Count Me Into Measurement Framework

1. What is measurement?

A measurement results from the process of dividing a continuous quantity, such as length, area, volume or mass, into identical units, so that the quantity can be compared with other quantities of the same type.

All practical measurement is approximate, and the accuracy depends on the precision of the measuring instrument and the experience of the person who is measuring.

2. Why teach measurement?

Measurement activities are relevant to many everyday experiences and provide rich contexts for extending mathematics knowledge by:

- developing concepts of units and scales
- providing links between number and space
- motivating students to apply their number and spatial skills to interesting problems
- integrating with other topics, for example, science, mapping, weather, craft
- illustrating historical developments in mathematics
- comparing performance in games, activities and sports.

Measurement may involve **non-standard** or **standard** units. We may calculate an amount of cupfuls for a recipe, an approximate distance to a venue, or the amount of cardboard to make a box. Measurement may also involve comparison, finding the longest string or the container that holds the most. More complex units of measure include rates such as speed or price for a given quantity.

Knowledge of measurement should be developed through **active participation,** followed by **reflection**.

3. What do teachers need to know about learning measurement concepts?

- The principle of conservation is fundamental to an understanding of measurement.
- Knowledge of unit iteration and unit size is fundamental to the process of measuring.
- Estimation is an important part of measurement.
- An understanding of length is the foundation for building concepts of area and volume.

4. Where should teachers begin?

Teachers are encouraged to **estimate what students currently know**, and to try a lesson at that level. The results will indicate if the teaching program should go up or down a level, or if the teachers intuition was correct. Ensure that students **understand the language used in the measurement process**, as this is crucial to learning any concept.

Lessons should begin by **alerting students to the focus attribute and by revising key features.** Students' understanding of the attribute should never be assumed. Teachers should always **check by questioning and expecting students to demonstrate their knowledge.**

Students may be asked to demonstrate how they will measure. It is useful to **discuss different approaches.**

Ask each student in the group to measure the attribute (e.g. the length of one person's footprint) **individually first**, then compare results with other members of the group. The variability of measurements made by different students will **highlight the need to use precise measurement processes.**

5. How will students' understanding be assessed?

The **Count Me Into Measurement** framework provides several different but related activities at each Level. Therefore the teacher can **assess similar concepts as students complete different activities.** For example, the teacher could focus on individually questioning students in one group on one day as they work on one activity, then another day focus on a different student who may be completing one of the other activities.

Teachers should encourage students **to record their findings** as frequently as possible. These make excellent work samples for explaining and sharing methods, reporting back, student portfolios, and displays. The recordings can be taken home and shared with parents. Collected work samples will also support the teacher's own documentation and reflection.

6. Using the document

The CMIM document is divided into sections for length, area, volume and mass. Each of these sections is further subdivided into six levels that may be approximately interpreted as Kindergarten, Year 1 and Years 2-3, providing the children have worked through the previous levels. Each level has two parts.

The structure of each strand is set out as follows:

- the knowledge and strategies expected for each level,
- teaching notes for each level, parts 1 and 2,
- sample lesson plans for each level, parts 1 and 2.

These CMIM levels suggest a sequence for teaching the content of each strand. Students are NOT expected to be at the same level in each strand.

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	LENGTH	AREA	VOLUME & CAPACITY	MASS
Indentification of attribute				
Level 1.1	Make direct comparisons of length			1.1 Make direct comparisons of mass
Level 1.2			Order two or more quantities by direct comparison	1.2 Compare and order objects by _____ or by making _____ judgements.
				1.3 Compare masses using an equal arm balance
Informal Measurement				
Level 2.1			Choose and use appropriate units for measuring volume and capacity	
Level 2.2	Compare and order lengths by using _____ for each length			Compare and order masses using identical units for each mass (indirect comparison)
Structure of repeated units				**Relationship between units**
Level 3.1		Use one unit to work out how many will be needed altogether when making indirect comparisons		
Level 3.2	Explain the relationship between unit size and the number of units used to _____	Explain the relationship between unit size and the number of units used to _____	Explain the relationship between unit size and the number of units used to fill or _____	Explain the relationship between unit size and the number of units required to _____

	LENGTH	AREA	VOLUME & CAPACITY	MASS
Measure using conventional units				
Level 4.1	Measure 1 ___	Measure 1 ___	Measure 1 ___	Measure 1 ___
Level 4.2	Measure in ____ or _____	Measure in ____ or _____	Use pouring or displacement to measure capacity in L or _____. Measure volume in cm^3 by packing	Measure quantities smaller than 1 kg in _____
Relationship between formal measurement units				
Level 5.1	Investigate the relationship between the lengths of sides of a rectangle and the _____. Measure and calculate _____ in mm and cm	Investigate the relationship between the lengths of sides of a rectangle and the _____ Measure and calculate _____ in cm^2 or m^2	Investigate the relationship between height and the area of the base when comparing _____. Measure capacity in __; Measure volume in ____	Select and use appropriate measuring device Express measurements in kg and grams
Level 5.2	Measure in mm and cm and record using decimals	Calculate areas which are a combination of rectangles or squares in cm^2 and m^2 Investigate the area of triangles	Design and build prisms and cubes using 1 cm grid paper; find the volume	Measure and record mass in kg using decimals Convert from kg to grams and vice versa
Knowing and representing large units				
Level 6.1	Understand how to measure in km Understand how a scale is used	Understand how to measure using km^2 and _____ Understand how a scale is used	Understand how to measure in m^3 Use Geodesic dome kit or similar to build m^3 models	Measure using the _____
Level 6.2	Consolidate the relationship between units: convert ___ to ___ or ___ to ___ to compare lengths. Use a scale.	Use a scale.	Consolidate the relationship between units: convert __ to __ to compare capacity	Consolidate the relationship between units: convert ___ to ___ and ___.

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	LENGTH	AREA	VOLUME & CAPACITY	MASS
Indentification of attribute				
Level 1.1	Make different comparisons of length	Make direct comparisons of area	Make direct comparisons of volume or capacity	1.1 Make direct comparisons of mass
Level 1.2	Order two or more lengths by direct comparison	Order two or more areas by direct comparison	Order two or more quantities by direct comparison	1.2 Compare and order objects by hefting or by making intuitive judgements.
				1.3 Compare masses using an equal arm balance
Informal Measurement				
Level 2.1	Choose and use appropriate units for measuring length	Choose and use appropriate units for measuring area	Choose and use appropriate units for measuring volume and capacity	Choose and use appropriate units for measuring a mass
Level 2.2	Compare and order lengths by using identical units for each length	Compare and order areas by covering each area with identical units	Compare and order volumes and capacities by filling or packing with identical units	Compare and order masses using identical units for each mass (indirect comparison)
Structure of repeated units				**Relationship between units**
Level 3.1	Use one unit to work out how many will be needed altogether when making indirect comparisons	Use one unit to work out how many will be needed altogether when making indirect comparisons	Use one unit to work out how many will be needed altogether when making indirect comparisons	
Level 3.2	Explain the relationship between unit size and the number of units used to measure length	Explain the relationship between unit size and the number of units used to measure area	Explain the relationship between unit size and the number of units used to fill or pack a container	Explain the relationship between unit size and the number of units required to balance a mass

	LENGTH	AREA	VOLUME & CAPACITY	MASS
Measure using conventional units				
Level 4.1	Measure 1 m	Measure 1 m^2	Measure 1 L	Measure 1 kg
Level 4.2	Measure in mm or cm	Measure in m^2 or cm^2	Use pouring or displacement to measure capacity in L or millilitres. Measure volume in cm^3 by packing	Measure quantities smaller than 1 kg, in grams
Relationship between formal measurement units				
Level 5.1	Investigate the relationship between the lengths of sides of a rectangle and the perimeter. Measure and calculate perimeter in mm and cm	Investigate the relationship between the lengths of sides of a rectangle and the area. Measure and calculate area in cm^2 or m^2	Investigate the relationship between height and the area of the base when comparing volume. Measure capacity in L; Measure volume in cm^3	Select and use appropriate measuring device Express measurements in kg and grams
Level 5.2	Measure in mm and cm and record using decimals	Calculate areas which are a combination of rectangles or squares in cm^2 and m^2 Investigate the area of triangles	Design and build prisms and cubes using 1 cm grid paper; find the volume	Measure and record mass in kg using decimals Convert from kg to grams and vice versa
Knowing and representing large units				
Level 6.1	Understand how to measure in km Understand how a scale is used	Understand how to measure using km^2 and ha Understand how a scale is used	Understand how to measure in m^3 Use Geodesic dome kit or similar to build m^3 models	Measure using the tonne
Level 6.2	Consolidate the relationship between units: convert mm to cm or cm to m to compare lengths. Use a scale.	Use a scale.	Consolidate the relationship between units: convert mL to L to compare capacity	Consolidate the relationship between units: convert g to kg and t.