

CUPS AND CAPACITY

(1) You will need a collection of cups, either disposable cups like the ones shown or any mugs and cups you have available. You will also need some water and a measuring jug or cylinder.



Which cup would you fill with water if you are really thirsty and want a lot to drink?

Arrange your cups in order of size from the one that holds the smallest amount of liquid (the smallest capacity) to the one that holds the most.

Number your cups 1 to 8, number 1 for the smallest capacity and 8 for the biggest.

How many cupsful from cup 1 would it take to fill cup 8? How would you test this without using a measuring jug? Now check this answer. Was your estimate about right? If not can you explain how you made your estimate and why it was wrong?

How many cupsful from cup 4 will fill cup 8?

(2) Now use your measuring jug to find the capacity of cup 1 and cup 8 in millilitres.



Use this information to help you **to estimate** the capacities of cups 2, 3, 4, 5, 6 and 7 in millilitres. Write down your estimates.

Now check by filling cups 2, 3, 4, 5, 6 and 7 in turn with water and then pouring the water into the measuring jug and reading the number of millilitres from the scale.

HELP

If you have a sink in your classroom, or some sand, and can experiment for yourself, it would be ideal to work on this activity practically in pairs or small groups.

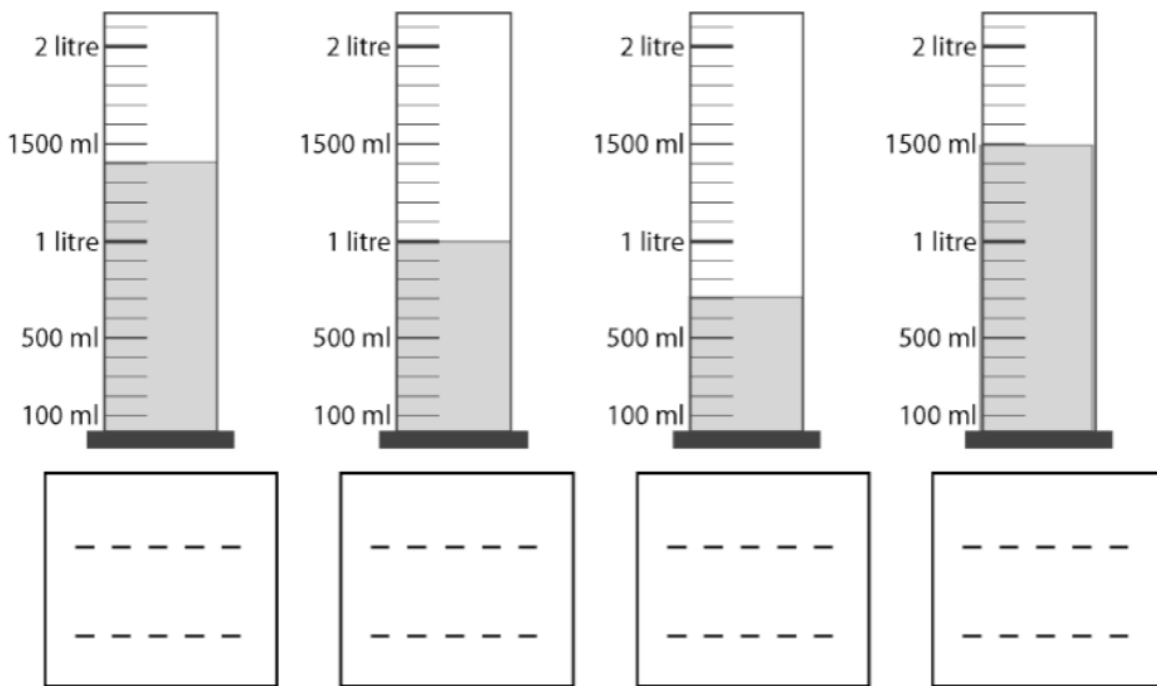
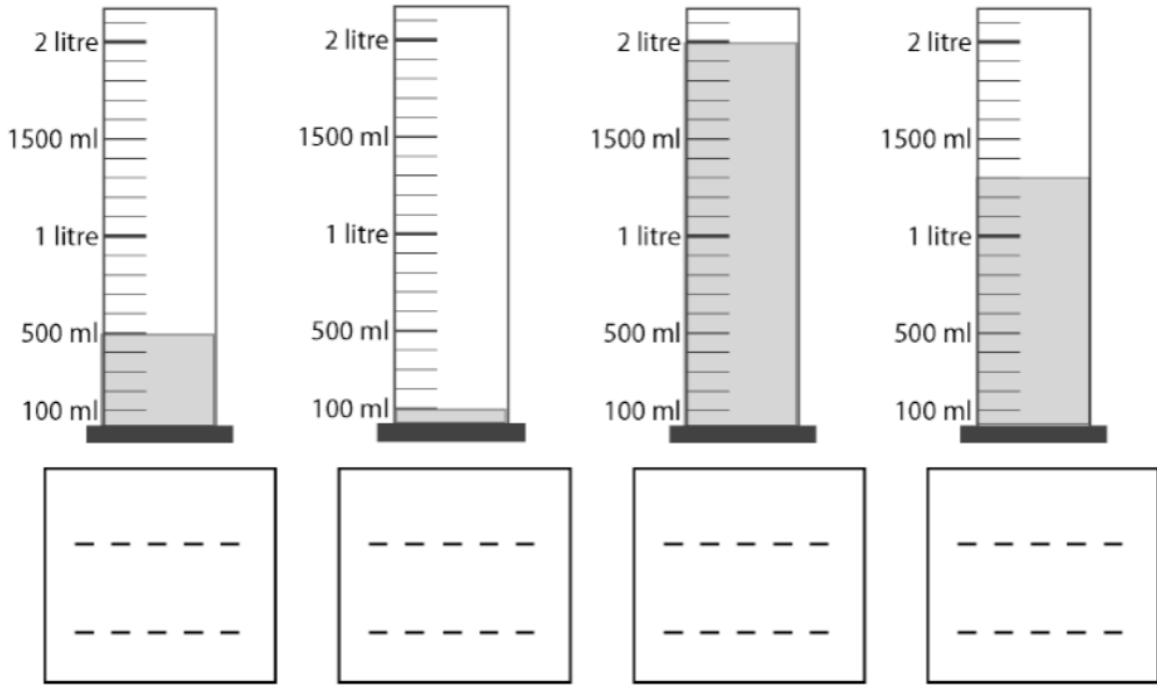
With a partner, use 2 cups (perhaps you could each bring a cup to class for this activity). Answer the question about how many of the smaller cup fill the bigger one by pouring the water (or sand) from cup to cup, or from cup to measuring jug. Then do the experiment with more cups.

NEXT

Find a much smaller container, for example a teaspoon or a 5 millilitre medicine spoon and estimate how many of the smaller container it would take to fill the bigger container.

CAPACITY

Under each cylinder, on the **top line**, write down the number of millilitres of liquid shown 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.



NOTES FOR TEACHERS

Why do this activity?

The Cups and Capacity 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. This practical activity gives learners an opportunity to develop their conceptual understanding of capacity before working with standard units. 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.

This Learning Guide provides help for secondary school learners to become confident about measures of capacity, including the applications to doses of medicine.

Learning objectives

In doing this activity students will have an opportunity to:

- learn about capacity and volume;
- to develop the skill of estimating capacity in millilitres;
- to develop a better understanding the metric system.

Generic competences

In doing this activity students will have an opportunity to:

- **think flexibly**, be creative and innovative and apply knowledge and skills;
- develop the skill of estimating quantities and a better familiarity with the metric system.

Suggestions for teaching

(1) You could put the 8 cups on a table at the front of the class 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 come to the front and to arrange the cups in order of size. Ask the rest of the class if they agree and when everyone has agreed the order label the cups from 1 (the smallest) to 8 (the biggest).

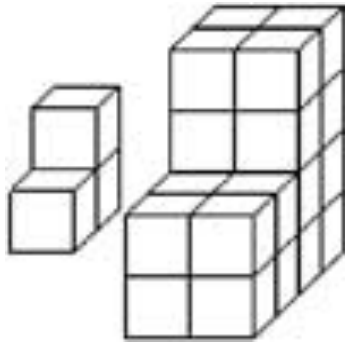
Pose some questions to the class, as in the problem, and encourage them to think about the answers by estimating and by eye at first.

You could ask all the class to write down their answer to the question "How many of cupsful from cup 1 would it take to fill cup 8?" (perhaps on a showboard). 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 class 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 lesson above or a separate lesson. Use your measuring jug to show the class 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 bring some empty containers from your kitchen that give the quantity written on them of whatever is inside in litres and millilitres.

Ideally you will work with small groups from the class so that learners have a chance to read the number of millilitres from the scale for themselves. While the different groups are doing this the rest of the class can be doing the worksheet on page 2. You can discuss the answers to this worksheet with the class before proceeding to the final part of the activity.

(3) Now have all the cups on display and the capacities of cups 1 and 8 written on the board and tell the whole class 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 all the class has done this, demonstrate to the class 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. Have they got better at estimating these 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?

Follow up

Bottles and Capacity is designed to come BEFORE Cups and Capacity

<https://aiminghigh.aimssec.ac.za/years-4-7-bottles-and-capacity/>

Little Man <https://aiminghigh.aimssec.ac.za/years-4-6-little-man/>