DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Measurement: Mass, volume, and capacity

Level 1 (Year 1/ Year 2)

Teacher Booklet

Task 1	Mereana is preparing a chilly bin full of banana poke to sell at the Pasifika festival. She would like to know which chilly bin will fit the most containers of poke. How many can she fit in each chilly bin and still shut the top?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1:** Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. **NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-2:** Know the forward and backward counting sequences of whole numbers to 100.
Learning Outcomes: Students will be able to:	• Compare the volume of a container using non-standard units. • Use non-standard units to measure volume. • Count whole numbers of units to describe the measurement. • Explain the relationship between size of the measurement unit and the measurement count. • Estimate the volume of a container.
Mathematical language	Space, volume, more than, less than, same, measurement unit, measurement count.

Sharing back/Connect	Select students to share who measure the volume of the boxes in a systematic way by layering the bottom first and then filling the rest of the box and ensuring that there are as little spaces as possible. Teacher to model recording the solutions using representations involving numbers and drawing. **Connect:** Show the students bigger or smaller containers and ask them to discuss how many of each packet would fit in the chilly bin and compare to the number of measurement units for the first unit. Facilitate students to notice that the bigger the measurement unit the more space it takes and therefore less would fit in the same size chilly bin and vice versa.
Teacher Notes	• During the launch, use food packets of different sizes. Have children order from biggest to smallest and discuss with the children which takes up the most space (volume). • Have three bins (or large boxes) for the students to work with and use glad containers or lunch-boxes which are the same size as the measurement unit. • Facilitate the students to notice the need for a common measurement unit to compare. • Monitor for students using vocabulary which includes space, volume, and more than, less than and the same as. • Notice students who use grouping or counting on to find the number of measurement units. If these are not used, model how to use them. • Expect students to represent their solutions using drawing and numbers. • For the independent task, have different sized containers available and sets of blocks, multi-link cubes, and/or foam shapes to use as the measurement unit.
Independent Tasks	Use the different material to measure the volume of each container. Record the measurement count for each different measurement unit that you used. Draw a picture to show how you measured the different containers and write the numbers to match.

Anticiptions	

Task 2	Talia is making herself a jewellery box. She is wondering which box has the largest volume. Can you help her by measuring the volume of the boxes?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1**: Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. **GM2-1:** Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time. **NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-2:** Know the forward and backward counting sequences of whole numbers to 100.
Learning Outcomes: Students will be able to:	• Compare and order the volume of objects. • Explain volume as the space inside an object/container. • Use units to measure volume. • Count whole numbers of units to describe the measurement. • Explain that when an object is subdivided the volume remains the same (conservation).

Mathematical language	Space, volume, most, least, same.
Sharing back/Connect	Select students to share who measure the volume of the boxes in a systematic way by layering the bottom first and then filling the rest of the box and ensuring that there are as little spaces as possible. Also focus attention on students who use grouping or counting on solutions to find the measurement unit count. **Connect:** Select one of the volume measurements that were shared and ask the students to think about the volume (in total) if the box was cut into two pieces and volume of each piece was measured. Support them to understand that the volume would be the same (conservation) Then select a box where the 1 cm cube did not fit exactly and ask students to discuss how you could get an accurate volume measurement (e.g., using fractions).
Teacher Notes	• For the launch, ask show students the boxes and ask them to estimate which would have the largest volume measurement. • For the task, have a collection of small boxes (e.g., shoe boxes) and either centi-cubes (these are best given they are a standard one cm measurement unit) or multi-link cubes. • Facilitate students to notice that the volume of an object is the amount of space it takes up and that the volume of an object is measured by the number of unit volumes that fit into it. • Expect students to record and use representations to show their thinking. • For the independent task, have a collection of different sized and similar boxes or containers. Give the students the centi-cubes to find the volume.
Independent Tasks	What box has the most volume? What box has the least volume? Which boxes have the same volume? Represent how you found the volume for each box and label which one has the most volume, the least volume, and same volume.

Anticipations	

Task 3	How many children would fit in the one metre cube? Can you work out the volume of these big boxes and work out which has the greatest volume, the smallest volume and similar volume?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
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Learning Outcomes: Students will be able to:	• Use non-standard units to measure volume. • Compare the volume of a container using non-standard units. • Count the number of units to describe the measurement.
Mathematical language	Space, volume, more than, less than, same, cubic metre.
Sharing back/Connect	Select students to share who measure the volume of the boxes by visualising how the space could be filled or by comparing to the cubic metre. **Connect:** Ask the students to visualise and estimate how many of the cubic metres would fill spaces around the school (e.g., classroom, bathroom, hallway, hall). Model recording student responses as m^3.

Teacher Notes	• Use metre rulers and card and newspaper to construct the cuboid. Use the term cubic metre and record as 1 m^3. • For the second part of the task, have large boxes for the students to compare and estimate the volume. • Monitor for students using vocabulary which includes space, volume, and more than, less than and the same as. Encourage the use of cubic metre. • Facilitate students to understand that volume is the space inside a unit. • For the independent task have a variety of pictures showing different volumes (e.g., fish tank, shipping container, warehouse).
Independent Tasks	Look at the cubic metre and use this to estimate the volume of the spaces in the pictures. Record your estimations in cubic metres and make sure you use m^3. What has the largest volume? What has the smallest volume? Which have similar volumes?
Anticipations	

Task 4	Use the cubes to build different cuboids. Draw a representation of the cuboid and record the volume.
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1:** Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units.
Learning Outcomes: Students will be able to:	• Use units to measure volume. • Use grouping to find the volume of cuboids. • Compare and order the volume of objects. • Count whole numbers of units to describe the measurement.
Mathematical language	Volume, cuboid, centimetre cubed, more than, less than, same, divide.
Sharing back/Connect	Select students to share who have used grouping to find the measurement unit count. Ask them to represent their solutions using drawing and number sentences or model this to them. **Connect:** Show students different models of cuboids made from the centi-cubes. Ask them say what the volume is for each one. Include some cuboids that are a different shape but the same number of cubes to highlight that the volume can remain the same even if they look different.
Teacher Notes	• For the launch, with the students make a 3 by 3 grid of 1 cm cubes. Have them make another 3 by 3 layer on top of it to make a cuboid. Have the students talk about the dimensions of the cuboid that you have made together and how many cubes it contains. Have them decide what its volume is. • Emphasise how the shape of objects could be different but have the same volume.

Independent Tasks	Three cuboids have the same volume but different shapes. Build these cuboids out of 1cm cubes and then draw representations of your models showing how different shaped cuboids can have the same volume.
Anticipations	
Task 5	Look at the containers. Sort them into groups which have about the same volume. Estimate in litres the volume of the different containers. Use the litre measure to check whether your estimation was close.

Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C.
Curriculum links	**GM1-1:** Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units.
Learning Outcomes: Students will be able to:	• Estimate the volume of a container. • Use non-standard units to measure volume. • Compare the volume of a container using non-standard units.
Mathematical language	Space, capacity, volume, more than, less than, same, estimate.
Sharing back/Connect	Select students to share solution strategies where they have used a bench-marking strategy (potentially gesture). Focus student attention on the possibility that different containers could be measured and compared by using one as a benchmark (transitivity). **Connect:** Have pictures of different shaped containers. Ask students to estimate the volume in litres.
Teacher Notes	• For the launch, fill a with water milk bottle to about halfway and mark the level. Have a different (either wider, taller, shorter but wider) container and point and ask if them if they think that they would have the same volume of water if they poured it into the second container. Pour the water into the second container and ask them if the volume has changed. If needed, pour the water back into the first container to show that the volume has not changed.

	• Use containers of different shapes but have sets that are relatively the same size. • Explicitly use the term capacity to describe the volume of the liquid a container holds without overflowing. • For the independent task, have containers of different sizes (labelled with numbers or letters) that can be filled with water.
Independent Tasks	Estimate which container would hold the largest volume. Write down the order from biggest to smallest. Use the water to measure the volume of each container. Write down the order from biggest to smallest and compare with your estimate.
Anticipations	

Task 6	Make different number lines to match the measurement markings on the measuring jug.
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1**: Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. **NA1-1**: Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-2**: Know the forward and backward counting sequences of whole numbers to 1000.
Learning Outcomes: Students will be able to:	• Use standard units to describe and measure capacity. • Count whole numbers of units to describe the measurement. • Represent measurement scales in different ways.
Mathematical language	Space, capacity, volume, more than, less than, same, estimate, measurement unit, measurement count, full, half full, half empty, three-quarters full, millilitres, mL, litre, L.
Sharing back/Connect	Select students to share who have used equally spaced marks on the number line and represent equal volume between measurements. Encourage and model the use of standard unit measurement language (e.g., millilitres, litres, 500mL is halfway to 1L). **Connect:** Show the students a picture of a number line from 50mL to 1000mL marked in a scale without numbers. Ask them to identify how many millilitres are represented at specific points.
Teacher Notes	• For the launch, have students explore different containers which are marked in millilitres (mL) and identify the unit of measure being used. Discuss how this is used when there is not exactly a litre.

	• Use a measuring jug that is cylindrical in shape and has millilitre markings (e.g., 500mL, 740mL, 1000mL, 2000mL). • Facilitate students to ensure equal spacing between their marks and understand that the space between them represents slices of equal volume. • Support students to use skip counting in 100s (or other combinations) to work out that one litre is 1000mL. Use number lines to represent these. • Make links to the terms, millilitre, and millimetre, and that milli represents one thousand. • For the independent task, have a selection of cylindrical jugs both with millilitre markings and unmarked containers.
Independent Tasks	Estimate how many millilitres would fit in each container. Write your estimate down. Use one of the measuring jugs to compare how much liquid in millilitres the container would hold. Make a number line which shows the scale for each container.
Anticipations	

Task 7	Measure the containers using the measuring jug and record the measure in millilitres (mL). Now measure the container using the cubes and record the measure in cm^3. What do you notice?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used. There are relationships between measurement units, for example, conversion between metric units involves multiplication or division by a power of ten. There are relationships between measurement attributes, for example, the area of a rectangle and the volume of a rectangular prism.
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Learning Outcomes: Students will be able to:	• Measure the volume of a container using millilitres (mL). • Measure the volume of a container using cubic centimetres ($cm^{3)}$ • Compare and describe the relationship between volume and capacity and millilitres and cubic centimetres.

Mathematical language	Volume, capacity, millilitres, mL, cubic centimetres, centimetre cubed, more, less, same, different.
Sharing back/Connect	Select students to share who have used a range of measurement language to describe what they notice. If needed model the use of measurement language. **Connect:** Show children sets of pictures of containers with the measure shown as either mL or cm^3 and have them give the alternative measure of volume.
Teacher Notes	• For the launch, show a pictures of cuboids (block of cheese, butter, clay) with lines to show cm^3. As the students to discuss and describe the volume of the cuboid. • Notice whether students are able to explain how the different measurement units match. Build on this to have students understand that 1 cm^3 is the same as 1mL. • Facilitate students to use grouping strategies to count the cubes when measuring volume. • Use a variety of measuring jugs/bottles and cuboid containers (including some the same) so students can swap and explore these as they work. • For the independent activity, have a variety of measuring jugs/bottles and cuboid containers.
Independent Tasks	Can you find some containers that have the same capacity but a different shape?
Anticipations	

Task 8	The post office needs your help to work out the mass of the parcels. Can you use the cubes to work out the mass of each parcel?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1**: Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. **GM2-1**: Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time. **GM2-2**: Partition and/or combine like measures and communicate them, using numbers and units. **NA1-1**: Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-4**: Communicate and explain counting, grouping, and equal-sharing strategies using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	• Use units to measure mass on a balance scale. • Compare the mass of an object using grams. • Combine like measures of grams to find the mass. • Count whole numbers of units to describe the measurement.

Mathematical language	Mass, same, different, heavier, lighter, less mass, more mass, massive.
Sharing back/Connect	Select students to share who have been able to combine the measurement units to find out the mass of the parcels. **Connect:** Ask students to use the mass measures of their classmates to order the parcels that have been weighed from greatest mass to least mass. Focus attention on how the measurement units can be combined as tens and ones.
Teacher Notes	• To launch the task, ask students if they have heard the word 'gram' and what they think it means. Introduce the centi-cube and tell the students that it weighs one gram. Let the students hold it. Then introduce a stick of ten centicubes and establish that it weighs ten grams. • For the task, have wrapped up boxes to represent packages for the post office. Use either equal-arm balances (or two plastic bags on two ends of a coat hanger held by a hook for students to use to measure. • Expect the students to use representations (e.g., drawing and numbers). Model how to record the numbers and how to count in tens. • Facilitate students to notice that the unit can be combined to make ten units which is the same as ten grams. • For the independent task, have a variety of different objects to measure and balance scales available for students to use.
Independent Tasks	These objects will be put into a parcel to send from the post office. Can you use the cubes to work out the mass of each parcel?
Anticipations	

Task 9	Here are some bags. Fill them up with different materials or objects. Use the balance scale to weigh the sets of objects with the one kilo mass. Can you find some objects that have the same mass? Can you find some objects that have less mass? Can you find some objects that have more mass? What mass in kilograms do the different sets of objects have?

Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
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Learning Outcomes: Students will be able to:	• Compare and order the mass of objects. • Use measurement language to describe the comparison of mass. • Find the mass of objects in kilograms.
Mathematical language	Mass, same, different, heavier, lighter, less mass, more mass, massive, kilogram.

Sharing back/Connect	Select students to share who are using a range of measurement language including unit measures to describe what they notice. **Connect:** Have pictures of sets of different objects (e.g., feathers, marbles) and ask the students to predict whether they have a mass equivalent to one kilogram or more or less and why.
Teacher Notes	• To launch the task, ask students if they have heard the word 'kilogram' and what they think it means. Have bags of objects which have a mass equivalent to 1 kg. Let the students hold it. • For the task, have bags and sets of objects that students can put in the bags and compare with the one kilogram mass. Have balance scales available for students to use. • Facilitate the students to notice that the mass of the object is measured by the number of unit masses that balance it. • Expect students to use measurement language and to • record their measurements using kg. • For the independent task, have a set of different sized and shaped objects and balance scales available for students to use.
Independent Tasks	Predict the mass of each object and put them in order from lightest to heaviest. Check the mass of each object using the balance scale and record the results. Was your prediction correct?
Anticipations	

Task 10	Sose is helping her mother buy some fruit at the supermarket. She needs to know the mass of the fruit to work out the cost. Can you measure the mass of the fruit and record this on a number-line and using grams?
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
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	GM2-2: Partition and/or combine like measures and communicate them, using numbers and units. **GM3-1**: Use linear scales and whole numbers of metric units for length, area, volume and capacity, weight (mass), angle, temperature, and time. **NA1-2**: Know the forward and backward counting sequences of whole numbers to 1000. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	• Measure the mass of objects. • Represent the mass of objects using standard unit measures. • Compare the mass of objects. • Use measurement language to describe the comparison of mass.
Mathematical language	Mass, grams, kilogram, same, different, heavier, lighter, less mass, more mass, massive.
Sharing back/Connect	Select students to share who have developed number lines which show the measurement units remaining the same and repeated with no gaps. Alternatively model this to students and discuss. **Connect:** Ask the students to select three objects that they think have a total mass of one kilogram. Check the estimate by measuring the total mass on the scale.
Teacher Notes	• During the launch, use scales marked in grams to find the mass of various pieces of fruit. Highlight that g represents grams. • Have analogue scales with measurement markings and different pieces of fruit (or dough to represent fruit) • Facilitate students to understand that a kilogram is a national and international agreed unit (metric standard) for measuring mass and is recorded as kg and that gram is another similarly agreed unit of mass recorded as g. • Note that scales find the weight of an object. This is the force of gravity by which it is attracted to the Earth (gravitational pull). However, because gravity is almost the same everywhere on Earth an object's weight provides a good estimate of its mass. • Talk about finding the mass and not weighing. Use the term more massive or less massive rather than heavier or lighter or so on.

	• Expect students to compare the mass of different pieces of fruit and then represent this as measurement units on a number line and record this using the unit measurement of grams. • Support the students to count in groups of tens to make a 100g, or 20s, or 50s to make 100g or 1000g, or 100s to make 1000g. This is a good opportunity to look at the place value of these numbers. • For the independent task, have a range of objects of differing size and mass and analogue scales available for the students to measure with.
Independent Tasks	What objects do you think will have a mass of 50g? What objects do you think will have a mass of 75g? What objects do you think will have a mass of one kilogram? Use the scales to find the mass. Represent the measurement using a number line and record the measurement in grams.
Anticipations	

Task 11	What is the mass of each object? Record your results in a table including the object and mass in grams.
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
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<table>
<tr><td>Learning Outcomes: Students will be able to:</td><td>Compare the mass of objects.
Use an analogue scale to find the mass of an object in grams.</td></tr>
<tr><td>Mathematical language</td><td>Mass, grams, kilograms, same, different, heavier, lighter, less mass, more mass, massive.</td></tr>
<tr><td>Sharing back/Connect</td><td>Select students to share who are using a range of measurement language.

Connect:
Ask students to identify how many grams are in a kilogram and convert their measurements from grams to kilograms. Record this on a table

<table><tr><td>Object</td><td>Grams (g)</td><td>Kilograms (kg)</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Teacher Notes</td><td>For the launch, have students discuss objects with the following measurement labels (10g (box) 15g, 70g (box) 50g, 100g (box) 50g, 1000g (box) 500g, 1000g (box) 1kg). Ask them to record number sentences about the objects using <, >, =
Have a range of objects and analogue/digital scales available to use.
Notice students who realise that the measurement in grams is larger than the measurement in kilograms and if this does not emerge then address it explicitly.
Facilitate students to understand the 1000 grams is the same as one kilogram.
For the independent task, have digital/analogue scales for the students to use and a collection of objects to measure.</td></tr>
<tr><td>Independent Tasks</td><td>Can you find two objects that have the same size but different mass?

Can you find two objects that have the same mass but different size?</td></tr>
<tr><td>Anticipations</td><td></td></tr>
</table>

Task 12	In most ball games, the rules are that balls should have the same mass. Use the scales to find out the mass of each ball in the set. Record what you notice.
Big ideas	There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. When we measure, we use comparison, specifically, we compare like properties to see which is greater. We can make comparisons using standard or non-standard units of measure and we use mathematical language to describe these. Conceptual understanding of measurement requires understanding of conservation and transitivity. Conservation requires understanding that when moved or subdivided, an object will retain its size. Transitivity involves understanding that the measures of two objects can be compared to a third object. For example, if object A weighs more than object B, and object B weighs more than object C, then object A will weigh more than object C. There are key principles related to measurement including that the size of the measurement unit remains the same (including identical units or subdivisions), units are repeated with no gaps or overlaps (iteration), the unit is part of a whole and the measurement is expressed as the total number of units used.
Curriculum links	**GM1-1:** Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units. **GM2-1:** Create and use appropriate units and devices to measure length, area, volume and capacity, weight (mass), turn (angle), temperature, and time. **GM2-2:** Partition and/or combine like measures and communicate them, using numbers and units. **GM3-1:** Use linear scales and whole numbers of metric units for length, area, volume and capacity, weight (mass), angle, temperature, and time. **NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-2:** Know the forward and backward counting sequences of whole numbers to 1000. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies using words, numbers, and pictures.

Learning Outcomes: Students will be able to:	• Use a scale to find the mass of an object in grams and kilograms. • Record measurement of mass using standard units. • Compare the mass of an object using standard units. • Count whole numbers of units to describe the measurement.
Mathematical language	Mass, same, different, heavier, lighter, less mass, more mass, massive, grams, kilograms.
Sharing back/Connect	Select students to share who have noticed that there can be a difference between the volume of a ball and the mass (e.g., density. **Connect:** Use pictures of balls and ask students to order these in relation to their mass and then their volume. Ask students to discuss what they notice.
Teacher Notes	• To launch the task, have pictures of objects that vary widely in size and mass. Have the mass of each object recorded below the object. Have the students put them in order of mass (less massive, more massive) and explain their reasons. Discuss when it is better to use grams and when it is better to use kilograms and why. • For the task, have two sets of balls, small ones (e.g., tennis balls, golf balls, ping pong balls, bouncy ball, marbles) and large ones (e.g., beach-ball, soccer ball, rugby ball, basketball) and digital/analogue scales to use to measure. • Note, the relationship between mass and volume is called density and this is a science concept.
Independent Tasks	Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: M3: Find the volume of boxes. M3A: Find the mass of books in grams. M3B: Find objects which have a combined mass of 1 kilogram.
Anticipations	

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

MEASUREMENT – MASS, VOLUME, CAPACITY: LEVEL 1 Task M3

Which one of these boxes is the biggest? Which one is the smallest? Describe how you measured it and how you know.

(Teacher notes: Give students 3 small boxes and centi-cubes or multi-link. Take photos of students' way of measuring)

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

ASSESSMENT TASK

MEASUREMENT – MASS, VOLUME, CAPACITY: LEVEL 1 Task M3A

Malia wants to post one of these books to her friend. Find the mass of each book and record it in grams.

(Teacher notes: Provide students with a balance scale, centi-cubes and books to measure).

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ASSESSMENT TASK

MEASUREMENT – MASS, VOLUME, CAPACITY: LEVEL 1 Task M3B

Find a set of objects that have a combined mass of one kilogram (1kg).

(Teacher notes: Provide students with an analogue or digital scale and a collection of objects to measure).