## News

The weather is getting hot and students are filling up their water bottles even more than usual, so it's probably a good time to think about all the maths that's related to water. Did you know that 70.8% of the surface of the Earth is covered by water?[1] Also, according to the Guinness Book of Records, the fastest time for drinking 1 litre of water is 13 seconds, but please don't try to beat that. What exactly is a litre of water anyway?

A Litre of Water

Do you know that '**a litre of water's a pint and three quarters**'?[2] $1\,cm^3$ is actually the same thing as 1 millilitre. They are both measures of volume. That means 1 litre is the same as $1000\ cm^3$. If you want to picture what that looks like, one way to do it is to picture a cube whose sides are all 10 cm long. Like the one directly below these words.[3]

10 cm

10 cm

10 cm
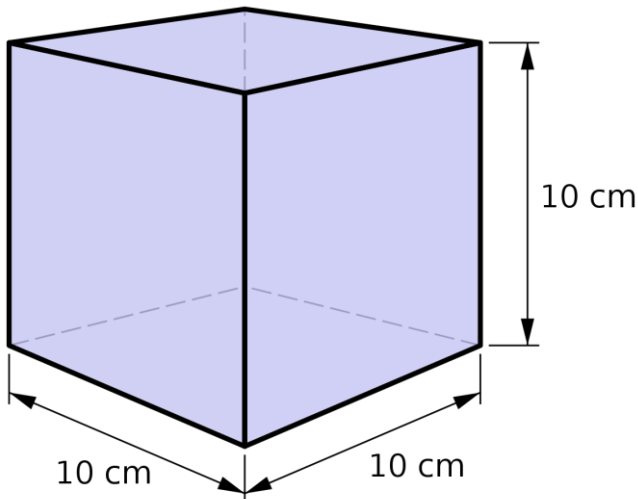
Maths Words

In maths, a **unit** is something that tells you what the number 1 represents in a given situation. If I measure my classroom and say that its width is 7, this makes no sense until I define what I mean by 1 in this situation. If I define 1 to be a metre, then that is my unit. My classroom then has a width of 7 metres and most people will then understand what I mean.

Junior Maths Challenge

Congratulations to Sophie Howman in 7X and Diya Adheesh in 8V who both scored an amazing 129 out of 135 in the recent Junior Maths Challenge Kangaroo round. Close behind them were Sophie Wallace in 8V, Savannah Seid in 7V, Thushara Yasotharan in 8Y, Arushi Lahiri in 8W, and Advika Singh in 7X. They all did extremely well. If you are looking for something mathematical to do over the summer holidays, why not have a go at some UKMT Maths Challenge papers from previous years? You'll find a lot of them online.

Joke

What did one raindrop say to the other raindrop?

Two's company, three's a cloud.

1. Remember facts like this for when you are taking part in a quiz.
2. Remember this. I've found that it's occasionally useful. More accurately, a litre is actually 1.75975 pints.
3. Cube in diagram not actual size, although this may depend on how far away you are from this newsletter.

A Special Number

What's special about the number **381654729**?

Here are two clues:
1. It's to do with divisibility rules.
2. It's related to the fact about the number 102 at the start of this newsletter.
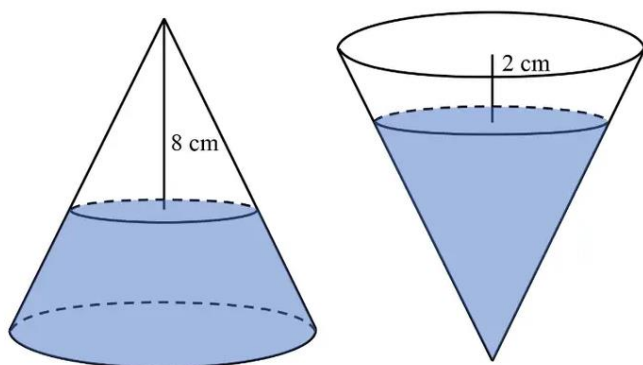
Water Bottle Puzzle

Here's a water-based maths puzzle. A jar is partly filled with water. The diagram shows you what it looks like when it is the right way up and when it is turned upside down. What fraction of the bottle contains water?
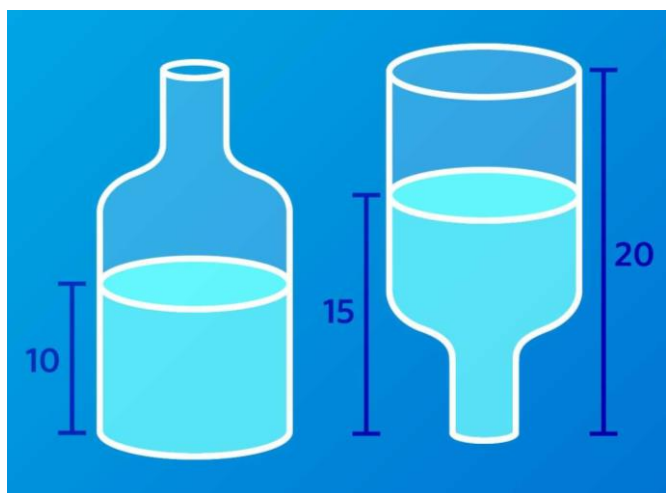
Water Cone Puzzle

Here's a slightly trickier version. A cone is partly filled with water. The diagram shows how it looks the right way up and upside down.[4] What is the height of the cone?

Water Pouring Puzzles

These maths puzzles are very common and they go something like this:

You have three jugs that hold 8 litres, 5 litres and 3 litres. The 8 litre jug is filled with water. Using these three jugs, is it possible to measure out exactly 4 litres of water?
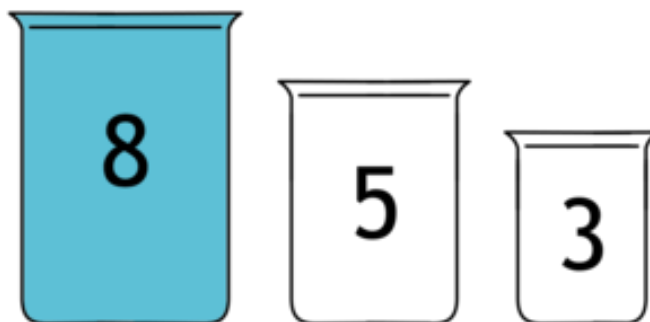
The maths behind these puzzles is very interesting. Since you can only know how much is left in a jug if you use the water from it to completely fill a smaller jug, you will only ever be able to create certain amounts. The question is which ones can you create and why?[5] How do the three different capacities determine what amounts you can make? Well, here's a clue:

If two different numbers have a common factor and you subtract the smaller number from the bigger number, the amount you have left will also be divisible by that factor.

So, for example, 20 and 12 are both divisible by 4. If I subtract 12 from 20 I get 8, which is a number that is also divisible by 4.

This fact is the key to understanding some important ideas in maths such as **Euclid's Algorithm**, and **Bézout's Identity**. You won't find either of those things on the GCSE Maths syllabus, but I recommend looking them up if you're interested.[6]

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4. Don't ask me which is which.
5. Yes, OK, I know, that was two questions.
6. Euclid's Algorithm is also required for a full understanding of the proof of Lagrange's Four Square Theorem, which I definitely haven't forgotten about!