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Maths Matters

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FORTITUDINE CRESCAMUS

Welcome to the March 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 sections are: **Mathematician of the Month** (with thanks to Dr Neman) and **Insights from the Newstead Maths Team.**

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

With thanks to Bella J (9W), Ipin P (9N) and Priyanka K (9W)

On **23rd March 1882**, **Amalie Emmy Noether** was born in Erlangen, Germany. As the daughter of a mathematics professor, she developed an early interest in the field despite the restrictions on women in academics at the time. Noether earned her doctorate in 1907 and, although she faced significant gender-based challenges, she gained recognition, especially through her work in abstract algebra.

Amalie Emmy Noether was a groundbreaking German mathematician known for her revolutionary contributions to **abstract algebra**. She made key advancements in **ring theory, group theory, and field theory,** which are fundamental areas of modern algebra. Her work on Noetherian rings and modules provided critical insights into the structure of algebraic systems. Additionally, she explored the role of symmetries in mathematics.

$$\frac{d}{dt}\left(\sum_a \frac{\delta L}{\delta \frac{dq_a}{dt}} \delta q_a\right) = 0$$

Despite facing significant challenges as a woman in a male-dominated field, Noether's innovative ideas paved the way of modern algebra and in mathematical research. Emmy Noether's contributions to mathematics were transformative, especially her work on **Noetherian rings and modules** introduced a more organized way of studying algebraic systems and made it easier for mathematicians to understand how different algebraic structures behave and relate to each other. It also had a big impact on **algebraic geometry** and **number theory**, (study of shapes and numbers in abstract ways). Her work on symmetries in mathematics helped explain how certain properties of mathematical objects stay the same even when they are transformed (e.g. rotations, reflections and scaling), and her work continues to influence modern mathematics today.

MATHS In The Moment

"A good mathematical problem is one you don't know how to solve." – Andrew Wiles

Finding Your Birthday Pi

Did you know that your birthday could be hidden somewhere in the digits of Pi? Thanks to the website www.mypiday.com, you can now find out exactly where your birthdate appears in this infinite number!

Pi (π) is one of the most fascinating mathematical constants, representing the ratio of a circle's circumference to its diameter. It starts as **3.1415926535...** and continues infinitely without repeating. Pi contains an endless sequence of random digits so every possible combination of numbers is bound to appear somewhere in it! Pi is so important in mathematics and science that it even has its own holiday! **Pi Day is celebrated every year on March 14th (3/14, US style, matching the first digits of Pi).** Math enthusiasts around the world celebrate by reciting digits of Pi, holding math competitions, and of course, eating **pie** as a delicious tribute!

Simply visit www.mypiday.com and enter your birthdate. The website will scan the first several million digits of Pi and tell you where your birthday first appears. Try with your friends and find out who has the earliest appearance in Pi.

MATHS in the unexpected

The Golden Ratio in the National Geographic Logo

Have you ever wondered why the **National Geographic logo**—a simple yellow rectangle—looks so visually appealing? The answer lies in **mathematics**! This famous logo is designed using the **Golden Ratio ($\phi \approx$ 1.618)**, a mathematical proportion often found in **nature, art, and architecture**.

What is the Golden Ratio?

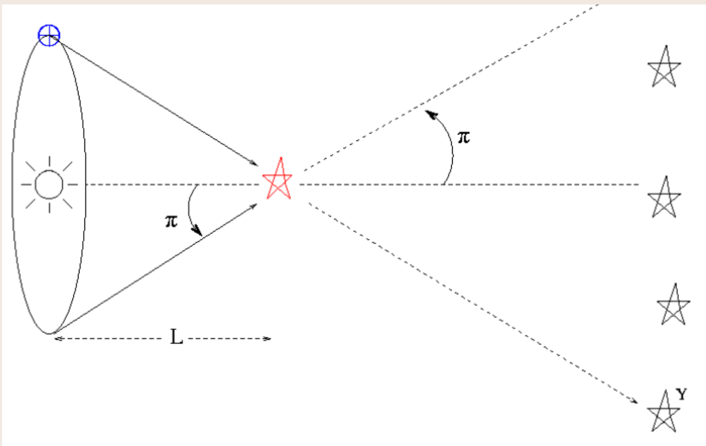
The Golden Ratio appears when a line is divided into two parts so that **the ratio of the whole to the larger part is the same as the ratio of the larger part to the smaller**. This proportion, approximately **1.618**, has been used for centuries to create visually pleasing designs. The **yellow rectangle** in the logo, its height-to-width ratio, follows the Golden Ratio. The Golden Ratio is more than just a cool number—it's a **mathematical principle that shapes the world around us**! From the spirals of seashells to the structure of galaxies, this ratio appears in unexpected places.

MATHS Meets The World

With thanks to Sophie A (12N)

What is a parsec - astronomy meets maths

An important distance in astrophysics is the parsec, which revolves around angles subtending from Earth's orbit. But what actually is a parsec?



This picture shows the Earth at 2 points in its orbit 6 months apart. They are exactly opposite each other. Now there are lines pointing to a relatively nearby star and into the background for both of these points, as well as a line coming from the sun, which divides the sector in half. The angle labelled "pi" is defined as the parallax angle, but what does this mean for our measurement of the parsec?

The number of parsecs from an object is determined by the magnitude of the parallax angle, but for simplicity, astronomers stated that one parsec must be the distance subtended from a parallax angle of one arcsecond (1/3600 of a degree)! So essentially a parsec is a unit length used to measure vast distances to astronomical objects, approximately equal to 3.26 light-years.

"Some people think that mathematicians are just calculating machines, but really, we are like artists, painting with numbers and logic."

– Maryam Mirzakhani

FIVE REASONS THIS MONTH TO LOVE MATHS

1. Visit www.mypiday.com, enter your birthdate and find out **where your birthday first appears in Pi.**

2. Watch a TED talk by Arthur Benjamin entitled **"The magic of Fibonacci numbers"** https://www.youtube.com/watch?v=SjSHVDfXHQ4.

3. Watch a short video by Numberphile **"Pi is Beautiful"** https://www.youtube.com/watch?v=NPoj8lk9Fo4 for Pi visualisations.

4. Listen to a short podcast **"Can maths prove the existence of aliens?"** https://www.bbc.co.uk/sounds/play/w3ct5b78.

5. Find out what was **the first (known) maths mistake** in a nicely animated video by Matt Parker https://www.youtube.com/watch?v=MZVs6wF7nC4.

Insights from the Newstead Maths Team

In this edition of our Maths Matters, we bring you the first part of an **interview with Dr. Neman, Head of Maths**, who offers her perspective on viral maths questions and her views on the nature of mathematics.

Elleanore: Dr. Neman, why do you think basic algebra questions, such as 8÷2(2+2)=?, regularly go viral online?

Dr. Neman: Well, to be perfectly honest, it's simply an unfortunate part of general population approach to maths. Numbers usually come to us from a context, a measurement, counting or they correspond to something we want to achieve. These type of questions ignore the need for context in dealing with numbers. Some educational researchers have gone so far to tell students the rather unfortunate comment that 4 carrots are equal to 4 watermelons without considering what we may be measuring or counting here, and what would equality mean here.
The sensationalism of such questions, I think, is connected with assuming numbers appeared randomly through thin air, or that mathematicians are born with a magical gift. If we consider Maths magic that controls us rather than a logical art that we control, then when we do not understand something, we assume it to be mystical rather what it is which in this case is simply a badly made problem.

Elleanore: Is Maths a language, and do you think that the fact that Leibniz and Newton came across calculus at similar times supports the argument that mathematics existed prior to its discovery?

Dr. Neman: That's an interesting question. Mathematics can indeed be seen as a language, as it has its own symbols, rules, and structure. The simultaneous development of calculus by Leibniz and Newton suggests that mathematical truths existed independently of human discovery. This is not the only instance of this. There were times when communication was much slower than today and hence solutions to problems were found simultaneously but independently. They needed to distil the essence of a real-life problem. While thinking mathematically, one is constrained within the field of logic. which means two people far apart start from the same problem, would inevitably arrive at similar solutions.
As another example of maths as a language, you have measuring the angles. Degrees came about from the Babylonians, who believed the Earth went around the Sun in 360 days, leading to the division of the circle into 360 degrees. Centuries later, when we need to decipher the world of motion, we created a completely different language, i.e. calculus, here we need to move away from a random splitting of an angle and instead connect the size of an angle to the length of the arc facing the said angle, hence the creation of radians. mathematics is an ever-evolving language with which we make sense of the world around us.