



A scrambled Rubik's Cube can always be solved in at most 20 moves

News

As you probably know, Dr Ridha is 21 years old this year¹, and is retiring at the end of the week.

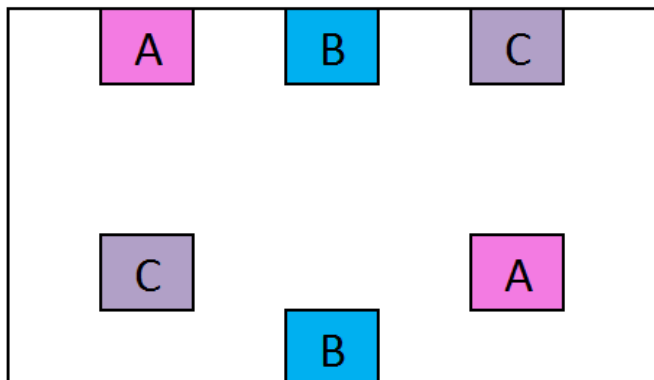
Because of this, we asked him to tell us what his favourite number is, what his favourite puzzle is, who his favourite mathematicians are,



and what his favourite maths quotes are. We also asked him what he planned to do during his retirement, and were surprised to discover that he plans to start his own religion based around the numbers 0 and infinity. He has always thought of these numbers as being like God and the devil, although he's not sure which one is which. Why not ask him about it? (We're not quite sure if he's joking or not about this.)²

Puzzle

Here is a puzzle from Dr Ridha. All you have to do is join each pair of corresponding letters without crossing any of the lines.



1. If you only count the prime numbers.
2. But we think he probably is joking.
3. The only other decimal number, apart from 0 and 1.
4. Although unofficial sources claim that we actually came joint 2nd.

Favourite Number

Dr Ridha's favourite number is 3435. This is because

$$3435 = 3^3 + 4^4 + 3^3 + 5^5$$

Numbers with this unusual property are called Canouchi numbers and they are very rare. The only other number³ with this property is 438579088.

Competition Winners!

Several Camp Hill girls have taken part in various maths competitions over the last few weeks. On 13th July, six year 9 girls (Eleanor, Emma, Susannah, Ria, Kujani and Naiya – see the picture below) finished 3rd in the Year 9 South Birmingham Schools Team Challenge.⁴ On 7th July, five year 9 girls (Anna, Anshu, Eleanor, Kujani and Susannah) finished 3rd again (this time, out of roughly 400 teams that entered) in the Edge Hill University Mathematics Challenge. Kanakdurga Nanda in year 8 won a silver medal in the Junior Maths Olympiad, placing her in the top 50 competitors in the country. Naina Gupta in year 7 also achieved a merit in the same competition.



Year 9 at Queensbridge on Wednesday 13th July

Évariste Galois

Dr Ridha's favourite mathematician is the French genius Évariste Galois, who is mainly known for two things. Firstly, he was killed in a duel in Paris at the age of 20, in the year 1832. Nobody is certain why this happened, but we do know that he was considered by some people to be a bit of a troublemaker because of his political views. There was also a woman involved, but we're not sure who it was, and we're not sure if it was her fiancée who shot Galois. It's all a bit of a mystery. The other thing Galois is famous for is being a brilliant mathematician, although this was never recognised while he was alive. You may know that the quadratic equation $ax^2 + bx + c = 0$ can be solved using the quadratic formula⁵:



$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

There are also formulas to solve equations where the highest power of x is 3 or 4 (called cubics and quartics). One of the big unsolved maths problems of the early 1800s was to explain why there did not appear to be formulas for solving equations with powers of x bigger than 4. Galois answered this question, and also explained why it's possible to solve equations of degree 4 or lower⁶ using a formula, and why their solutions take the form that they do. Galois theory also gives a conceptually clear, and often practical, means of telling when some particular equation of higher degree can be solved in that manner.

5. You now need to memorise the quadratic formula for your GCSE exam (not right now – but at some point).
6. The 'degree' of an equation is the highest power of x . It is also sometimes called the 'order' of the equation.
7. Yes, we know they don't look identical in the picture, but it was the best we could find at short notice.
8. We said quite a bit about Leonhard Euler back in newsletter 2 (19th October 2015)

Puzzle

Dr Ridha first solved this puzzle when he was a teenager, while he was half asleep, more than half a century ago.

These 12 marbles appear to be identical.⁷ In fact, 11 of them are identical, and one is of a different weight. Your task is to identify the unusual marble and discard it. You are allowed to use the scales a maximum of three times. Can you do it?



Maths Quotes

Here is one of Dr Ridha's favourite quotes about mathematics.

"Not only does zero hold the secret to our existence; it will also be responsible for the end of the universe."

Charles Seife

Last Week of Term

Dr Ridha will be greatly missed at Camp Hill, so why not say goodbye to him before the end of the week? You could ask him how Gauss worked out how to add up the numbers from 1 to 100 in under 10 seconds, or why he's particularly fond of the Riemann Zeta Function. You could tell him the answer to one of his puzzles, or ask him why he thinks the mathematician Leonhard Euler was actually better than Galois.⁸ Perhaps you could ask him more about his new religion of zero and infinity, or maybe just wish him well for the future. He would like that. Anyway, have a good holiday and see you in September ☺