King Edward VI Camp Hill School for Girls
Maths Department Newsletter

5th October 2020

73 is the only Sheldon number

News

In the 73rd episode of The Big Bang Theory, Sheldon says that 73 is the best number.

He says that this is because the product of its digits is 21, and 73 happens to be the 21st prime. This is called the **multiplication property** of Sheldon primes. He also points out that the reverse of 73 is 37 and this is the 12th prime number, and 12 is the reverse of 21. This is called the **mirror property** of Sheldon primes. If a prime number has both the multiplication property and the mirror property, then it is a **Sheldon prime**. It has been shown, however, that 73 is the only Sheldon prime.[1] You may be interested to know that another prime that has the multiplication property is 2475989, which is the 181440th prime, because $2 \times 4 \times 7 \times 5 \times 9 \times 8 \times 9 = 181440$.

Did You Know?

In binary, 73 is 1001001, which is a palindrome. Here's another, more interesting, mathematical palindrome:

$$25986 = 213 \times 122$$

$$221 \times 312 = 68952$$

Can you find any other mathematical palindromes? Let us know if you can.

Maths Word

Pick any positive whole number, then repeat the following steps:

If your number is even, then halve it.
If your number is odd,
then multiply it by 3 and add 1.

Keep repeating this and eventually you should get to the number 1.

Nobody knows why. The fact that you will always get to the number 1 is called the **Collatz Conjecture**[2], and it has been described as "quite possibly the simplest unsolved problem in mathematics".

In maths, a **conjecture** is something that mathematicians think might be true, but that has not yet been proved.[3]

Joke

1. You can read more about this here: https://phys.org/news/2019-04-big-theory-math-carl-pomerance.html
2. https://en.wikipedia.org/wiki/Collatz_conjecture
3. Some people think that if you solved the Collatz Conjecture, you would immediately become rich and famous, but this has not been proved.

Spot the Mistakes?

Look at the following bit of working out:

$$a = b^2 - c$$

(for example a = 144, b = 13, c = 25 would work in that equation, since $144 = 13^2 - 25$)

$$\sqrt{a} = b - \sqrt{c}$$

(square root it all)

$$\sqrt{a} + \sqrt{c} = b$$

(add $\sqrt{c}$ to both sides)

$$\sqrt{a + c} = b$$

(then combine the a and the c under the single square root sign)

As you can see, the re-arranged equation now still works, because

$$\sqrt{144 + 25} = 13$$

So does that mean our maths was right?

Maths Puzzle

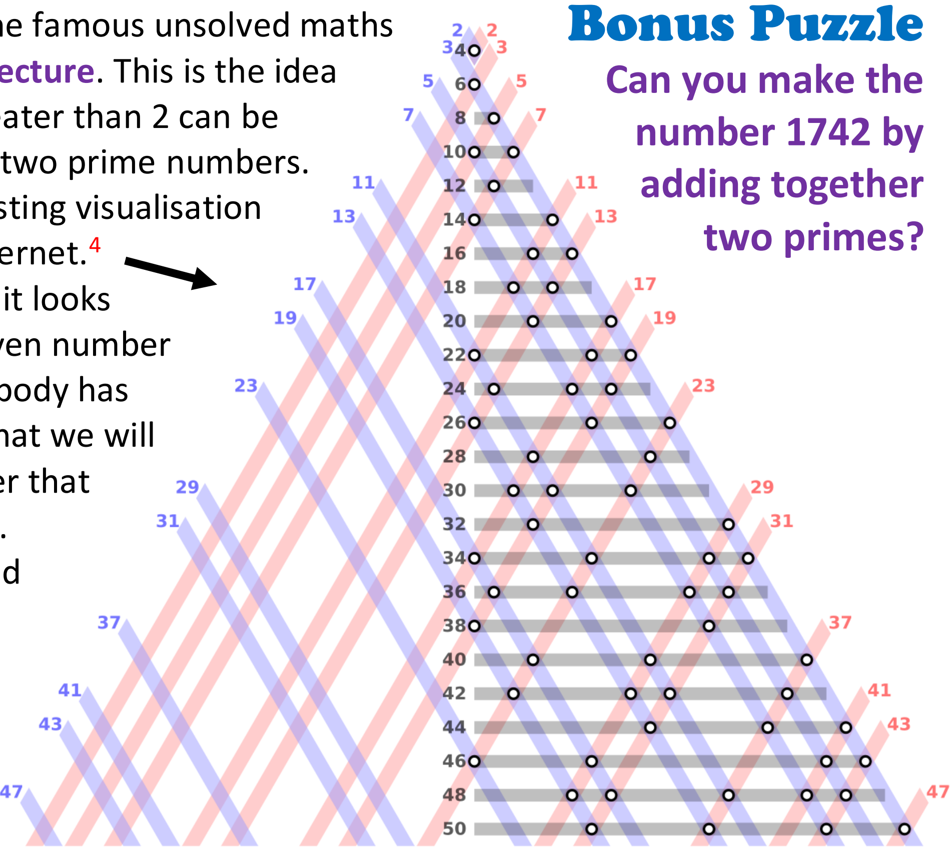
Here's a puzzle I got from Chris Smith…

			70
			32
			162
72	120	42	

Fill the spaces with the numbers 1,2,3,4,5,6,7,8,9 so that the product of the three numbers in a row or column matches the number at the end of that row or column.

Goldbach's Conjecture

In year 7, we talk about the famous unsolved maths problem **Goldbach's Conjecture**. This is the idea that any even number greater than 2 can be made by adding together two prime numbers. I recently found an interesting visualisation of this problem on the internet.[4] Although we can see that it looks like we can make every even number by adding two primes, nobody has ever been able to prove that we will never find an even number that we can't make in this way. This problem has remained unsolved since it was first talked about in the year 1742. There is a 1 million dollar prize on offer for anyone who solves it.[5]



Bonus Puzzle

Can you make the number 1742 by adding together two primes?

4. https://towardsdatascience.com/prime-numbers-and-goldbach-s-conjecture-visualization-60d1993a1424
5. Not from the Camp Hill Maths Department – but we might be able to give you a million house points.