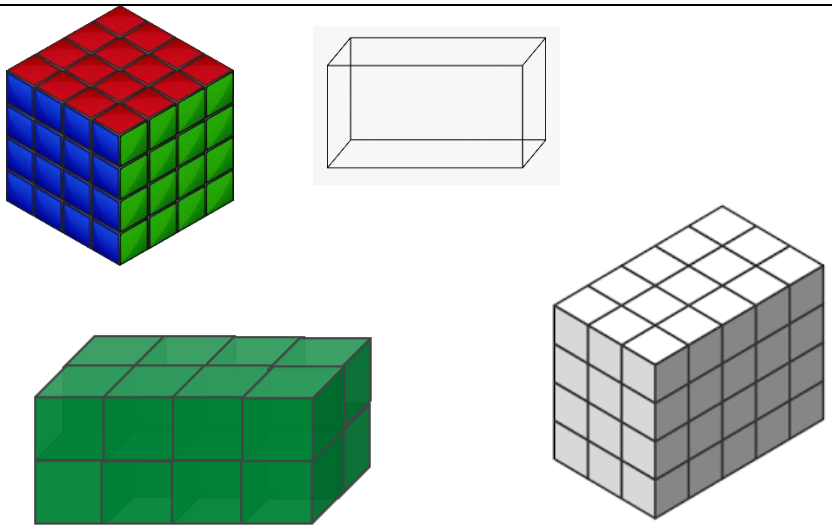
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Measurement: Mass, Volume, and Capacity

Level 4 (Year 7/ Year 8)

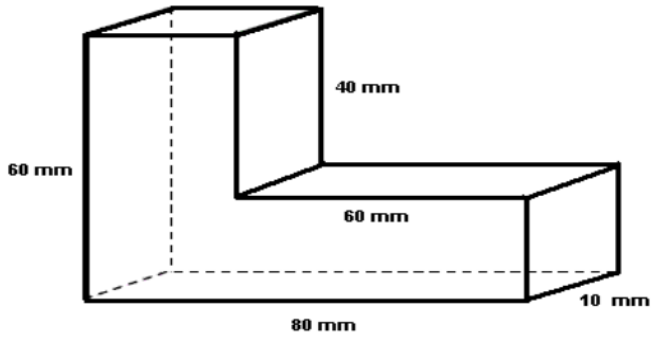
Teacher Booklet

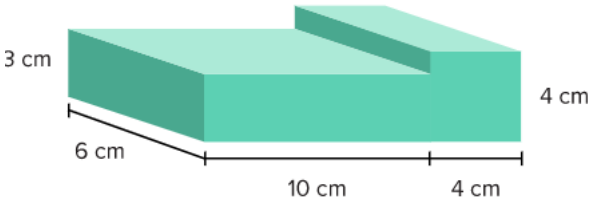
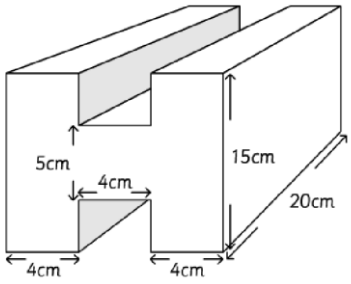
Task 1	 Here are some rectangular cuboids. Find the volume of each cuboid. Write an explanation for how to find the volume of any cuboid. Note: Putting a rule is NOT an explanation!
Big ideas	• There are a range of attributes that we can measure including length, mass, time, area, angle, and volume. 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.
Curriculum links	GM3-2: Find areas of rectangles and volumes of cuboids by applying multiplication. GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers.

Learning Outcomes: Students will be able to:	• Compare volume of objects using whole number units. • Use appropriate units/whole numbers to measure volume. • Use multiplicative reasoning to find the volume of cuboids. • Use all the dimensions to find the volume of cuboids. • Develop a generalised for finding the volume of a cuboid.
Mathematical language	Cube, cuboid, face, vertex, vertices, length, breadth, height, surface, centimetre, 3-dimensional, 2-dimensional, volume, width, depth, multiply, rectangular prism.
Sharing back/Connect	Select students to share who have developed different explanations to find the volume of the cuboids. Work towards having all groups display their explanations side by side so that they can see all and work to refine down to an agreed explanation. **Connect:** Discuss, explore, and refine the explanations until a generalised rule emerges.
Teacher Notes	• Begin by exploring with students the 3-D cube and all its attributes. Make links to the differences between cubes and cuboids (length, breadth, height). Emphasise that a cube is a special case of a square prism, and a square prism is a special case of a rectangular prism and that they are all cuboids. • Facilitate students to understand the concept that the volume of an object is the amount of space it takes up and that an object is measured by the number of unit volumes that fit into it. • For the independent activity, have multi-link or centi-cubes available if needed.
ndependent Tasks	Use 10 x 1cm³ cubes to build as many different box-shaped (cuboid) buildings as possible. Draw a 3-D representation for each cuboid. Use 24 x 1cm³ cubes to build as many different box-shaped (cuboid) buildings as possible. Draw a 3-D representation for each cuboid. Use 35 x 1cm³ cubes to build as many different box-shaped (cuboid) buildings as possible. Draw a 3-D representation for each cuboid.
Anticipations	

Task 2	Mereana has a wooden block of wood with the following measurements: 12cm, 24cm, 30cm. She wants to cut it into identical cubes. How many identical cubes can she get?
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 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers.
Learning Outcomes: Students will be able to:	• Use appropriate units/whole numbers to measure volume. • Use multiplicative reasoning to find the volume of cuboids. • Provide justification for the formula to find volume. • Identify the relationship between the dimensions of an object and volume.
Mathematical language	Cube, cuboid, face, vertex, vertices, length, breadth, height, surface, centimetre, 3-dimensional, 2-dimensional, volume, width, depth, multiply, rectangular prism, rectangular cuboid, representation, dimensions, identical
Sharing back/Connect	Select students to share who use 3-D representations to explain and justify the different identical cubes that can be constructed from the cuboid. **Connect:** What happens if you double one of the dimensions of the wooden block?
Teacher Notes	• Facilitate students to understand that that an object is measured by the number of unit volumes that fit into it. Support students to make connections between the dimensions used for area and those used to find volume.

	• Expect students to draw a 3-D representation of the first cuboid to use as a visual tool and 3-D representations with dimensions marked on them to justify rules for volume. • Have multi-link or centi-cubes available for students to use if needed.
Independent Tasks	What cuboids can you build with these dimensions? What would be the volume for the cuboid? Use a representation to justify your answers. 1. Length is 6 cubes; width is 3 cubes; height is 2 cubes. 2. Length is 10 cubes; width is 8 cubes; height is 3 cubes. 3. Length is 13 cubes; width is 4 cubes; height is 2 cubes. 4. Length is 12 cubes; width is 8 cubes; height is 4 cubes. 5. Length is 10cm, width is 9cm, height is 5cm. 6. Length is 3cm, width is 7cm, height is 5cm. 7. Length is 7cm, width is 2cm, height is 10cm. 8. Length is 5cm, width is 6cm, height is 7cm.
Anticipations	

Task 3	Atawua is helping his father to build a step for a dolls house. They make an L-shaped rectangular block like the one below to join two pieces of wood. His father challenges him to find the volume of this L-shaped rectangular structure. Can you help him? 
Big ideas	• 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. • 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers.
Learning Outcomes: Students will be able to:	• Use multiplicative reasoning to find volume. • Find the volume of a composite cuboid.
Mathematical language	Cuboid, length, breadth, height, surface, centimetre, 3-dimensional, 2-dimensional, volume, width, depth, rectangular prism, dimensions.

Sharing back/Connect	Select students to share who have split the composite cuboids into two cuboids and found the volume of each. **Connect:** How would you find the volume of these stairs? Use a representation and mark in the measurements you would need to find the volume. 
Teacher Notes	• Expect students to use multiplication to find the volume and use 3-D representations to explain and justify.
Independent Tasks	Find the volume:  Find the volume: 
Anticipations	

Task 4	Our church hall has a room for practising singing for special occasions. The dimensions of the room are width 5.1m, length 7m, height 2.5m. Our church membership has increased so we need a larger room. We decided to double all three dimensions. Does that mean that the new room will have double the volume? Make sure you justify and explain your thinking.
Big ideas	• 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Use multiplicative reasoning to find volume. • Explain the relationship between increasing dimensions and volume. • Develop justification for an explanation.
Mathematical language	Length, height, surface, millimetre, 3-dimensional, volume, width, depth, multiply, rectangular prism, rectangular cuboid.
Sharing back/Connect	Select students to share who drew on initial intuitive erroneous reasoning in which they thought that the volume had doubled. Draw on further explanations that use different forms of justification for why it does not double. **Connect:** If you double all the dimensions for a cuboid does the volume double? Construct an explanation for a younger person to show why you agree or disagree.
Teacher Notes	• Note, the context of the problem is set in a church room. These are often used for practising singing and that is why all three dimensions might be doubled.

	• Notice student discussions related to their first intuitive response and facilitate them to use representations to explore the relationship between the increasing dimensions and volume.
Independent Tasks	Here is the volume of some rectangular blocks of wood. Draw the outline of the block of wood and mark the dimensions in cm which could match the volume. There may be more than one solution so make sure that you have all possible solutions. 1. $60cm^3$ 2. $12cm^3$ 3. $99cm^3$ 4. $45cm^3$ 5. $13cm^3$ 6. $150cm^3$
Anticipations	

Task 5	Our recycling bin is a rectangular cuboid with the dimensions of length 1.8m, width 1.5m, height 1.2m. Every day we add approximately 0.25m³ to it. How many days will it take until it is filled?
Big ideas	• 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 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Use multiplicative reasoning to find the volume. • Solve volume problems involving decimals.
Mathematical language	Length, height, surface, millimetre, 3-dimensional, volume, width, depth, multiply, rectangular prism, rectangular cuboid.
Sharing back/Connect	Select students to share who provide an exact measure (in decimals) and an approximate measure in days (rounded to the nearest whole number). **Connect:** The zoo has five and half bags of hay in the storeroom. A giraffe eats 0.25m³ of a bag of hay every day. How many days will the hay last?
Teacher Notes	• To launch the task, ensure that the students understand that the focus is on the number of days. • Facilitate the students to notice the need to have larger unit measures than the use of centimetres cubed (cm³).

	• Expect students to both visualise the space taken by a cubic metre and use gesture (hands) to outline either form of volume. Use the term cubic metre and record as 1 m^3 • Notice students who recognise that the measure for volume can be described in cubic metres even when the materials measured are not exactly the same. • Facilitate students to make links to how they had to find the volume of the container and then apply an additive or subtractive measure (as measurement division) to find the total of days. • Notice students who highlight that 0.25m^3 is the same as one quarter of a cubic metre.
Independent Tasks	A container has a volume of 48m^3. Can you give a range of designs for the container including the dimensions for each?
Anticipations	

Task 6	A neighbour is getting rid of bricks. Our family take some to build a brick wall around part of the section. We need a wall that is 14.5m long, 2m high and 45cm thick. If 285 bricks are needed for one m^3 wall, how many bricks do we need?
Big ideas	• 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-2: Convert between metric units, using whole numbers and commonly used decimals. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Use multiplicative reasoning to find volume. • Convert cm to m (converting between metric units). • Solve volume problems involving decimals.
Mathematical language	Volume, cubic metres, base-ten, place-value, multiply, centimetres, metres, length, depth, height.
Sharing back/Connect	Select student to share who provide an exact measure (in decimals) and an approximate measure in bricks (rounded to the nearest whole number). **Connect:** If you needed the following amount of bricks, how many would you get? 199.9 75.44 350.621 1987.765

Teacher Notes	• To launch the task, ensure that the students understand that the focus is on the number bricks. • Notice student explanations that recognise that measure for volume can be described in cubic metres even when the materials measured are not exactly the same. • Expect students to use 3-D representations as a way to explain and justify finding the volume of a uniform space.
Independent Tasks	Mona claims that two containers with the same volume and capacity must have the same shape. Do you agree or disagree? Design a proof to support your explanation.
Anticipations	

Task 7	Our BOT has decided to put 6 wooden block shaped flowerpots at the school office entrance. Each one has the following external dimensions: length 1.25m, width 300mm, height 40cm. The thickness of the wooden boards the flowerpots are made of is 0.8cm. If each flowerpot is filled to 1cm below the top how many litres of soil will the BOT need to buy to fill all 6 pots?
Big ideas	• 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. • 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:	• Use appropriate units/whole numbers to measure volume. • Use multiplicative reasoning to find volume. • Convert cm to m (converting between metric units). • Solve volume problems involving decimals.
Mathematical language	Volume, cubic metres, base-ten, place-value, multiply, centimetres, metres, length, depth, height, capacity, litres.
Sharing back/Connect	Select students to share who consider the thickness of the board and link to other similar situations (chilly bin, a freezer) in their explanation. **Connect:**

	Ask students to discuss what measures are used for volume and capacity. Introduce the concept of density.
Teacher Notes	• Density is mass divided by volume (ρ=m/v), and water was used as the basis for establishing the metric unit of mass, which means a cubic centimetre ($1cm^3$) of water weighs one gram (1g). So, $1g/1cm^3 = 1g/cm^3$, giving water its easy-to-remember density. • Notice students who recognise that 1000ml equals a litre and also that measures such as litres can be expressed as volume.
Independent Tasks	A juice container has the volume and capacity of 480ml can you give a range of designs for the box? A juice container has the volume and capacity of $250cm^3$ can you give a range of designs for the box? A juice container has the volume and capacity of 1 litre can you give a range of designs for the box?
Anticipations	

Task 8	Your baby sisters bath measures 70cm long, 50cm wide and 45cm high. If the bath is filled to 3/5 of its height how much water is used?
Big ideas	• 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-2: Convert between metric units, using whole numbers and commonly used decimals. GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Use multiplicative reasoning to find volume. • Convert between metric units (cm/m and ml/l). • Identify the relationship between volume and capacity.
Mathematical language	Volume, cubic metres, centimetres, metres, length, depth, height, capacity, litres, millilitres.
Sharing back/Connect	Select students to share who have developed explanations which consider the conversions of cm to m^3 and to ml and l. **Connect:** What if the bath had been half full? What if the bath was ¾ full?
Teacher Notes	• Notice students who recognise that 1000ml equal a litre and that measures such as litres can be expressed as volume. • Facilitate students to notice that uniformity is needed in measuring volume, and this is the same in measuring capacity.

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- Expect students to go above 1 litre including using fractional language. Facilitate them to use number lines to represent these.
- Make links to the terms, millilitre, and millimetre, and that the term milli represents one thousand.

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<tr><td>Independent Tasks</td><td>

My measurements are in a jumble. Sort them out so they match correctly.

When you have finished write another ten for someone else to solve.

<table>
<tr><td>Temperature of a fridge</td><td>0.06</td><td>seconds</td></tr>
<tr><td>Length of a human intestine</td><td>1.2</td><td>kg</td></tr>
<tr><td>Area covered by one litre of paint</td><td>324</td><td>ml</td></tr>
<tr><td>Time of one TV advert</td><td>4</td><td>°C</td></tr>
<tr><td>Mass of an adult</td><td>250</td><td>cm</td></tr>
<tr><td>Area of a piece of A4 paper</td><td>15</td><td>metres</td></tr>
<tr><td>Length of a cello</td><td>22</td><td>m^2</td></tr>
<tr><td>Capacity of a teaspoon</td><td>40</td><td>km</td></tr>
<tr><td>Mass of an orange</td><td>100</td><td>months</td></tr>
<tr><td>Temperature of the human body</td><td>10</td><td>metres</td></tr>
<tr><td>Length of the Equator</td><td>40000</td><td>m^2</td></tr>
<tr><td>Capacity of a car’s petrol tank</td><td>70</td><td>grams</td></tr>
<tr><td>Height of the Eiffel Tower</td><td>120</td><td>°C</td></tr>
<tr><td>Gestation of an elephant</td><td>37</td><td>litres</td></tr>
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<tr><td>Anticipations</td><td></td></tr>
</table>

Task 9	An aquarium tank measures 2.4m high, 6m long, and 1.5m wide and is filled with water. The density of water is 1000 kg/m³. What is the mass of the water in the tank?
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 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:	• Use multiplicative reasoning to volume. • Use appropriate units/whole numbers and decimals to measure mass • Convert between metric units. • Identify the relationship between mass and volume.
Mathematical language	Mass, volume, capacity, cubic metres, kilograms.
Sharing back/Connect	Select students to share who use a range of measurement language and representations. **Connect:** What measurements are used for mass, volume and capacity? What is the relationship between the different measurements?
Teacher Notes	• Note, density is mass divided by volume ($\rho=m/v$), and water was used as the basis for establishing the metric unit of mass, which means a cubic centimetre ($1cm^3$) of water weighs one gram (1g). So, $1g/1cm^3 = 1\ g/cm^3$, giving water its easy-to-remember density.

Independent Tasks	Solve these multiple-choice questions: A marble will have a mass of about 1g 50mg 5g A man could have a mass of about 80kg 8kg 8g A truck could have a mass of about 500kg 5t 500g A large whale will have a mass of about 20g 50kg 50t A teaspoon will have a capacity of about 300mL 5mL 5l A cup of water will have a capacity of about 350mL 5mL 1l A can of coke will have the capacity of about 1l 1.25l 2l Write 10 multiple-choice questions of your own.
Anticipations	

Task 10	A camel's mass is greatly affected by the water it drinks (and stores). For one camel, 84% of its mass is water. After drinking some water, the camel's mass increases to 416kg. Now the water accounts for 85% of its mass. What was the camels' mass before drinking?
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 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:	• Identify the relationship between capacity and mass. • Convert between metric units. • Find percentage of an amount.
Mathematical language	Mass, percentage, multiply, divide, difference, kilogram, litres.
Sharing back/Connect	Select students to share who make connections between percentages and fractions and use a range of representations. **Connect:** Describe the process to find: 90% of 200 77% of 150
Teacher Notes	• To launch the task, ensure that the students understand that the focus is on the mass of the camel before drinking.

	• Notice student use of fractions as equivalent to percentages.
Independent Tasks	1. I had 275ml of water in a container. When I put an object in the container, the water level rose to 295ml. What might I have placed in the water? What unit of measurement would you use to describe your object and why? 2. I had 300ml of water in a container. When I put an object in the container, the water level rose to 305ml. What might I have placed in the water? What unit of measurement would you use to describe your object and why? 3. I had 987ml of water in a container. When I put an object in the container, the water level rose to 1.2l. What might I have placed in the water? What unit of measurement would you use to describe your object and why?
Anticipations	

Task 11	Jodie collects water from her roof for her garden in a large water barrel. When it is full, it has a mass of 52kg. When she uses a quarter of the water on the garden, the mass is reduced to 40kg. What would be the mass of her water barrel when empty?
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 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.
Curriculum links	GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time. GM4-2: Convert between metric units, using whole numbers and commonly used decimals. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Find a fraction of an amount.
Mathematical language	Mass, multiply, divide, difference, kilogram.
Sharing back/Connect	Select students to share who use a range of representations to justify their explanation. **Connect:** Ask students to describe how they would solve the following: Jodie's water barrel has a mass of 70kg when full. If she uses 1/3 of the barrel, the mass will be 48kg. What will the mass of the barrel be when it is empty?
Teacher Notes	• To launch the task, ensure that the students understand that the focus is on the mass of the water barrel when empty. • Expect students to use a range of representations to support their solution.

Independent Tasks	1. A container holds 375 teaspoons of water. What might the container look like. Draw a diagram to represent your reasoning. 2. Design a container that could hold 5 litres of juice and still fit in your fridge. Use a diagram to represent your reasoning.
Anticipations	

Task 12	The local gardens use the apples that fall on the ground to make apple juice to give to the community. Every 7kg of apples makes 3 litres of juice. This weekend after a big storm they find 42kg of apples on the ground. How many litres of juice will they give to the community?
Big ideas	• 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. • Ratio is a relationship between two numbers of the same kind and a way of comparing two things of the same kind.
Curriculum links	GM4-2: Convert between metric units, using whole numbers and commonly used decimals. NA4-1: Use a range of multiplicative strategies when operating on whole numbers. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.
Learning Outcomes: Students will be able to:	• Solve ratio problems involving kilograms and litres by using equivalent relationships. • Solve ratio problems involving kilograms and litres by using a representation.
Mathematical language	Capacity, mass, multiply, ratio, kilogram, litre.
Sharing back/Connect	Select students to share who use a representation to solve the problem or equivalent relationships. If no students use an equivalent relationship, then model this for them. **Connect:** Brainstorm a set of commonly known measures including informal benchmarks.
Teacher Notes	• Expect students to use representations to represent the ratio and relationship. • Facilitate students to notice that the numbers can be adjusted using equivalent relationships.
Independent Tasks	Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: M13A: Volume: Dimensions of a juice container M13: Volume: Chocolate box

Anticipations	

DMIC
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

MEASUREMENT – MASS VOLUME AND CAPACITY: LEVEL 4 Task M13A

A juice container has the volume of 240 cm³. What could the dimensions of the container be?

Give a range of possible solutions and use representations to justify your reasoning.

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ASSESSMENT TASK

MEASUREMENT – MASS, VOLUME, CAPACITY: LEVEL 3-4 Task M13

Cadbury wants to make a new box for their chocolates. Each chocolate is a cube that measures 2 cm^3

They would like to fit 24 chocolates in the box. Can you design some different options for them to choose from and include the measurements and volume of the boxes?