 kilograms, 1000 times 1000 grams?

Record an arrow with 'x 10' going to the left of the 'kilogram' and '10 kilograms' at the end of the arrow, and an arrow going to the right and $\div 10$ below it, for example,



*Tonne is pronounced 'ton' rhyming with 'gone'
while ton is pronounced 'tun' rhyming with 'gun'.*

- ▶ Is 1000 times 1000, 1 million?
- ▶ Is 1000 kilograms, 1 million grams?
- ▶ Will we have a million grams?
- ▶ Does the prefix 'mega' mean million?
- ▶ Would 1000 kilograms be a megagram?
- ▶ We should call it a megagram, because it is one million grams.
- ▶ But instead we call it a tonne!
- ▶ In some places, they say this is a metric tonne.
- ▶ That's because we are using metric measurement to measure the mass of the tonne.
- ▶ The United States of America, who still use the Imperial system, measure mass in tons – which we will investigate a little later!
- ▶ A ton and a tonne are not the same mass!
- ▶ But a tonne is a million grams.
- ▶ Which of these units of measurement do we use in Australia?
- ▶ Do we use the gram, the kilogram and the tonne?

▶ **Now that we've investigated the units of measurement that we**

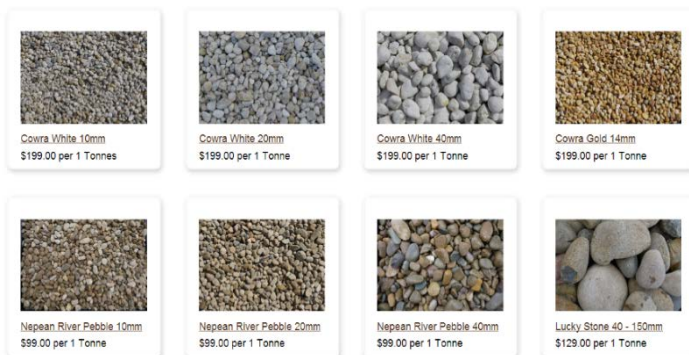
Record, for example, 4 tonnes, 500 kilograms

Record, for example 1 tonne = 1000 kilograms

Record, for example, 500 kilograms = $\frac{1}{2}$ tonne

Record, for example, 4 tonnes, 500 kilograms = $4\frac{1}{2}$ tonnes

Display an advertisement or brochure from a landscaping supp [for example,](#)



use to measure mass, let's investigate how we could measure mass using these units of measurement!

- ▶ Imagine we work in a zoo and we are weighing an elephant.
- ▶ And we find that the elephant weighs 4 tonnes and 500 kilograms.
- ▶ Let's record that the elephant weighs 4 tonnes and 500 kilograms.
- ▶ If a tonne is 1000 kilograms, what fraction of a tonne is a 500 kilograms?
- ▶ Is 500 kilograms, half a tonne?

- ▶ How could we record the mass of the elephant in tonnes and a fraction of a tonne?
- ▶ Could we record the mass of the elephant as 4 and half tonnes?
- ▶ If we don't work in a zoo, what might we want to know the mass of?

- ▶ Imagine we want to do some landscaping in our garden and we need some pebbles.
- ▶ Here is a brochure from a landscape business that sells pebbles.
- ▶ What unit of measurement do they use to use to sell their pebbles?
- ▶ Do they use tonnes?

- ▶ How many tonnes of pebbles shall we buy?

Record, for example, 2 tonnes

Record, for example, 1 tonne = 1000 kilograms

Record, for example, 2 tonnes = 2000 kilograms

Record, for example, 250 kilograms

Record, for example, 1000 kilograms = 1 tonne

Record, for example, 1 kilogram = $\frac{1}{1000}$ tonne

Record, for example, 250 kilograms = $\frac{250}{1000}$ tonne

Record, for example, $\frac{250}{1000} = \frac{1}{4}$

Record, for example, 250 kilograms = $\frac{1}{4}$ tonne

- ▶ Could we buy 2 tonnes of pebbles?
- ▶ If we buy 2 tonnes of pebbles, how many kilograms will that be?
- ▶ If 1 tonne is 1000 kilograms, will 2 tonnes be 2000 kilograms?

- ▶ Let's imagine that we want to buy 250 kilograms of the pebbles.
- ▶ What fraction of a tonne is 250 kilograms?
- ▶ If there are 1000 kilograms in a tonne, what fraction of a tonne is a kilogram?
- ▶ Is a kilogram, one-thousandth of a tonne?
- ▶ If one kilogram is one-thousandth of a tonne, what fraction of a tonne is 250 kilograms?
- ▶ Is 250 kilograms, 250 thousandths of a tonne?

- ▶ What fraction is equivalent to 250 thousandths?
- ▶ What is the relationship between the numerator and the denominator?
- ▶ Is 250 a quarter of 1000?
- ▶ Is the numerator a quarter of the denominator?
- ▶ Is 250 thousandths equivalent to a quarter?
- ▶ Is 250 kilograms, a quarter of a tonne?

- ▶ Let's imagine we want to buy 750 kilograms of Cowra Gold pebbles and 400

Record, for example, 750 kilograms and 400 kilograms

Record, for example, $750 + 400 = 1150$

Record, for example, 750 kilograms and 400 kilograms = 1150 kilograms

Record, for example, 1000 kilograms = 1 tonne

Record, for example, 1150 kilograms = 1 tonne and 150 kilograms

kilograms of Lucky Stones

- ▶ What will be the total mass?
- ▶ Could we add 750 kilograms and 400 kilograms?
- ▶ Does 750 and 400 equal 1150?
- ▶ Is the total mass 1150 kilograms?
- ▶ How could we record this mass in tonnes and kilograms?
- ▶ Are there 1000 kilograms in a tonne?
- ▶ If we have 1150 kilograms do we have 1 tonne plus some extra kilograms?
- ▶ Do we have an extra 150 kilograms?
- ▶ If we have 1150 kilograms do we have 1 tonne and 150 kilograms?

Distribute 130g cans of spaghetti to

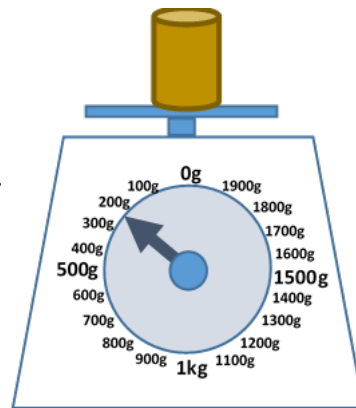
- ▶ **Have you ever looked closely at the labels on packaging?**



children, for example,
Children identify any Mathematical
information they can see on the can.

Point to '130g NET', for example,

Distribute sets of scales to children in pairs or groups.
Children measure the mass of the can of spaghetti,
for example,



Record, for example, Mass of can of spaghetti = 230 grams

- ▶ What mathematical information do you think the packaging might give us?
- ▶ Do you think the labels on the packaging might tell us the length of the item?
- ▶ Do you think the labels on the packaging might tell us the volume of the item?
- ▶ Do you think the labels on the packaging might tell us the mass of the item?
Let's investigate!

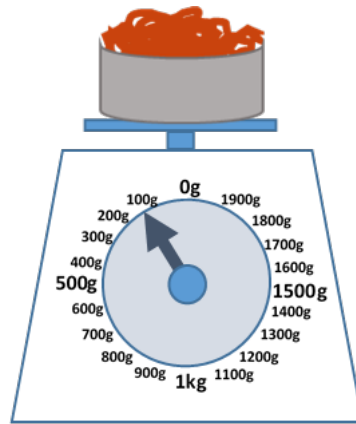
- ▶ Here we have a can of spaghetti
- ▶ What mathematical information can you see on the can?
- ▶ Can you see where it says '130g NET'?
- ▶ What do you think that might mean?
- ▶ Do you think it means the mass is 130 grams?

- ▶ But what mass is 130 grams – the can of spaghetti, or just the spaghetti?
- ▶ Let's investigate!
- ▶ Let's place the can of spaghetti onto the scales to measure its mass.
- ▶ Do you expect the mass to be 130 grams?
- ▶ What is the mass of the can of spaghetti?
- ▶ Is the mass of the can of spaghetti, 230 grams?
- ▶ Why does the label on the can say the mass is 130 grams, when the can of spaghetti has a mass of 230 grams?
- ▶ Does the 230 grams include the can as well as the spaghetti?
- ▶ Did we measure the mass of the can and the mass of the spaghetti?
- ▶ What word can you see after the 130 g on the label?
- ▶ Can you see the word 'net'?
- ▶ What do you think 'net' means in mass?

Place bowl on the scale and reset the scale to zero.

Open the can and measure the mass of the spaghetti, for example,

Mass of spaghetti = 130 grams



Record, for example, net = mass of the contents

Record, for example, gross = mass of the contents and the mass of the packaging

Record, for example, Gross mass = 230 grams

- ▶ When the mass says 'net', do you think it means the mass of the spaghetti and the can, or just the spaghetti?
- ▶ How could we check?
- ▶ Could we open the can and measure the mass of the spaghetti?
- ▶ Could we pour the spaghetti into a bowl?
- ▶ Shall we first place the bowl on the scale, then set the scale to zero first, so we are only measuring the mass of the spaghetti?
- ▶ Shall we then pour the spaghetti into the bowl?
- ▶ What is the mass of the spaghetti?
- ▶ Is the mass of the spaghetti, 130 grams?
- ▶ Is the mass of the spaghetti without the can, 130 grams?
- ▶ So what do you think the label '130 grams net' on the can means?
- ▶ Do you think '130 grams net' means the mass of the spaghetti without the mass of the can?
- ▶ Does net mean the mass of the contents without the mass of the packaging?
- ▶ If 'net' means just the mass of the contents, do you think there must be a word that means the mass of the contents and the mass of the packaging?
- ▶ The word 'gross' means the mass of the contents and the mass of the packaging.
- ▶ What is the gross mass of the can of spaghetti?
- ▶ Is the gross mass of the can of spaghetti, 230 grams?
- ▶ What is the net mass of the spaghetti?
- ▶ Is the net mass of the spaghetti, 130 grams?

Record, for example, Net mass = 130 grams

Record, for example, difference between gross and net mass = 100 grams

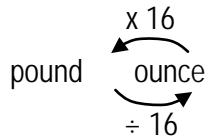
Record, for example, mass of can = 100 grams

- ▶ What is the difference between the gross mass and the net mass?
- ▶ Is the difference between the gross mass and the net mass, 100 grams?
- ▶ So what do you think is the mass of the can?
- ▶ Do you think the can has a mass of 100 grams?

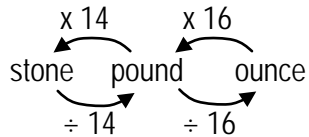
- ▶ Today we're going to investigate the units of measurement in the Imperial system for measuring mass.

Record, for example, ounce

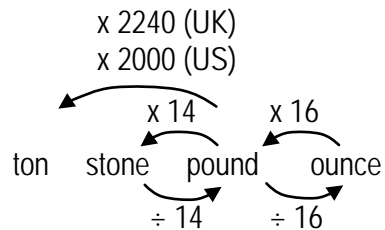
Record, for example,



Record, for example,



Record, for example,



Mass is often still measured in stone and pounds in the UK as they have only recently converted to the metric system. Tons are sometimes still used in the UK for the same reason. To convert from pounds to tons in the UK, they multiply by 2240! So a ton is a different mass in the UK and US.

- ▶ We can start with an ounce.
- ▶ An ounce is about 30 grams.
- ▶ To make a pound we multiply by 16.
- ▶ A person's weight is often recorded in pounds in the United States where they still use the imperial system.
- ▶ To make a stone, we multiply by 14.
- ▶ To make a ton, we multiply a pound by 2000 in the United States.
- ▶ A ton is different to tonne.
- ▶ A tonne is 1 million grams or 1000 kilograms.
- ▶ While a ton is 2000 pounds!

Pebbles



Cowra White 10mm
\$199.00 per 1 Tonnes



Cowra White 20mm
\$199.00 per 1 Tonne



Cowra White 40mm
\$199.00 per 1 Tonne



Cowra Gold 14mm
\$199.00 per 1 Tonne



Nepean River Pebble 10mm
\$99.00 per 1 Tonne



Nepean River Pebble 20mm
\$99.00 per 1 Tonne



Nepean River Pebble 40mm
\$99.00 per 1 Tonne



Lucky Stone 40 - 150mm
\$129.00 per 1 Tonne