Volume and capacity – millilitres and litres

Capacity refers to the amount a container can hold and is usually associated with liquid. Common capacity measurements are millilitres and litres.

$1000$ millilitres $= 1$ litre

$1000$ mL = $1$ L

1. **When we convert:**
   
   a. millilitres to litres, we ___ by ___
   
   b. litres to millilitres, we ___ by ___

2. **Convert these amounts to litres:**
   
   a. $3 452$ mL = ___
   
   b. $7 895$ mL = ___
   
   c. $10 000$ mL = ___
   
   d. $12 674$ mL = ___
   
   e. $56 780$ mL = ___
   
   f. $235$ mL = ___

3. **Convert these amounts to millilitres:**
   
   a. $2.568$ L = ___
   
   b. $3.999$ L = ___
   
   c. $10.566$ L = ___
   
   d. $1.78$ L = ___
   
   e. $7.305$ L = ___
   
   f. $0.35$ L = ___

4. **Solve these word problems. They all involve conversion.**
   
   a. Omar was filling up a $3$ L container with cordial. He only had a small $300$ mL jug. How many times did he have to fill the jug to totally fill the container?
   
   b. I poured $375$ mL out of a $2$ L milk container. How much was left? I then poured out another $375$ mL. How much is left now?
   
   c. How many $315$ mL glasses can be filled from a $1.7$ L jug? How much is left over?
   
   d. Paula is making a punch for her party. She uses $1.5$ L of orange juice, $750$ mL pineapple juice, $1.25$ L of lemonade and $1.25$ L of ginger ale. How much punch does she have altogether? How many $250$ mL cups will she be able to fill?
Volume and capacity – millilitres and litres

5 How much liquid is in each jug? Answer in both litres and millilitres. The first one has been done for you.

- a ______ L ______ mL
  - 0.5 ______ mL

- b ______ L ______ mL
- c ______ L ______ mL
- d ______ L ______ mL
- e ______ L ______ mL

6 Fill the jugs below to the amount shown:

- a 600 mL
- b 0.4 L
- c 1800 mL
- d 1.6 L
- e 500 mL

These capacity measurements are useful to know: 1 teaspoon = 5 mL
1 cup = 250 mL

7 Below is a recipe for the delicious summer drink, Lava Flow. The capacity measurements are expressed in cups or teaspoons. Express them in millilitres:

Lava Flow
Ingredients (for one drink)
• 1/2 cup of pineapple juice ______ mL
• 1/2 cup of cream ______ mL
• 1/2 a banana
• 3 teaspoons of coconut cream ______ mL
• 4 strawberries
• 1 cup ice ______ mL

Method
Blend all ingredients (except strawberries) until smooth. Put the strawberries in the bottom of a tall glass and add the blended mixture. Decorate with a drizzle of strawberry topping.

8 If you were going to make this drink for your entire class, what amounts of each ingredient would you need to purchase? Use a calculator if you wish. What is the most effective unit in which to express the amounts?
Volume and capacity – cubic centimetres and cubic metres

Remember that volume refers to the amount of space occupied by an object or substance. Commonly used volume measurements are the cubic centimetre and the cubic metre.

One cubic centimetre is 1 cm long, 1 cm wide and 1 cm high. The symbol we use for cubic cm is cm³. 1 cm × 1 cm × 1 cm = 1 cm³

One cubic metre is 1 m long, 1 m wide and 1 m high. The symbol we use is m³. 1 m × 1 m × 1 m = 1 m³

1 Find the volume of these shapes by counting the cubes. Each cube is 1 cm³.

a  Volume = ____________ cm³  b  Volume = ____________ cm³  c  Volume = ____________ cm³

We can find out the volume of a rectangular prism or cube without counting each block. We just multiply the length by the width by the height.

We can find out the volume of these prisms. You may use a calculator.

<table>
<thead>
<tr>
<th>Shape</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
</tr>
</tbody>
</table>

Use the formula L × W × H = V to find the volume of these prisms. You may use a calculator.

Length

Height

Width

L × W × H = V

5 × 2 × 2 = 20 cm³
Volume and capacity – cubic centimetres and cubic metres

3 Use the formula $L \times W \times H = V$ to find the volume of these prisms. You may use a calculator.

<table>
<thead>
<tr>
<th>Shape</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boxes of tissues are packed in cubic metre containers to be shipped to supermarkets. Use a calculator to work out how many of these boxes will fit into each container. You will first need to work out how many cubic centimetres are in a cubic metre.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Work with a friend on this activity. You may either physically build the towers or choose to talk through the problem together. You are building towers using centicubes. One of you makes your first level with 4 rows of 3 blocks. The other person starts with 5 rows of 4 blocks. The first one has been done for you.

a Fill in the table to show how the volume of the towers would increase as they grow.

<table>
<thead>
<tr>
<th>Level</th>
<th>Person 1</th>
<th>Person 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>12 cm$^3$</td>
<td>20 cm$^3$</td>
</tr>
<tr>
<td>2nd</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>3rd</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>4th</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>5th</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>6th</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>7th</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
<tr>
<td>8th</td>
<td>cm$^3$</td>
<td>cm$^3$</td>
</tr>
</tbody>
</table>

b Your teacher says you can only have 200 cubes between you. You build the towers to the same height. How many levels could you each build?
Volume and capacity – displacement

Remember that volume is the amount of space occupied by an object or substance and capacity is the amount an object will hold. Displacement is the amount of fluid that is pushed away when an object is placed in the fluid. We can use displacement to calculate both volume and capacity.

1 Try this experiment to find out about displacement. You will need a jug, a lunchbox, a tray and a model made from 100 centicubes. Work with a friend or in a small group.

1 Stand the lunchbox in the tray.
2 Fill the box to the top with water.
3 Carefully submerge the model in the water in the box.
4 Pour the water that overflowed into the tray into the measuring jug. How many mL equals 100 cm³?

___________________________________________

Check your answer with that of two other groups. Do they agree with you?

2 Now use the objects below (or something equivalent). Using displacement, find the volume and capacity of each object.

<table>
<thead>
<tr>
<th>Object</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Using what you now know about volume and displacement, how many millilitres of water would be displaced by objects with these volumes?

<table>
<thead>
<tr>
<th></th>
<th>a 100 cm³ = _________ mL</th>
<th>b 250 cm³ = _________ mL</th>
<th>c 500 cm³ = _________ mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 8 cm³ = _________ mL</td>
<td>e 1000 cm³ = _________ mL</td>
<td>f 56 cm³ = _________ mL</td>
<td></td>
</tr>
<tr>
<td>g 86 cm³ = _________ mL</td>
<td>h 4300 cm³ = _________ mL</td>
<td>i 1.9 cm³ = _________ mL</td>
<td></td>
</tr>
</tbody>
</table>
Volume and capacity – linking mass, capacity and volume

Do you remember the relationship between volume, mass and capacity?

\[1 \text{ cm}^3 = 1 \text{ mL} = 1 \text{ g}\]

1 Calculate the volume, mass and capacity of these shapes by counting the cubes. Each cube is 1 cm³.

a

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

b

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

c

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

d

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

e

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

f

\[
\begin{align*}
\text{Volume} &= \underline{\hspace{2cm}} \text{ cm}^3 \\
\text{Capacity} &= \underline{\hspace{2cm}} \text{ mL} \\
\text{Mass} &= \underline{\hspace{2cm}} \text{ g}
\end{align*}
\]

2 Seven tenths of the human body is water. Weigh yourself in kg then use a calculator to help you work out the answers to the following:

a How much of your mass is water? \underline{\hspace{5cm}}

b What is the capacity of this water? \underline{\hspace{5cm}}

c What is the volume of this water? \underline{\hspace{5cm}}

3 If you could drain yourself of all the water (not a good idea), what kind and size of container would be suitable and why?

\underline{\hspace{10cm}}

\underline{\hspace{10cm}}

\underline{\hspace{10cm}}
In this activity you are going to use what you know about the relationship between mass and volume to calculate the volume of the water in mud. You will need a cup, some newspaper and a scale.

Work with a partner. This experiment may take a day or so to complete and is probably best done outside.

Collect a cupful of mud or damp soil. Make sure the mud is not too sloppy. Find its mass by weighing it. How will you do this? Perhaps you could weigh the empty cup and then subtract the weight of the cup.

Now spread out your mud onto sheets of newspaper and leave it to dry in the sun. It may help to place weights on the paper or tape it down. You may also need to label your experiment so it doesn’t get accidentally cleaned up!

Once your mud has dried, carefully collect it and measure its mass. Remember to use the same cup. Why do you need to do this?

What was the volume of water in the mud?

How do you know?

Find a rock that has the same volume as the lost water. How will you do this? How will you know that it has the same volume?
This activity could come in handy should you ever be stranded in the bush somewhere! You will need a garbage bag, some string and a measuring jug. Work in a small group.

You are going to predict, collect and measure the amount of water a tree branch loses through transpiration (evaporation) over the period of a day. It is best to begin the experiment as early in the day as possible and to collect the water as late in the day as you can. Choose a nice sunny day for your experiment. A bit of a breeze will help too.

Choose a nice leafy tree branch. How much water do you think you will be able to collect from it? Write down your predictions.

Put your bag over your selected branch and tie it off. Now, make a pouch at the bottom of the bag and tie that off too.

Leave the bag over the day and come back to collect the water as late as you can.

Cut the pouch and carefully drain the water into a measuring jug. What is the capacity of the water you have collected?

Compare your results with the results of other groups. Do they differ? Why?

Repeat your experiment on another day using the same branch. Are your results different to those of the original experiment? What was different about the two days?