



King Edward VI Camp Hill School for Girls

Maths Department Newsletter

25th September 2023

98.6 degrees Fahrenheit is the normal body temperature for humans

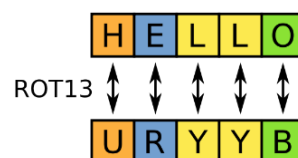
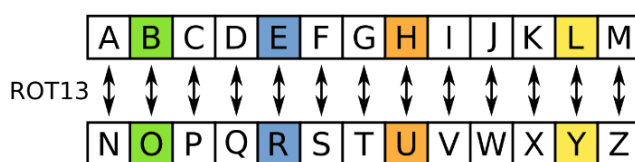
News

How often do you think about the Roman Empire? This seems to be a question that lots of people are asking at the moment. Here at the maths newsletter, we don't talk about the Romans very much because, on the whole, they weren't very interested in maths.¹ This should come as no surprise when you think about their number system. Roman numerals are hardly ideal for doing maths with. Try doing a long multiplication with Roman numerals and let us know how you get on. Is it even possible? The woman in the picture above was named Hypatia. She wasn't Roman, but she lived during the time of the Roman Empire, in Alexandria, on the north coast of Egypt. She is well-known for being the first female mathematician that we know very much about.² Unfortunately, she was killed in the year 415 AD by an angry mob who didn't agree with her beliefs.



Competition

One thing that the Roman Emperor Julius Caesar is famous for is something called a Caesar cipher. This is a way of encrypting a message by shifting all the letters forwards a fixed number of places through the alphabet. Julius Caesar apparently used to shift the letters 3 places along in his messages, so A would become D etc. A popular shift is to move each letter 13 places along. Why do you think this is?



VG'F GUNG GVZR BS LRNE NTNVA JURA
 JR'ER TRGGVAT ERNQL GB FGNEG GUR
 FBHGUNZCGBA HAVIREFVGL PVCURE
 PUNYYRATR. GUVF VF N PBZCRGVGBA
 GUNG JR GNXR CNEG VA RIREL LRNE, NAQ
 VG'F SBE NALBAR JUB VF VAGRERFGRQ
 VA PBQR OERNXVAT. JRY Y QBAR SBE
 OERNXVAT GUVF SVEFG PBQR. WHYVHF
 PNRFNE JBHYQ OR IREL NAABLRQ JVGU
 LBH. CYRNFR PBZR NYBAT GB GUR ZNGUF
 QRCNEGZRAG GB TRG NABGURE PBQR VS
 LBH NER VAGRERFGRQ VA ORVAT CNEG
 BS BHE FPUBBY PBQR OERNXVAT GRNZ.
 VG'F NOBHG GVZR JR JBA GUVF
 PBZCRGVGVBA!

Joke



I can't remember how to write 1, 1000, 51, 6 and 500 as Roman numerals!

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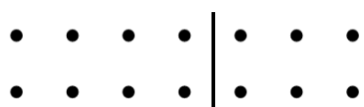
1. I know. Crazy.

2. We do know of other female mathematicians before Hypatia (such as Pandrosion) but we don't know much about them.

Lagrange's Four Square Theorem (part 2)

As you may remember, starting from the previous newsletter (number 97), I'm going to be exploring the ideas needed to prove Lagrange's Four Square Theorem. Last time we thought about what even and odd numbers are³, so now let's think about what happens when we add them together.

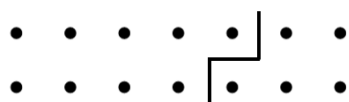
If an even number is just made up of groups of 2, we can see what will happen when we add two even numbers together.



We will just end up with even more groups of 2, which will be another even number.⁴ Therefore, we have the rule that says

Even + Even = Even

An odd number can be thought of as just being an even number with 1 added to it, so what happens if we add two odd numbers together?

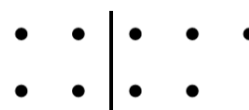


The diagram shows us what happens when we add 9 and 5. The two extras 1s that make the two numbers odd combine together to make another group of 2. This means the sum of the two odd numbers is now an even number. This gives us the rule

Odd + Odd = Even

Hopefully this all seems very obvious and easy to understand. If so, that's good. My aim is to try to get you all the way to the end of the proof without that changing.⁵

It probably goes without saying that if you add an even number to an odd number, you will get an odd number.



We'll leave it there for now. I'll continue this in the next newsletter. Meanwhile, here's a riddle and a puzzle for you.

Riddle

I am an odd number. Take away one letter and I become even. What am I?

A Tricky Puzzle

Here is a puzzle about odd and even numbers. Try to solve it yourself before you click on the link to see the solution.

I write the whole numbers from 1-9999 (inclusive) on a huge chalkboard. Each number is written once.

During the night the board is visited by a series of naughty maths elves. Each elf approaches the board, selects two numbers at random, erases them, and replaces them with a new number that is the difference between the two numbers they erased.

This vandalism continues all night until there is just one number remaining.

I return to the board the next morning and find the single number on the board. Is this remaining number odd or even?⁶

3. If you didn't read the back of the previous newsletter, it might be a good idea to do that.

4. The diagram shows us what happens when we add 8 and 6.

5. It's not going to be easy. I know some of the stuff that's coming up!

6. Solution: <https://www.theguardian.com/education/2022/oct/17/did-you-solve-it-nick-berry-data-dude>