

Metric Mass.

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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.

Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding.

Intervene

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

METRIC MASS.

EXPLICIT TEACHING PLAN OVERVIEW PAGE

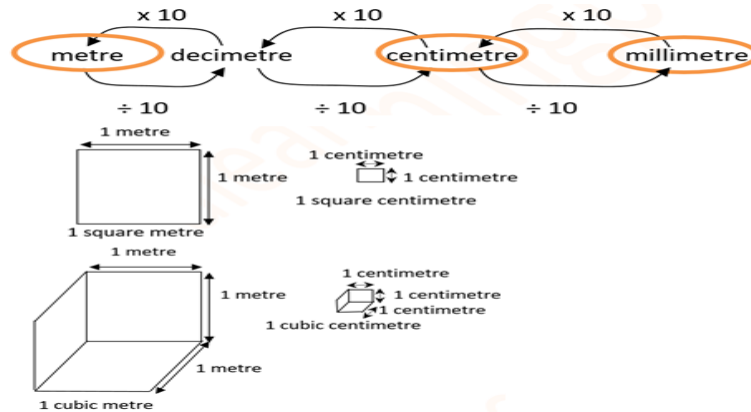
THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: EQUAL ARM BALANCE, OBJECTS TO MEASURE THE MASS OF, FORMAL UNITS OF MEASUREMENT – KILOGRAM WEIGHT AND GRAM WEIGHT, PENCIL, PAPER

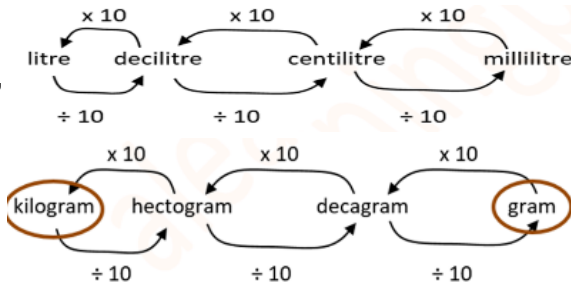
WHAT COULD WE DO?

Children:

- review metric length, area and volume units, for example,



- explain metric mass units, for example,



- measure mass as a mass of more than / a mass of less than / a mass of about a kilogram / gram, for example,

WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children

- ask one another questions about mass using metric units of measurement, for example:
 - ▶ what is mass?
 - ▶ how are metric length and liquid volume and capacity units based on multiplicative place value?
 - ▶ how are metric mass units based on multiplicative place value?
 - ▶ how could we measure mass in grams and kilograms on an equal arm balance?

METRIC MASS.

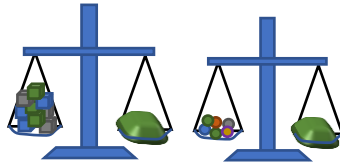
EXPLICIT TEACHING PLAN

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.

Measure the mass of an object, for example, a book, and some informal units of measurement of mass, for example, marbles and blocks using an equal arm balance, for example,



Record, for example, Mass of 1 book = 9 marbles or 7 blocks

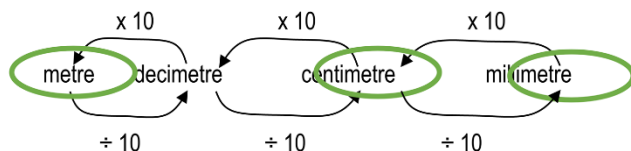
WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

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

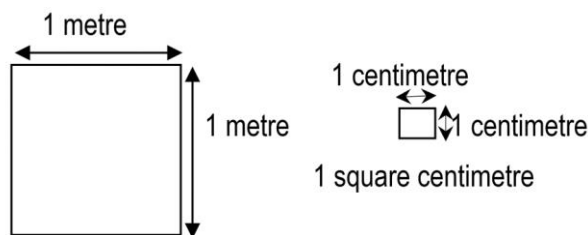
- ▶ We've investigated mass.
- ▶ And we found that we cannot see mass.
- ▶ We found that mass is how heavy or light an object is.
- ▶ We've investigated measuring the mass of objects like books, on an equal arm balance using units of measurement like blocks and marbles.
- ▶ We found that when we measured the mass of the book using different units of measurement, we got a different number of units.
- ▶ We found that we needed more of the lighter units than the heavier units to measure the same mass.
- ▶ And we found that we needed fewer of the heavier units than the lighter units to measure the same mass.

- ▶ The French mathematicians who created our metric measurement system found this too.

Display the metric measurement system of length, circling the units we use in Australia, for example,

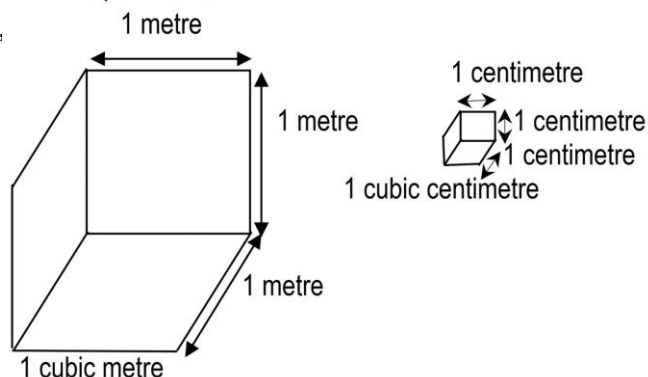


Record, for example,



1 square metre

Record, for example,



1 cubic metre

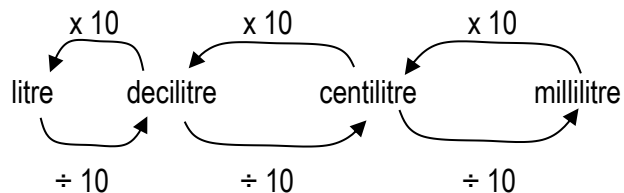
- ▶ They realised that if we all use the same unit to measure mass, we'll all get the same measurement!
- ▶ So what unit of measurement did they create to measure mass? Let's investigate!

- ▶ Let's review how the French mathematicians created the metric measurement system, basing it on multiplicative place value by multiplying and dividing by 10.
- ▶ We found that they started with a metre, and divided the metre by 10, and got a decimetre, divided the decimetre by 10, and got a centimetre, divided the centimetre by 10, and got a millimetre.
- ▶ We found we could measure 1 dimension with these units.

- ▶ We found they turned these units into squares by adding a second dimension, to measure area.

- ▶ And we found they turned these units into cubes by adding a third dimensions, to measure volume and capacity.
- ▶ We found these cubes were great to measure 3 dimensions of an object or container with faces and edges.
- ▶ But what if we wanted to measure 3 dimensions of an object or container with curved surfaces?
- ▶ We'd need a unit of measurement that can bend around curved surfaces.
- ▶ We found they used units of measurement of water to measure volume and capacity of objects and containers with curved surfaces, basing it on multiplicative place value by multiplying and dividing by 10.

Display the metric measurement system of volume and capacity using water, for example,



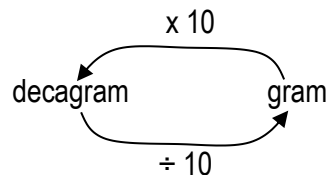
Display a gram weight, for example,



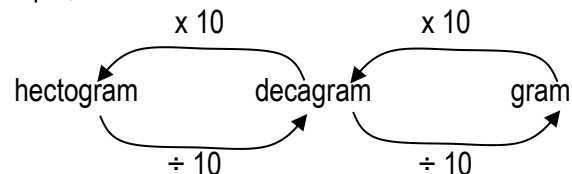
Record, for example,

gram

Record, for example,



Record, for example,



▶ They started with the litre, divided the litre by 10, and got a decilitre, divided the decilitre by 10, and got a centilitre, divided the centilitre by 10, and got a millilitre.

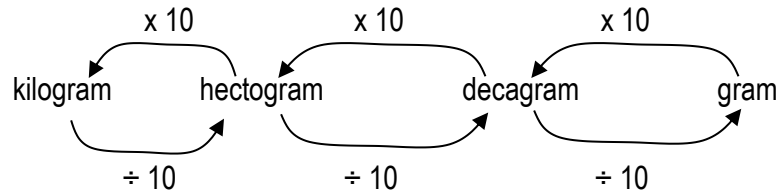
▶ Do you think the French mathematicians who created the metric measurement system to measure length, area, and volume and capacity, also created a metric measurement system to measure mass, basing it on multiplicative place value by multiplying and dividing by 10.? Let's investigate!

▶ The French mathematicians started with a gram.

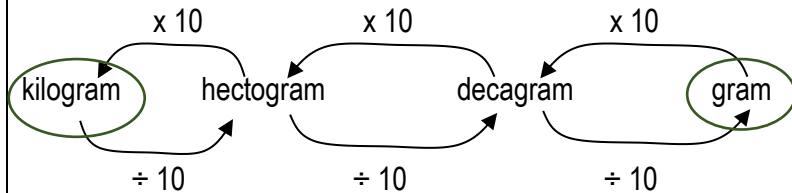
▶ To measure larger masses, they multiplied the gram by 10, and named the unit a decagram. The prefix 'deca' means 10 in Greek. If they divided the decagram by 10, they had a gram.

▶ To measure larger masses, they multiplied the decagram by 10, and named the unit a hectogram. The prefix 'hecto' means 100 in Greek. If they divided the hectogram by 10, they had a decagram.

Record, for example,



Circle the units we use in Australia, for example,

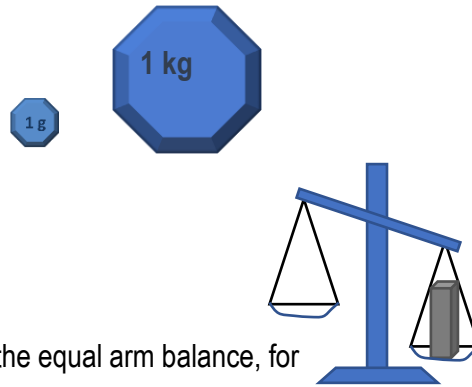


- ▶ And to measure larger masses, they multiplied the hectogram by 10, and named the unit a kilogram. The prefix 'kilo' means 1000. If they divided the kilogram by 10, they had a hectogram.

- ▶ The units that we use in Australia are the gram and the kilogram.

Display a 1 kilogram weight, for example,

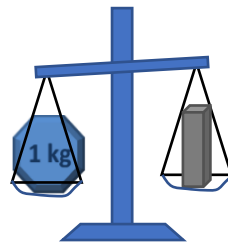
Display a gram weight, for example,



Place the book in the pan on one side of the equal arm balance, for example,

Allow children to feel the mass of the gram and the kilogram to decide which one they would use to measure the mass of the book.

Place a kilogram weight in the pan on the left side of the equal arm balance, for example,



▶ **Let's investigate how we can use grams and kilograms and an equal arm balance to measure mass.**

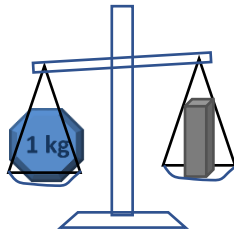
- ▶ Let's place a heavy object in the pan on the right side of the equal arm balance.
- ▶ What object shall we select?
- ▶ Shall we select a book?

- ▶ Which unit of measurement could we use to measure the mass – the kilogram or the gram?
- ▶ Shall we use the kilogram?
- ▶ Which do you estimate will have a higher mass, the book or the 1 kilogram weight?
- ▶ Which do you estimate will have a lower mass, the book or the 1 kilogram weight?

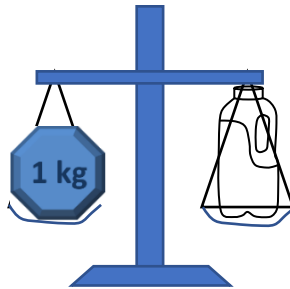
- ▶ Where will we place the 1 kilogram weight?
- ▶ Will we place the kilogram into the pan on the left hand side of the equal arm balance?

Record, for example,

The book has a mass of less than 1 kilogram

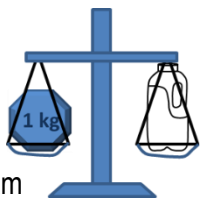


Place the litre of water in the pan on the right side of the equal arm balance, and the kilogram weight in the pan on the left side of the equal arm balance, for example,



Record, for example,

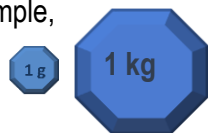
1 litre of water has a mass of about 1 kilogram



- ▶ Does the book have a mass of more or less than 1 kilogram?
 - ▶ Does the book have a mass of less than 1 kilogram?
 - ▶ How do you know?
 - ▶ Is the arm on the equal arm balance tilting down to the left where the 1 kilogram weight is?
 - ▶ How could we record this?
 - ▶ Could we record the equal arm balance and the book and the kilogram weight?
 - ▶ Could we record that the book has a mass of less than 1 kilogram?
-
- ▶ What other object could we measure the mass of using the kilogram weight?
 - ▶ Could we measure the mass of this litre of water?
 - ▶ Let's place the litre of water in the pan on the right side of the equal arm balance, and the kilogram weight in the pan on the left side of the equal arm balance.
 - ▶ Does the litre of water have a mass of more than a kilogram, less than a kilogram, or about a kilogram?
 - ▶ Does the litre of water have a mass of about 1 kilogram?
 - ▶ How do you know?
 - ▶ Is the arm on the equal arm balance almost horizontal?
 - ▶ How could we record this?
 - ▶ Could we record the equal arm balance and the litre of water and the kilogram weight?
 - ▶ Could we record that the litre of water has a mass of about 1 kilogram?

Display a 1 kilogram weight, for example,

Display a gram weight, for example,



Place the pencil in the pan on one side of the equal arm balance, for example,



Allow children to feel the mass of the gram and the kilogram to decide which one they would use to measure the mass of the pencil.

Place a gram weight in the pan on the left side of the equal arm balance, for example,



- ▶ Let's place a light object in the pan on the right side of the equal arm balance.
- ▶ What object shall we select?
- ▶ Shall we select a pencil?
- ▶ Which unit of measurement could we use to measure the mass – the kilogram or the gram?
- ▶ Shall we use the gram?
- ▶ Which do you estimate will have a higher mass, the pencil or the 1 gram weight?
- ▶ Which do you estimate will have a lower mass, the pencil or the 1 gram weight?
- ▶ Where will we place the 1 gram weight?
- ▶ Will we place the gram into the pan on the left hand side of the equal arm balance? Let's do it!
- ▶ Does the pencil have a mass of more than 1 gram or less than 1 gram?
- ▶ Does the pencil have a mass of more than 1 gram?
- ▶ How do you know?
- ▶ Is the arm on the equal arm balance tilting down to the right where the pencil is?

Record, for example,

Record, for example,

1 pencil has a mass of more than 1 gram



- ▶ How could we record this?
- ▶ Could we record the equal arm balance and the pencil and the gram weight?
- ▶ Could we record that the pencil has a mass of more than 1 gram?