NCEA Level 1 Numeracy - Measurement

Conversions within the metric measurement system

Content

This resource supports the teaching and learning of conversions within the metric measurement system. The sequence is suitable for learners in any context which requires the use of measurement to solve problems and also where tutors are gathering naturally occurring evidence for the achievement of the NCEA Level 1 Numeracy Unit Standard 26627.

Alignment

The content aligns with Step 5 of the *Measure and Interpret Shape and Space* strand of the Learning Progressions, in particular the *Measurement* Progression.

Learners should complete the teaching and learning sequence *Understanding the metric measurement system and simple conversions within that system,* or be familiar with its content, before undertaking this teaching and learning sequence.

Intent

After completing the teaching and learning sequence learners will be able to carry out metric conversions within the metric measurement system.

Sequence

There are four parts to this sequence. Learners will:

1. brainstorm reasons for converting metric units
2. discuss whether to multiply or divide when completing a metric conversion
3. know what to multiply or divide by when completing a metric conversion
4. solve problems with metric conversions.

1. *Brainstorm reasons for converting metric units*

Step one: Ask learners for examples of when they might have to convert one metric unit into another. These might include:

Woking out the amount of juice for a function at a marae. Each glass holds 250 millilitres (ml) but the order will be in litres.

The framing for each window is given in millimetres, but the order needs to be in metres.

A recipe requires 200g of flour, but if you are making fifty times the quantity, the flour will be measured in kilograms.

2. *Discuss whether to multiply or divide when completing a metric conversion*

Step one: Give learners the problem below or a similar problem from your context and tell them that this problem will be used to learn about metric conversions.

You are ordering juice for a function at a marae. You want to have enough for every person to have two glasses. A glass holds 250 ml of juice. You are expecting 800 people. How many litres will you need to order?

Step two: Ask learners to work out the total amount of juice needed in millilitres (ml). Establish that the total needed is 400 000 ml and ask learners what they need to do to convert 400 000 ml into litres.

Listen for: Which is bigger, millilitres or litres? Will I have more or less litres? Will I have to multiply or divide? How many millilitres in a litre?

Step three: Summarise the discussion with the **conversion questions** below**:**

Am I changing from a smaller unit to a bigger unit?

Yes, so there will be less of them, so I need to divide.

Am I changing from a bigger unit to smaller unit?

Yes, so there will be more of them, so I need to multiply.

What by?

Step four*:* Revise knowledge of the meaning of the common metric prefixes and their order from biggest to smallest.

.The common prefixes with their symbols andmeaning are:

mega (M)	kilo (k)	base unit	centi (c)	milli (m)	micro (μ)
1 million times the base unit	1 thousand times the base unit		one hundredth of the base unit	one thousandth of the base unit	one millionth of the base unit

The base unit can be metres, litres, grams, bytes etc.

Step five: Apply the first two conversion questions to the problem.

400 000 milllitres is how many litres?

Am I changing from a smaller unit to a bigger unit? Yes, so I will divide.

3. Know what to multiply or divide by when completing a metric conversion

Step one: Discuss with learners the table below, where common prefixes are organised so that each one is **1000 times bigger** than the one on its right or **1000 times less** than the one on its left. This is an easy way to remember the relationship between the prefixes.

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mega (M)	kilo (k)	base unit	milli (m)	micro (μ)

The base unit may be metre, gram, litre, byte etc.

This '1000 table' leaves out centi. If we include deci, another prefix which means $\frac{1}{10}$, we can make another table which sits between the base unit and milli where each unit is **ten times bigger** than the one on its right and **ten times smaller** than the one on its left.

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base unit	deci (d)	centi (c)	milli (m)

The base unit may be metre, gram, litre, byte etc.

Step two: Apply the **third conversion** question (What by?) to the problem. The table tells us the relationship between millilitres and litres is 1000 so to change 400 000 millilitres to litres, divide by 1000.

400 000 ml = 400 000 ÷ 1000 litres

Step three: Discuss how to divide 400 000 ml by 1000. You could do this by moving the number 3 places to the left using a place value chart as below (see the teaching and learning sequence *Multiplying and dividing numbers by powers of 10).*

	millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones or units	tenths	hundredths	thousandths
400 000		**4**	**0**	**0**	**0**	**0**	**0**			
400 000 ÷ 1000					**4**	**0**	**0**			

The solution to the problem is 400 litres

4. Solve problems with metric conversions

Step one: Work through problems requiring conversion with learners. Below is one which you can model. Choose others from your context.

A joiner is making 30 rimu windows for a house. Each window requires 456 millimetres (mm) of timber trim. How many metres (m) of timber does the joiner need to order?

Question	Calculation	Comment
How much timber is needed in millimetres?	30 x 456 mm	Learners will probably do this calculation on a calculator. Ask learners to make an estimate. See teaching and learning sequence *Estimating answers to calculations.*
What is an approximate answer in mm?	30 x 500 mm	15 000 mm
What is the exact answer?	13 680 mm	
To change 13 680 mm to m are you going to multiply or divide?	divide	mm to m is from a smaller unit to a bigger unit so there will be less of them.
What by?	1000	There are 1000 mm in a metre.
What is 13680 ÷ 1000	13.68 m	Encourage learners to do this without a calculator - one way of doing this is by physically or imagining moving 13680 three places to the right on a place value chart.

A joiner is making 30 rimu windows for a house. Each window requires 456 millimetres (mm) of timber trim. He needs to order 13.68 m of timber trim.

Step two: Choose problems from your context for learners to work on in pairs.