

**CAPACITY is the theme
for this INCLUSION AND HOME LEARNING GUIDE**

This Guide suggests related learning activities for all ages from 4 to 17+

Just choose whatever seems suitable for your group of learners

The BOTTLES AND CAPACITY activity was designed for Years 2 to 4.

BOTTLES AND CAPACITY



You will need some water and a collection of jars and bottles of different sizes and shapes like those in the picture, or a mixture of jars or bottles and paper cups of different shapes

and sizes.

Which holds the most?

Which holds the least?

How could you find out? Explore

Put your containers in order from smallest capacity to largest capacity.

Can you find a way of counting how many times each of the other containers will fill the smallest container?

You could create your own questions for yourself or friends to answer.

HELP

Start with just 2 containers and explore the question of how many of the smaller container it would take to fill the larger one. If possible, test this practically using water or sand.

Compare the capacities of other containers 2 at a time and try to put all of them in order from smallest to largest.

NEXT

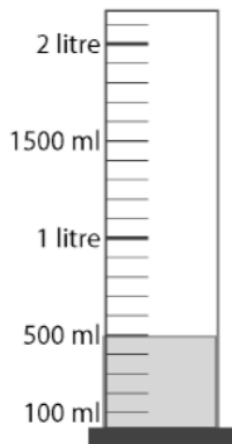
This activity has been all about comparing the capacities of various containers and estimating how much bigger one container is compared to another. Choose the largest and smallest of your collection of bottles. Predict what level a liquid would come up to in the larger vessel when it's poured from the smaller one. Then check to see how accurate your estimate was.

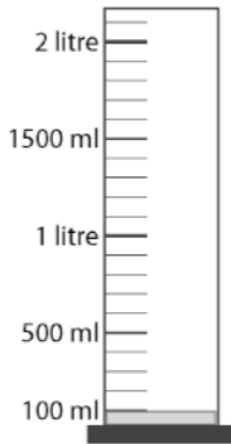
The NEXT activity takes you into the measurement of capacity. If you have an empty plastic bottle in your kitchen (for example a bottle for milk), that has the capacity in litres stated on the label, then mark lines on it to represent 1 litre, 500 millilitres and every 100 millilitres from 100 millilitres to 1 litre. By pouring water from other containers check the accuracy of your markings.

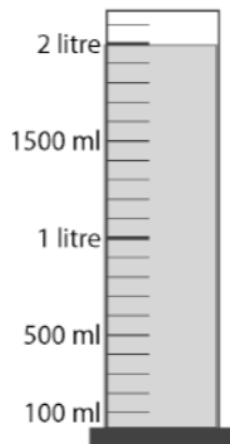
Use your home-made measuring bottle to measure the capacities of all your jars and bottles in litres or millilitres. If you have a measuring jug then use it for checking.

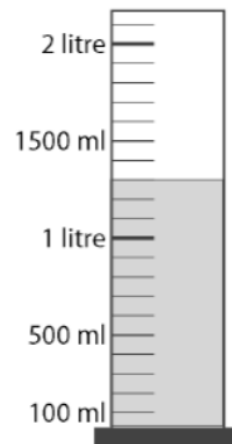
CAPACITY WORKSHEET FOR YEARS 7 TO 12

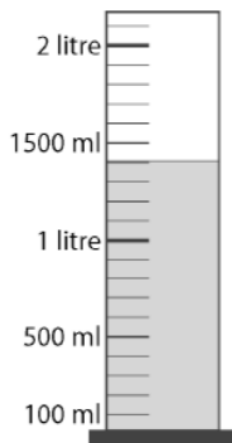
Under each cylinder, on the **top line**, write down the number of **millilitres** of liquid in the cylinder. On the **second line** write the number of **litres**, for example the first one is 500 millilitres which is 0.5 litres.

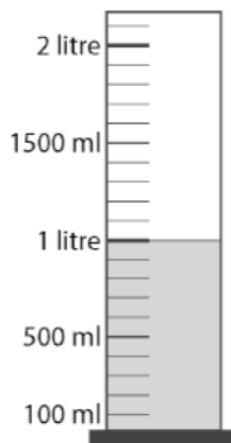


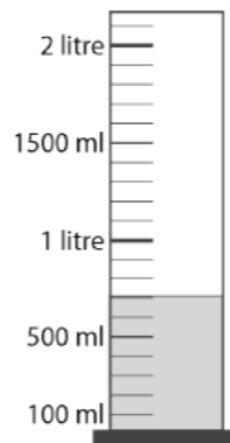


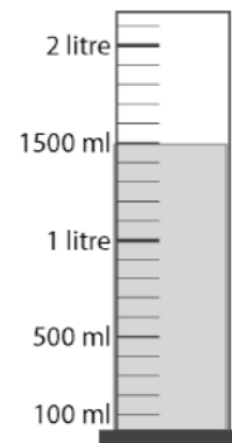












INCLUSION AND HOME LEARNING GUIDE

THEME: CAPACITY

Early Years



Hours of water play provide good early learning experiences for babies and small children. Containers from the supermarket, that would otherwise be thrown away, are excellent toys for this play. The play-learning can be enriched by play with sand and water, either at the beach or in a play area.

For this activity choose a few containers of different sizes. Ask the children to think about how much water they will contain and then ask them to arrange the containers in order accordingly. You can introduce the word **capacity**.

They can test to see if they were right about the order. You could then ask the children to compare the capacity of these containers with the capacity of their own favourite drinking cup or mug.

Lower Primary

Start with the diagnostic quiz as a warm-up to this topic.

Collect empty bottles and containers that would otherwise be thrown away. Some discussion could be had by looking at the bottles in the picture. Do this session outdoors or perhaps by the kitchen sink or in the bath. Ideally the learners should have a variety of bottles or jars to talk about and to explore the capacities practically for themselves.

If you have sand available then it can be used dry instead of water. Ideally the children will work on this activity in pairs or small groups. Give them plenty of time to discuss how the capacities compare and then how they could explore the capacities further, before testing this out and discussing the findings.

At the end you might ask them to help you to find the answers to the questions. Encourage them to ask other questions and together find the answers.

Key questions

- Why do you think that bottle is the largest? (Or why is it the smallest?)
- Tell me about your ideas.
- Why do you think this?
- Why have you chosen this as the smallest container"

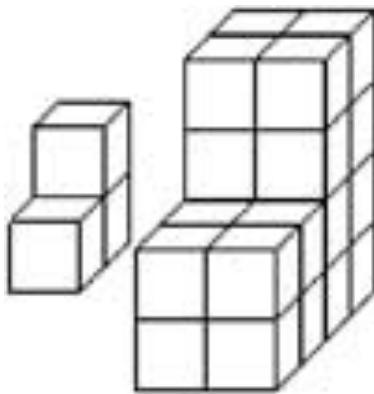
Upper Primary, Lower and Upper Secondary

(1) You could put the 8 cups or containers on a table and ask “Which cup would you fill with water if you are really thirsty and want a lot to drink?”. Then ask for a learner to arrange the cups in order of size. Ask the rest of the group if they agree and, when everyone has agreed the order, label the cups from number 1 (the smallest) to 8 (the biggest).

Pose some questions and encourage the learners to think about the answers by estimating and by eye at first.

You could ask all them to write down their answer to the question “How many cupsful from cup 1 would it take to fill cup 8?” Then test this by filling and re-filling cup 1 and pouring the water into cup 8 until it is full.

It is likely that learners will underestimate this number, perhaps giving an answer depending on the relative heights of the cups. Have some discussion of why learners did not make a better estimate of this answer.



Perhaps use this diagram to illustrate why a 3D object that is twice the height is NOT twice the volume.

Then ask a similar question: “How many of cupsful from cup 4 will fill cup 8?” and again check the answer.

So far you don’t need a measuring jug.

(2) This can be a continuation of the session above or a separate session. Use your measuring jug to show the learners how to find out the capacity of cup 1 and cup 8 in millilitres.

Introduce the idea of a LITRE and the meaning of the word ‘milli’ meaning ‘one thousandth’. Discuss the fact that there are 1000 millilitres in one litre.

Also make the connection with the use of litres when we buy petrol and perhaps use some empty containers from your kitchen that have the quantity contained in litres and millilitres written on the labels.

Ideally learners will have a chance to read the number of millilitres from the scale for themselves. While younger children are doing this older learners can be helping them or doing the worksheet on page 3. You can discuss the answers to this worksheet with the children before proceeding to the final part of the activity.

(3) Now have all the cups on display and label cups 1 and 8 with their capacities. Tell the learners to “Use this information about the capacities of cup 1 and cup 8 to help

you **to estimate** the capacities in millilitres of the other cups, numbered 2, 3, 4, 5, 6 and 7. Write down your estimates.”

When everyone has done this, demonstrate how to check by filling these cups with water and then pouring the water into the measuring jug and reading the number of millilitres from the scale. Has this session helped everyone to get better at estimating capacities?

Key questions

- How many of cup 1 (or cup 4) will fill cup 8? How did you decide on that estimate? Tell me about your thinking.
- How will you test out your ideas?
- Why is it important to remember that we are working in 3 dimensions?
- How many hundreds in 1000?
- How do you write down one tenth?

Diagnostic Assessment

This should take about 5–10 minutes.

Learners will find this quite easy and it gives an opportunity for developing the language ‘more (or greater) than’, ‘equal to’ and less than’, ‘full’, ‘empty’, and perhaps introducing the symbols $>$ and $<$.

Write the question on the board, say to the class:

“Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D”.

Bottle 3 has _____ juice than bottle 1, but _____ than bottle 2.

1 2 3

A B C D

less, more less, less full, empty empty, full

1. Notice how the learners respond. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for the answer.
2. It is important for learners to explain the reasons for their answers to help them to develop communication skills and perhaps to sort out their own thinking in order to give an explanation.

3. Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.

4. Ask the class to vote again for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.

A. is the correct answer.

<https://diagnosticquestions.com>

Upper Secondary

Complete the worksheet on page 3 and then study the following guidance. It's information that every adult and young adult should know and understand.

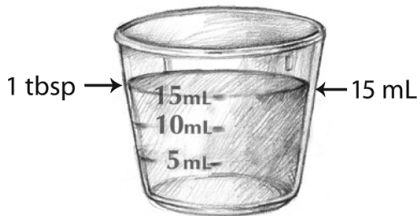
How to Measure Liquid Medicines



- Use the dropper, syringe, medicine cup, or dosing spoon that comes with the medicine. If the medicine does not come with a dosing device, ask your doctor or pharmacist for the one that should be used. Never use teaspoons, tablespoons, or other household spoons to measure medicine.

Best practice is to measure in milliliters (mL, ml, or mls) as read on the dosing device. In the past medicine was often measured in teaspoons (tsp), or tablespoons (tbsp).

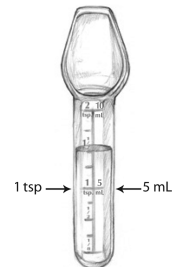
Medicine cups



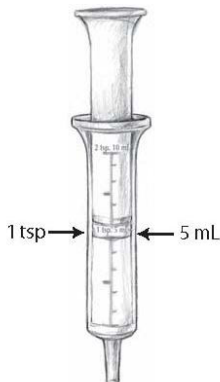
- Be sure to use the cup that comes with the medicine. These often come over the lids of liquid cold and flu medicines. Don't mix and match cups to different products. You might end up giving the wrong amount.
- Don't fill it up. Look carefully at the lines and letters on the cup. Be sure you are using the correct measure for the dose. Use the numbers and fill the cup to the right line. Ask your pharmacist to mark the right line for you if you are not sure. Be sure the cup is level. You can check by putting it on a flat surface.

Dosing spoons:

These work well for adults and older children who can "drink" from the spoon. Use only the spoon that comes with the medicine. Be sure you are using the correct measure for the dose and use the lines and numbers to get the right amount. Ask your pharmacist to mark the right line if you are not sure.



Droppers or syringes



- Don't just fill the dropper or syringe to the top. Read the directions carefully to see how much to use. Look at the numbers on the side of the dropper or syringe. Use the numbers to fill it to the right line. Or ask your pharmacist to mark the right line if you are not sure. *(If the syringe has a cap, throw it away before you use it. The cap could choke a child.)*
- Don't put the medicine in the back of the throat. This could choke someone. Squirt it gently between the patient's tongue and the side of the mouth to make it easier to swallow.

See American Academy of Pediatrics: <https://healthychildren.org>

Why do this activity?

This activity is useful for young learners to start thinking about capacity and to begin to calculate in that context. It will encourage discussion between learners and between learners and the teacher. Young learners are not required to measure in millilitres but merely to compare capacities.

This activity introduces learners in Upper Primary School (Years 4 to 6) to reading the scales on a measuring jug in millilitres and litres. Estimating quantities in millilitres and checking by actually pouring water from one container to another is a valuable learning experience.

Secondary School learners should become confident about measures of capacity, including the applications to doses of medicine. This Learning Guide provides for them.

Learning objectives

In doing this activity learners will have an experience of:

- practical **measuring of capacity and volume**: estimating, comparing, ordering and recording that will lead to the use of measuring instruments: measuring spoons, measuring cups, measuring jugs;
- calculations and problem solving in contexts involving capacity/volume.

Generic competences

In doing this activity students will have an opportunity to:

- **think flexibly**, be creative and innovative and apply knowledge and skills;
- **visualize and estimate quantities** and check estimates;
- **develop practical skills**.

Suggestions for teaching

Follow up

See also: <https://aiminghigh.aimssec.ac.za/years-5-7-cups-and-capacity/>

Go to the **AIMSSEC AIMING HIGH** website for lesson ideas, solutions and curriculum



links: <http://aiminghigh.aimssec.ac.za>

Subscribe to the **MATHS TOYS YouTube Channel**

<https://www.youtube.com/c/mathstoys>

Download the whole AIMSSEC collection of resources to use offline with the **AIMSSEC App** see <https://aimssec.app> or find it on Google Play.

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and school years up to Secondary 5 in East Africa.

New material will be added for Secondary 6.

For resources for teaching A level mathematics (Years 12 and 13) see <https://nrich.maths.org/12339>

Mathematics taught in Year 13 (UK) & Secondary 6 (East Africa) is beyond the SA CAPS curriculum for Grade 12

	Lower Primary Approx. Age 5 to 8	Upper Primary Age 8 to 11	Lower Secondary Age 11 to 15	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13