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Maths Matters

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FORTITUDINE CRESCAMUS

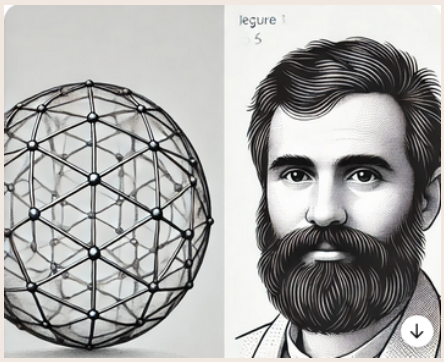
Welcome to the February issue of the Newstead monthly maths newsletter.

Each issue covers various maths matters: we will highlight some new or interesting maths **(Maths in the Moment)**, take you back in time for a snippet of historical maths fact **(Mathematical Time Machine)**, explain how maths is applied in the real world and how it links with other subjects **(Maths Meets the World),** show maths in unexpected places **(Maths in the Unexpected)** and give 5 recommendations **(Reasons to Love Maths).** The final section is: **Mathematician of the Month** (with thanks to Dr Neman). All this to prove that Maths does Matter! No doubt maths also matters to you so please get in touch and contribute to the next issue of this newsletter with your recommendations.

Thank you to those who have contributed so far! Please contact **Elleanore P in 12F or Dr. Neman.**

MATHS Time Machine

In **February 2016**, the mathematical world officially confirmed the proof of the **Poincaré Conjecture**, a century-old problem in the field of **topology** about the fundamental shape of space. It proposed that any three-dimensional space without holes must be mathematically equivalent to a four-dimensional sphere. Russian mathematician **Grigori Perelman** solved this in the early 2000s using **Ricci flow**, a technique that smooths out irregularities in shapes.



His work was so groundbreaking that he was awarded the Fields Medal (often described as the Nobel Prize of Mathematics) and a **$1 million Millennium Prize**—both of which he declined!

This remains one of the greatest achievements in modern mathematics and the remaining six millennium problems remain unsolved.

MATHS In The Moment

Mathematicians create computer simulations of airflows, chemical concentrations, and even the movement of flies around the flower. They must be both precise and creative, making assumptions that balance accuracy with the ability to write solvable equations. This approach is invaluable for studying biological phenomena that cannot easily be observed in a lab.

Thanks to mathematics, scientists can unlock the secrets of the corpse flower—even from thousands of miles away!

Mathematical Modelling

Mathematical modelling is just one of the many fascinating ways maths helps us understand the world, from predicting weather patterns to uncovering the secrets of rare and unusual plants like the Rafflesia Arnoldii. This flower, also known as the **corpse flower**, is the largest individual flower in the world. When it blooms, it releases a strong smell of rotting meat, attracting flies and beetles that help pollinate it. However, this fascinating plant is impossible to grow outside its remote natural habitat, making it difficult for scientists to study.

This is where **mathematics** plays a crucial role. By using **mathematical modelling**, researchers can simulate the flower's structure, scent dispersal, and insect interactions—all without needing a physical specimen. These models help to understand how the corpse flower attracts pollinators and how its unique ecosystem functions.

Mathematics, rightly viewed, possesses not only truth, but supreme beauty - a beauty cold and austere, like that of sculpture.

Bertrabd Ryssek

MATHS in the unexpected

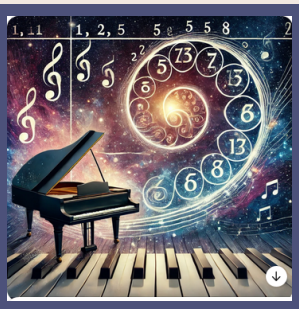
Maths in Music

The Fibonacci sequence (1, 1, 2, 3, 5, 8, 13...) is a famous mathematical pattern where each number is the sum of the two before it. This sequence appears unexpectedly in music composition, structure, and even instrument design!

The standard Western 12-note scale is structured in a way that Fibonacci numbers influence the number of keys in different scales:

- A major scale has 8 notes.
- A pentatonic scale has 5 notes.
- A natural minor scale has 13 notes.
- All of these are Fibonacci numbers!

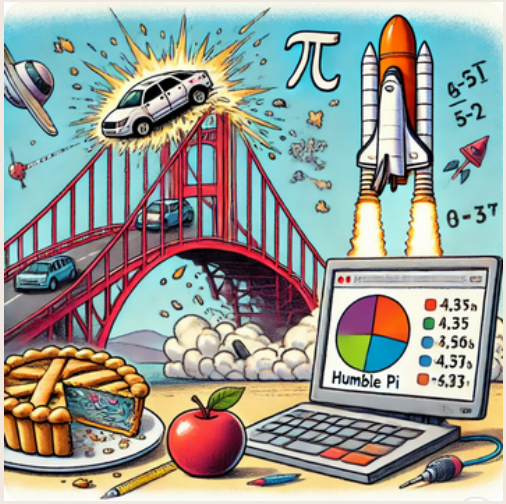
Even though music feels artistic and emotional, maths quietly shapes its structure, harmony, and beauty.



The next time you hear your favourite song, remember - there's maths hidden in the melody!

MATHS Meets The World

Catastrophic conversions



Have you ever written down an incorrect unit? For example, have you ever put 50 miles instead of 50 kilometres? If so, the consequence was probably one less mark in your test result.

However, have you ever wondered **what happens when maths goes wrong in the real world?** Matt Parker has collected numerous such examples in his book **"Humble Pi: A Comedy of Maths Errors"**. He explores how small miscalculations and overlooked details can lead to major failures in engineering, finance, computing, and more. The book is full of examples, like rounding errors that crashed spacecraft, software bugs that caused massive financial losses, and simple maths mistakes that led to structural collapses.

Two of the stories concern **confusing units of measurement**. The first one is about an Air Canada Boeing 767 on which both engines failed midflight because the fuel had been weighed in pounds rather than kilograms (aircraft fuel is calculated in terms of its mass, not its volume as mass stays the same regardless of temperature changes). Luckily, the pilot was able to fly the plane down like a glider and land safely. Another story concerned a 1998 Martian probe (Mars Climate Orbiter) that burned up in the atmosphere because one piece of software was using US customary units while the rest was expecting metric.
All of these real life examples in the book just show that maths really matters. From confusing unit measurements and rounding errors to the misuse of averages, scaling mistakes, coding bugs, and statistical misinterpretations—these errors aren't just theoretical. They happen in the real world, often with unexpected and sometimes disastrous consequences.

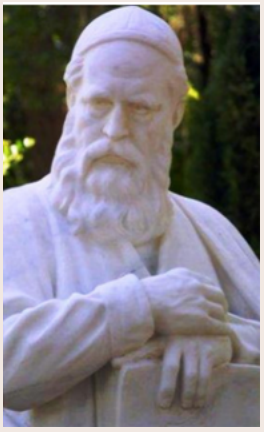
FIVE REASONS THIS MONTH TO LOVE MATHS

1. Watch a Royal Institution **talk** in which Matt Parker gives examples of What Happens When Maths Goes Wrong.
2. Humble Pi: A comedy of Maths Errors by Matt Parker – this book is in the school library!
3. This **video** explains the Golden Ratio and Fibonacci in Music.
4. Plants and Maths - how science collaborates: two Oxford scientists working on the mathematical modelling concerning Rafflesia Arnoldii discuss in this **video** how science collaborates.
5. A short **video** of Gladys West explaining her path to becoming part of the team that developed the Global Positioning System (GPS) in the 1950s and 1960s.

With thanks to Dr Neman

Mathematician of the Month

Mathematics in Bloom: Celebrating Omar Khayyam



As spring approaches and new life stirs in our gardens, I would like to share with you the story of a remarkable mathematician whose insight has had an enduring effect not only in mathematics and physics, but in everyday lives of all Iranians, Khayyam.

Imar Khayyam, a brilliant **Persian scholar** who lived nearly a thousand years ago (1048-1131), has a special connection to this time of year for me. It is important to note that **Iranians New year** happens at the Spring Equinox, the time and date is calculated by the Geophysics department of the Tehran university.
It is called **Nowruz**, literally meaning "a new day". Although The calendar is solar, it needed Khayyam's analytical insightful mind to perfect it. Khayyam's version, known as the **Jalali calendar**, is a testament to his extraordinary precision.
It calculates the length of the year so accurately that it only needs adjustment once every 3,770 years – even more precise than the Gregorian calendar!

Khayyam was what we would call a **polymath**. So naturally, he revolutionized mathematics by solving **cubic equations** through an ingenious blend of **algebra and geometry**. Centuries before his Western counterparts, Khayyam was intersecting conic sections to find solutions to these equations. Khayyam repeated and expanded on the works of another Persian Mathematician **Al-Karaji**, 953-1029, that studied what we know today as **Pascal triangle** centuries before Blaise Pascal . Thus, the triangle is often referred to **Khayyam's Triangle** in Iran. It is worth noting that Pascal's Triangle was also known to the Chinese in the 11th century. The Chinese Mathematician, **Jia Xian** devised a triangular representation of the coefficients of the binomial theorem in the 11th century. Later, another Chinese Mathematician **Yang Hui** further studied **Jui Xian's triangle**. In China they call the triangle **Yanghui's Triangle**.

Perhaps what makes Khayyam truly special is how he combined mathematical rigour with **poetic sensitivity**. As well as being a brilliant mathematician, he was also a **celebrated poet** whose verses explore life's deepest questions. His collection of poems, the **Rubaiyat**, shows us that mathematics and are in fact different expressions of human curiosity about the world around us.

Khayyam's inquisitive nature and philosophical approach sometimes put him at odds with religious orthodoxy, yet this same questioning spirit drove his scientific discoveries. His willingness to challenge conventional thinking makes him not just a historical figure but a role model for our students today.

As you continue your mathematical journeys this term, perhaps you may draw inspiration from Khayyam—a brilliant mind who showed us that **mathematics is not isolated from other pursuits but intimately connected with astronomy, philosophy, and even poetry** and I leave you with this:

"IN THE LIGHT OF THE CELESTIAL SPHERE, I REMEMBER, ON THE FIRST DAY,
MY HEART SEARCHED FOR SCROLL AND PEN, PARADISE AND INFERNO'S WAY;
UNTIL MY TEACHER TOLD ME WITH WISDOM PURE AND TRUE:
'SCROLL AND PEN, PARADISE AND INFERNO, ALL RESIDE WITHIN YOU".