



News

Hello! We thought we'd start the new year by trying to convince you that you don't actually exist. This is because the universe in which you live actually has no people in it, so therefore you can't be one of them. It's quite simple really. This is how the writer Douglas Adams explained it: "Although you might see people from time to time, they are most likely products of your imagination. Simple mathematics tells us that the population of the universe must be zero. Why? Well given that the volume of the universe is infinite there must be an infinite number of worlds. But not all of them are populated; therefore only a finite number are. Any finite number divided by infinity is zero, therefore the average population of the universe is zero, and so the total population must be zero." Therefore you can't possibly exist. And if that wasn't enough of a bombshell...



Mathsbombe

The Manchester University **Mathsbombe** competition starts on Wednesday 10th January, so form a team¹ and sign up. We need to start winning some competitions!

The Dame Kathleen Ollerenshaw



- 1. Each team is limited to four students.
If you prefer code breaking, the Alan Turing Cryptography competition (also run by the University of Manchester) starts on Monday 15th January.
- 2. If we can divide by infinity, surely we can multiply by infinity too... can't we?

Zero and Infinity

So if you can't divide by zero, can you really divide by infinity? Was Douglas Adams right when he said that 'any finite number divided by infinity is zero'? It seems fairly sensible, doesn't it? If you divide something by a bigger and bigger number, the answer becomes smaller and smaller, so if you divide something by something infinitely big, the answer will be infinitely small... which is zero... isn't it? The problem with this though is that if the two sums to the right of this sentence are correct, then it must also be true that

$$1 \div \infty = 0$$

$$2 \div \infty = 0$$

$$1 \div \infty = 2 \div \infty$$

because they both equal zero, and if we multiply both sides of the equation by infinity², we get

$$1 = 2$$

So maybe you do exist after all. Maybe there are two of you. Perhaps you are like two circles in a Venn diagram.

Joke



Harold had to face the painful truth that he and Daisy were never going to be a Venn diagram.

Infinite Improbability

Perhaps zero and infinity are really the same thing. Have you ever thought that?³ If they were, then that would mean that something that had a zero probability of happening would actually be extremely likely to happen. In his famous novel, *The Hitchhiker's Guide to the Galaxy*⁴, the writer Douglas Adams explored this idea by having a spaceship powered by an 'infinite improbability drive'.



He described it as 'a wonderful new method of crossing vast interstellar distances in a mere nothingth of a second, without all that tedious mucking about in hyperspace.' It was discovered when a student thought to himself that 'since such a machine is a virtual impossibility, then it must logically be a finite improbability. So all I have to do in order to make one is to work out exactly how improbable it is, feed that figure into the finite improbability generator, give it a fresh cup of really hot tea ... and turn it on!'

Mistakes

Some of you who read our newsletter carefully, might have noticed a mistake in the last one. We incorrectly stated that the number 8549176320 is divisible by 7. It's not. The reason we made this mistake is that if you type $8549176320 \div 7$ into your calculator it will give you a whole number answer. Can you work out why this is? In maths though, we love making mistakes, because we know that it's by making mistakes that people learn things. We just feel sorry for the students who never seem to make any mistakes at all. They can't be learning anything!

3. They're not.

4. (which you should all read)

Maths Challenge

The Intermediate Maths Challenge is on the 1st February so if you want to do some serious practising for that, come and get some practice papers from the maths department.

The Apples Puzzle

Here is a puzzle from Alex Bellos.

You and your two friends Pip and Blossom are captured by an evil gang of logicians. In order to gain your freedom, the gang's chief, Kurt, sets you this fearsome challenge.

The three of you are put in adjacent cells. In each cell is a quantity of apples. Each of you can count the number of apples in your own cell, but not in anyone else's. You are told that each cell has at least one apple, and at most nine apples, and no two cells have the same number of apples.



The rules of the challenge are as follows: The three of you will ask Kurt a single question each, which he will answer truthfully 'Yes' or 'No'. Everyone hears the questions and the answers. He will free you only if one of you tells him the total number of apples in all the cells.

Pip: Is the total an even number?

Kurt: No.

Blossom: Is the total a prime number?

Kurt: No

You have five apples in your cell.

What question will you ask?