YuMi Deadly Maths

Year 6 Teacher Resource:

MG – Convert me

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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QUT

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Growing community through education

ACKNOWLEDGEMENT

We acknowledge the traditional owners and custodians of the lands
in which the mathematics ideas for this resource were developed,
refined and presented in professional development sessions.

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Year 6 Measurement and Geometry

Convert me

Learning goal Students will explore measurement prefixes and convert between units of measurement.

Content description Measurement and Geometry – Using units of measurement

- Convert between common metric units of length, mass and capacity (ACMMG136)

Big idea Measurement – notion of unit, multiplicative structure

Resources Stimulus pictures, strip mat, place value (PV) word cards, marker (orange), measurement word cards, calculators, key-ring digit cards

Reality

Local knowledge Ask students to think of the unit of measurement they would use to measure the items in the following objects or stimulus pictures: a ruler, the width of the room, the length of an ant, the distance from Brisbane to Sydney; the weight of a block of cheese, a teaspoon of sugar, a box of apples; the volume of a dose of medicine, a bottle of soft drink, a swimming pool.

Prior experience Check students' understanding of the notion of unit. *Anything can be a unit; for example, we might take the kilometre as the unit or the millimetre as the unit or the metre as the unit. What is it that we are talking about? If it's metres, then a metre becomes the unit. The decimal point always comes after the unit, whatever that unit has been stated to be.* Get students to research the meanings of the prefixes kilo, centi and milli.

Kinaesthetic Students are given PV cards to order on the strip mat. Then have students place the measurement word cards *metre*, *gram* and *litre* under the Ones place.

Use the strip mat to show relationships between place values and metric units. Elicit from the students the necessary operations to move metres, grams and litres into the kilo place, the centi place and the milli place. Students then place the measurement cards in the appropriate places. Move one place (×10 ← up or ÷10 → down), two places (×100 ← or ÷100 →), 3 places (×1000 ← or ÷1000 →). *The main measurements we use are millimetre, centimetre, metre, and kilometre for length; milligram, gram and kilogram for mass; and millilitre, litre and kilolitre for capacity.*

Millions	Thousands			Ones			Parts of One		
Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
			kilo metre	hecto metre	deka metre	metre	deci metre	centi metre	milli metre
			kilo gram			gram			milli gram
			kilo litre			litre			milli litre

First have students make all the kilo measures (×1000) then reverse to make the centi (÷100) and milli (÷1000) measures. In all instances, have the students actually step out the movements from the unit measures up to the kilo then down to the centi and milli measures. Other students perform the operations with their calculators.

Abstraction

Body

Conversion: Use a marker (orange) on the unit you are starting with to position the decimal point (after the unit) in order to show a conversion. *Use key-ring digit cards to show 37 m on the strip mat. This is metres, so put an orange (or other marker) on the metre place. This shows 37 m. If we wanted to convert to millimetres, leave the 3 and 7 where they are and move the orange, the marker, to the millimetre position (×1000 as there are 1000 mm in a metre). Fill the three "empty" places with zeros as place holders. This shows 37 000 mm which is the same as 37 m.*

Reverse*: If we wanted to show how many km there are in 37 m, put the marker (orange) at the kilometre place (because km is now the unit, the measure we are talking about) and fill the "empty" place with the place holder, zero* [.037 km = 37 m]. *We have divided 37 m by 1000 as we need 1000 m to make a km and we have only 37 m, a small part of 1000 m*.

How many grams are there in 48 kg? Put the marker at the gram place. What digits are used as place holders? [zeros]. Another three students fill in the "empty" places to the marker with key-ring zeros. *Read how many grams there are in 48 kg* [48 000 g]. Repeat process using other digits and measurements, going from metres, grams and litres to the kilo measures and to the centi and milli measures.

Hand

Provide metric slide rules, metric expanders and PV charts (all attached) for students to use for examples given to convert between units.

Mind

Close your eyes and think of a 600 ml bottle of cream. See the 600 ml on a metric expander. Open the millimetres, then open the litres. We are now talking about litres so see the marker coming in the Ones of litres place. How many whole litres are there? [0] *See the decimal fraction that tells what part of a litre we have*. Use an example that reverses the conversion through multiplication.

Creativity

Students design their own tool or list, table or graph that shows the connections between the different measurements.

Mathematics

Language/ symbols

measurement, unit, length, mass, capacity, perimeter, area, volume, metric system, decimal, representation, appropriate unit, metre, gram, litre, milli, centi, kilo, powers of 10

Practice

Worksheets:

1. Simple conversion, e.g. 7 centimetres = ☐ millimetres; ☐ grams = 2000 milligrams
2. Conversions, e.g. 2047 millilitres = ☐ litres ☐ millilitres;
   8271 grams = ☐ kilograms ☐ grams
3. Decimal conversions, e.g. Write 3.49 litres in millimetres ☐; Write 350 metres in kilometres ☐
4. Which is more or are the two amounts equal? e.g. 3 litres or 2998 millilitres?
   8 kilograms or 8 000 001 milligrams? 5 metres or 500 centimetres?
5. Word problems, e.g. John rode 2 kilometres on his bike. His sister Sally rode 3000 metres on her bike. Who rode the farthest and how much farther did they ride (answer in km)?
   Carlos has a piece of wood 1.2 metres long. He wants to cut it into 3 equal lengths. How long should each piece be in millimetres?

Connections

Relate to place value powers of 10, multiplication and division.

Reflection

Validation	Students check where conversions in metric measurement are needed; e.g. doubling or tripling quantities in cooking; building sites and construction.
Application/ problems	Provide applications and problems for students to apply to different real-world contexts independently; e.g. *Search for a house floor plan and convert the millimetres to metres*.
Extension	**Flexibility**. Show different ways of representing metric units; e.g. 359 m = 35 900 cm = 359 000 mm = 0.359 km. Justify by reversing the process to re-establish the given number. **Reversing**. Students are able to move between telling a metric conversion story ↔ acting it out ↔ writing the larger unit in terms of the smaller ↔ converting the smaller unit in equal terms to the larger unit/s, starting from and moving between any given point. **Generalising**. *To change a larger metric unit to a smaller metric unit, the operation is multiplication as there is a base 10 multiple of the smaller units in the larger unit. Conversely, to change a smaller unit to a larger unit, the operation is division by the base 10 multiple as there are many of the smaller units needed to make up the larger unit*. **Changing parameters**. Investigate conversion to square and cubic measurements.

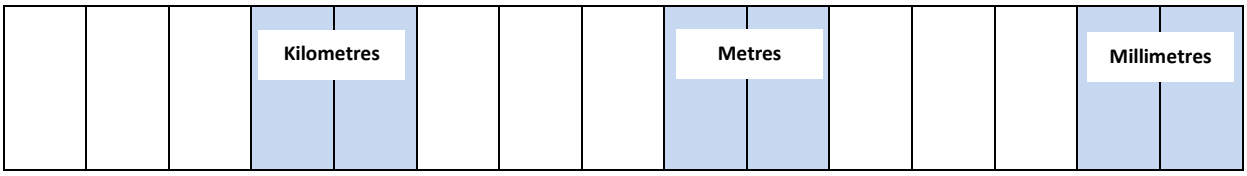
Teacher's notes

- Ensure that students have a sound understanding of the multiplicative structure in the place-value system before proceeding to conversions as this is a prerequisite to the process.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a kookaburra, students look at it, remove the picture, students then close their eyes and see the picture in their mind; then make a mental picture of a different bird.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; https://www.qcaa.qld.edu.au/3035.html
- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.

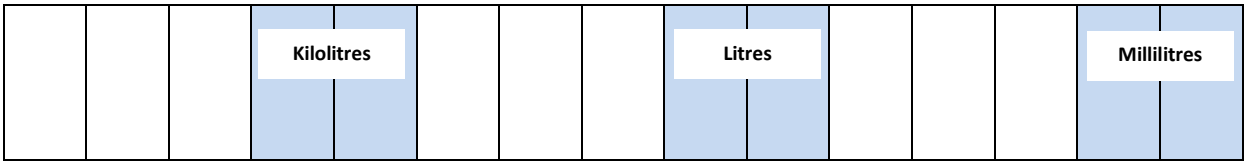
Metric Expanders

Fold shaded part so it is only shown as expanders are opened.

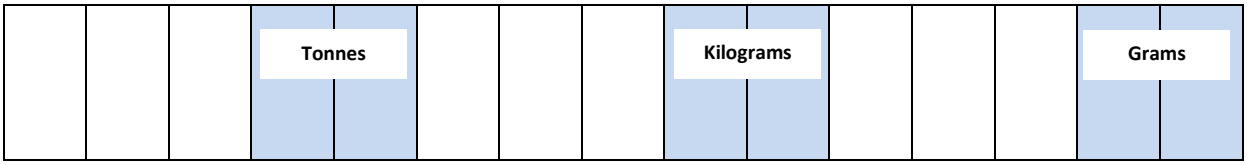
Expander A



Expander B



Expander C



Place Value (PV) Chart

Whole number PVs				Decimal PVs		
TH	H	T	O	t	h	th
1000	100	10	1	0.1	0.01	0.001

Cut out PV chart and slides.

Cut along dotted lines and insert slides

Slides

			km			m		cm	mm				

						L			mL				

			t			kg			g				

Metric Slide Rule

slit

Whole Numbers				Decimal Fractions		
TH	H	T	O	t	h	th
1000	100	10	1	0.1	0.01	0.001

slit

How does it work?

		3	**0**	**0**				What is my new number?

	Whole Numbers				Decimal Fractions		
	TH	H	T	O	t	h	th
✂ slit		3	0	0			slit ✂
	1000	100	10	1	0.1	0.01	0.001

Pull the slider one place to the left to multiply by 10; Pull the slider two places to the left to multiply by 100 etc.

Pull the slider one place to the right to divide by 10; Pull the slider two places to the right to divide by 100 etc.

3 in the Hundreds place – how many ones is that? etc.