Algorithm

12.0

TWELFTH EDITION | APRIL 2025

THE ENIGMA OF NUMBER THEORY

HELLO READERS,

we are delighted to present the **12th edition of Algorithm**. We aim to explore various aspects of mathematics, from its real-world applications to its philosophical depth. In previous editions, we have focused on topics such as applied mathematics, mathematical paradoxes, and the intersection of mathematics with art and nature. This time, we turn our attention to Number Theory with the theme, **“The Enigma of Number Theory: From Patterns to Possibilities”.**

Number Theory is one of the oldest and most intriguing branches of mathematics, often described as the purest form of mathematical thought. Did you know that the famous Fibonacci sequence, often found in nature, is deeply rooted in Number Theory? Or that prime numbers play a crucial role in modern cryptography, securing everything from online banking to private messaging? From Fermat’s Last Theorem to Goldbach’s Conjecture, this field has sparked curiosity and challenged mathematicians for centuries.

In this edition, we explore its significance, applications, and enduring mysteries. As you navigate through this newsletter, you will find a diverse range of articles presented in various formats such as plays, newspaper articles, debates, diary entries, etc. These approaches highlight the versatility of mathematical expression and its relevance to daily life. Through these different styles, we aim to demonstrate that mathematics is not confined to equations but extends into storytelling and creative thought.

This edition also introduces new sections. The first focuses on cultural references, examining how different societies have interpreted and applied Number Theory. Numbers play an essential role in folklore, religious beliefs, and traditional practices, offering unique insights into their symbolic and practical uses across cultures. Next, we have an interactive game designed to challenge and entertain you. Read the clues provided about a renowned mathematician and guess who they are based on their contributions in Mathematics. This engaging activity aims to deepen your appreciation for the mathematicians who have shaped this field. Finally, we introduce an unconventional yet intriguing section, a mathematical horoscope. This lighthearted feature explores how different zodiac signs might approach mathematical problems and analytical situations. This section offers a fun perspective on problem-solving tendencies based on personality traits. We hope this edition sparks curiosity and deepens your interest in Number Theory.

Whether you are a dedicated mathematics enthusiast or simply enjoy exploring new ideas, there is something in this issue for everyone. Our goal is to make mathematics accessible, engaging, and thought-provoking, and we believe this edition achieves just that.

CONTENT:
PALAK & PRIYANSHI

DESIGN:
KANIKA SAROHA

INSIDES...

EDITORS' NOTE

When we started brainstorming for the theme of 12.0, our original goal was to explore a wide territory but also which provides something for everyone hence, we stumbled upon Number Theory. The field that will never not leave you curious and enchanted. We are surrounded by numbers at every moment, they exist in spirals of galaxies, the rhythm of our heartbeats and the pixels on the screen you're probably reading this on. As Gauss said, "Mathematics is the queen of science and Number Theory is the queen of Mathematics." there was really no debate to finalise this theme. With this edition, we explore the unsolved mysteries, the beliefs, patterns, sequences and all the infinities in between.

As I write this note, I find myself at the edge of a chapter I'm not quite ready to close, my final one as Editor-in-Chief. Algorithm has been more than a publication for me; it has been a journey of discovery, growth, and most importantly, an opportunity of learning over and beyond. From crafting my first article to shaping entire editions, Algorithm has been both my classroom and my canvas. I am endlessly thankful to the team: the heads who have provided the best guidance, roadmap and vision and each member who has shared their heartfelt words and designs at Algorithm! Every page of this edition carries a piece of their dedication. May the numbers leave you curious, Happy Reading!

AVNI JAIN
EDITOR IN CHIEF, (2024-25)

From early schooldays, I found myself drawn to the beauty of numbers—their patterns, their logic, their quiet power to explain the world. Mathematics has always been more than a subject to me. It has been a world of curiosity, logic, beauty, and infinite possibilities. So being part of Algorithm and serving as the Sub Editor-in-Chief has been more than just a role—it's been a journey, a culmination of passion, effort, and love for math in its purest form. This time, we chose the theme "The Enigma of Number Theory: From Patterns to Possibilities." Number theory, often hailed as the "Queen of Mathematics", is a world where simplicity meets depth, where even the most familiar numbers hold secrets. Through the articles we've explored this world using creative formats—storytelling, diary entries, debates, and narratives to make each topic not just informative, but engaging and relatable.

Behind every word, every design, and every idea in this newsletter stands a team of passionate minds. I'm endlessly grateful to the content team, the designing team, and the social media and outreach team. Every single member poured their heart into making this edition what it is—and I'm honored to have worked alongside them. Being part of Algorithm has not only sharpened my skills but also shaped my journey as a writer, a team leader, and a learner. I urge every reader, regardless of discipline, to dive into this edition. We've crafted it with love, clarity, and curiosity for all as the magic of mathematics lies not just in numbers, but in the stories they tell.

ANAM
SUB-EDITOR IN CHIEF, (2024-25)

DESIGN- KANIKA SAROHA

FERMAT'S LITTLE THEOREM
and Goldbach's Conjecture

UNRAVELING THE UNKNOWN

A Tale of Two Mathematical Mysteries!

CONTENT - VRINDA KWATRA, DISHA JAIN || DESIGN- SRISHTI DEY

Mathematics has been shaped by fascinating ideas and discoveries, with some theories and problems lasting centuries. Among them, Goldbach's Conjecture and Fermat's Last Theorem are two of the most intriguing mysteries in number theory.

The Pythagorean theorem is one of the most well-known theorems in mathematics and has been proved multiple times over the years. The theorem states that in a right-angled triangle, the sum of the perpendicular and the base squares is equal to the hypotenuse square.

$AB^2 + BC^2 = AC^2$

This theorem is well known. It was later generalized for non-Euclidean spaces and n-dimensional figures. In the instances, all three numbers in the theorem are whole numbers, known as Pythagorean triplets, For ex: 7, 24 and 25; leads to a natural question:

Do there exist whole numbers (a, b, and c) that satisfy the equation a3 + b3 = c3, a4 + b4 = c4, and so on for increasing powers?

Fermat, a 17th-century lawyer who considered himself an amateur mathematician but is now one of the most celebrated number theorists of all time, wrote the statement of Fermat's Last Theorem. It was shared with the world by his son, Samuel de Fermat: ***"I have discovered a truly remarkable proof, which this margin is too small to contain."***

Fermat's Last Theorem states that the equation, i.e: $x^n + y^n = z^n$ has no nonzero integer solutions for **x, y, and z when n > 2.**

Fermat's Last Theorem was finally proved after more than 350 years of effort by numerous mathematicians. On the other hand, Goldbach's Conjecture remains unproven to this date.

"Every even number can be expressed as the sum of at most three primes."

This statement was proposed by the influential mathematician René Descartes in 1638. More than a century later, a similar idea gained widespread recognition through a letter sent by Christian Goldbach to Leonhard Euler, stating that every even integer greater than 2 can be expressed as the sum of two prime numbers. Mathematician Paul Erdős noted that while Descartes may have discovered it first, the conjecture should bear Goldbach's name—after all, ***"mathematically speaking, Descartes was infinitely rich, and Goldbach was very poor."*** Some examples include:

- **20 = 3 + 17 or 7 + 13**
- **100 = 53 + 47 or 47+ 53**

This long-standing problem in number theory has captivated mathematicians for years. Alternatively, he proposed another theory known as the **Weak Goldbach Conjecture** which states that every odd number greater than 5 can be written as the sum of three primes. For example:

- **9: 3+3+3**
- **17: 3+3+11 or 3+7+7 or 5+5+7**

It is considered "weak" because it directly follows from the Strong Goldbach Conjecture. If the strong conjecture holds, then any odd number **N>5, can be written as N=(N-2)+2, where N-2 is even and, by the strong conjecture,** can be expressed as a sum of two primes thus proving the weak conjecture automatically. While the strong conjecture remains unsolved, the weak conjecture was fully proven by **Harald Helfgott in 2013,** marking a significant breakthrough in number theory. Fermat himself proved his theorem for **n = 4** using his famous infinite descent method. For centuries, mathematicians have attempted to prove or disprove his theorem. On 7th June 1742, Goldbach wrote to his colleague Leonhard Euler proposing that every integer greater than 2 can be written as the sum of three prime numbers—a statement influenced by the now-abandoned convention of

considering 1 as a prime number. Euler reformulated this idea into what we know today as the Goldbach Conjecture that every even integer greater than 2 can be expressed as the sum of two prime numbers. Although he could not prove it, Euler acknowledged it as a completely certain theorem.

Leonhard Euler again wrote to Goldbach on 4th August 1753, claiming he had proved Fermat's theorem for n = 3. However, Euler's proof contained flaws, as he assumed the unique factorization of complex cube roots. While his proof had limitations, there is an indirect way to correct it using arguments from his other work, which is why, despite its flaws, it is still attributed to him.

Fermat's Last Theorem remained **unsolved** for centuries despite major efforts. From Germain's proof for **n<100 (1825) to Kummer's ideal numbers (1847) and Faltings' finiteness theorem (1983)**, the final link for this emerged in 1955 **with the Shimura-Taniyama-Weil Conjecture, connecting Fermat's Last Theorem to elliptic curves. Frey (1986) and Ribet (1987)** showed that proving this conjecture would imply Fermat's Last Theorem. In June 1993, Andrew Wiles announced his proof which was published in Annals of Mathematics in 1995 after a few corrections. Wiles' proof revolutionized number theory and earned him the 2016 Abel Prize.A significant breakthrough happened in 1966 when Chen Jingrun proved that every sufficiently large even number can be written as the sum of a prime and a semiprime, offering a partial resolution. As of 2012, it has been verified that Goldbach's Conjecture holds for even integers up to **4*10^18**. Recent publication suggest a more modern approach to solve the problem such as the **Chinese Remainder,** theorem which aids in handling congruences related to prime partitions. From the French Revolution to the discovery of Einstein's Theory of Relativity to the rise of modern computing, both Fermat's theorem and Goldbach's Conjecture have stood the test of time. Fermat's Last Theorem, once the most famous unsolved problem, inspired over 1000 incorrect proofs between 1908 and 1912 alone. Today, it stands as a triumph of modern mathematics. On the other hand, Goldbach's Conjecture— even after centuries of numerical and computational verification, despite partial progress, remains a mystery. Regardless of this contrast, both of these theorems have contributed to significant advancements in the field of number theory. **Will Goldbach's Conjecture follow Fermat's path, or will it always remain a mystery?**

THE SECRET CODE BEHIND OUR DIGITAL WORLD

CONTENT - MUSKAN & SANVI
DESIGN - KOMAL

MARCH 17, 2025
TECH & SECURITY DESK

You are employing cryptography daily, and sometimes you might not even know it. When you notice HTTPS on your browser, you recognize that your link is secure, and hence your information will not be broken into by hackers. Cryptography is also used to safeguard medical data, cloud storage, and even biometric security mechanisms such as fingerprint locks. In an age where cybercrime is increasing, encryption is more important than ever. Without cryptography, hackers can steal credit card information, tap into secret conversations, and interfere with financial transactions. Technology that protects our personal information is changing, but so are cyber threats. Each time you enter a password, send an email, or make an online transaction, cryptography is at work behind the scenes protecting your data and keeping It confidential.

NUMBER THEORY & CRYPTOCURRENCY

By encrypting plaintext into ciphertext, cryptography performs a crucial role in securing digital data by rendering it unintelligible to unauthorized parties. Number theory, the integers, and the prime numbers in particular are the basis for most cryptographic systems. For example, the security of RSA is based on the hardness of factoring the product of two extremely large prime numbers. It is easy to multiply two primes, but it is difficult to factor the product of their multiplication back to the original primes computationally. The basis for RSA's security lies in this one-way function. But prime-based encryption methods' security is in serious danger with the advent of quantum computation.

ELLIPTIC CURVES: THE NEXT GENERATION OF CRYPTOGRAPHY

While RSA encryption is secure, it's slow and large key sizes. Enter Elliptic Curve Cryptography (ECC), the security wonder. ECC is the same security as RSA but with much smaller key sizes, a few orders of magnitude, and that's why it is perfectly suitable for smartphone and app-based usage like WhatsApp and iMessage. ECC gets its strength from the application of hard mathematics. Instead of dealing with gigantic prime numbers, ECC has to deal with points on an elliptical curve and is hence capable of performing its encryption rapidly and with ease. Web browser security, digital signatures, and Bitcoin, above all, are advantages it derives from this discovery. As cyber attacks are on the increase, ECC has emerged as the security option of the day. It protects information even with reduced processing power. Whether you're using a smartwatch or a secure email service, ECC is working silently in the background, proving that small equations can have a massive impact on online security.

PRIME NUMBERS: PATTERNS, MYSTERIES & SECURITY ROLE

Prime numbers—those divisible only by 1 and themselves—have fascinated mathematicians for centuries. Though their arrangement appears to be random, they possess a peculiar strength in cryptography. All the cryptographic schemes, such as RSA (Rivest-Shamir-Adleman), are based on prime numbers since it is virtually impossible to factorize large primes. For example, anyone can pick two large primes and multiply them, but doing the reverse computation to determine what the two primes were is highly resource-intensive. It is for this reason that prime numbers get their uses in hiding information. Even social media and online banking are protected by such mathematical marvels. The prime numbers remain shrouded in mystery despite extensive research.

CHALLENGES OF THE FUTURE IN CRYPTOGRAPHY

Encryption does have certain challenges that it will encounter in the future. Current encryption methodologies are vulnerable to being compromised with the advent of quantum computing. Quantum-resistant algorithms need to be developed since quantum algorithms can compute problems such as discrete logarithms and integer factorization exponentially better than traditional computers. Furthermore, generating prime numbers is still hard. The requirement for efficient methods of generating large primes grows with key sizes increased to provide security. Side-channel attacks, which exploit physical characteristics such as power consumption in an attempt to break cryptographic hardware, are also an emerging problem. Cryptographers are investigating more secure cryptographic techniques that are resistant to such attacks. In addition, the advent of the Internet of Things (IoT) and other distributed systems introduces new scalability problems. Cryptographic techniques need to be lighter and more efficient, especially for computation-limited devices.

CRYPTOGRAPHY ESSENTIALS: THE TECHNOLOGY OF ENCODED AND DECODED INFORMATION

Think of sending a secret message that your friend may only attempt to decipher, that is what cryptography does on an even bigger level. It encodes readable data (plaintext) into encrypted data (ciphertext) to defend it against cyber attack by hackers. Only someone who has a secret key can decode it again. Each time you purchase something online, you access a social media site, or you send an off-the-record message, cryptography is in action. Without encryption, passwords, transactions, and confidential data would be exposed. In our current cyber age with an abundance of cyber threats, encryption is a cyber lock on your cyber life, shielding you from the prying eye, making your browsing, chatting, and bill-paying private .

WHY ONLINE SECURITY IS MORE IMPORTANT THAN EVER?

In today's digital era, nearly every area of our lives—banking, communications, shopping, and even working—are internet-dependent. More connectivity means more vulnerability to cyber attacks, so security on the internet is more important than ever before. Cybercriminals use hacking, phishing, malware, and identity theft to steal individual data, financial data, and even government data. Without proper security measures, sensitive information can be breached, leading to financial losses and invasion of privacy. Secure passwords, two-factor authentication (2FA), and encrypted links (e.g., HTTPS) protect against cyberattacks. Social media users should not overshare since hackers utilize personal data to breach security inappropriately. Secure messaging apps, VPNs, and updated software add additional protection levels. With the ongoing advances in cyber threats, security practices and awareness are necessary.

ERROR DETECTION CODE: THE MATHEMATICS BEHIND DATA INTEGRITY

CONTENT BY - DISHA JAIN
DESIGN BY - DISHA SHARMA

Breaking: a major development has just unfolded as the mathematical community is engaged in a rather heated debate— Can EDC's keep up with the growing complexity of cybersecurity threats? In our digital lives, where phones, laptops, and even online monetary transactions have become a necessity, the majority of our movements are shared and stored as data. Where privacy is deeply threatened, paired with the increasing frequency of cyberattacks, one can't help but wonder— Is our data protected? How reliable are our current protections?

Experts highlight the crucial role of EDC's in maintaining data integrity. They identify errors that might've occurred during data transmission or storage and detect unintended changes that may happen due to noise, interference, or hardware failures and help ensure that users' data remain accurate, consistent and uncorrupted.

First introduced by Richard Hamming in 1950, EDCs are mathematical techniques that add redundant information—extra bits—to data, allowing the receiver to check for errors. EDCs have long been relied upon to maintain data integrity, identifying errors in transmission and storage through techniques like parity checks, checksums, and Cyclic Redundancy Checks (CRC). However, in an era where cyber threats are more sophisticated than ever, data is constantly tracked, shared, and stored, and privacy concerns are at an all-time high, mathematicians question whether these traditional methods can still be trusted? While EDCs detect errors, they do not prevent intentional tampering or data breaches. As digital systems grow more complex, the question remains—are EDCs enough to protect data in today's evolving cybersecurity landscape?

Parity bits and checksums are simple error detection methods that use mathematical operations to identify inconsistencies in transmitted data. Parity bits ensure the total count of 1s in a binary sequence follows an even or odd rule, flagging errors when the count changes. Checksums rely on modular arithmetic to compute a numerical value from data; any mismatch upon receipt signals corruption. A more advanced method, Cyclic Redundancy Check (CRC), uses polynomial division to detect errors, appending a remainder as a check value. While these techniques enhance data integrity, they remain vulnerable to advanced cyber attacks and intentional tampering. Although they have evolved and helped the people against cyber criminals, they fail to remain completely foolproof in today's data driven world of AI.

EDCs are used all around us. In networking and communication, methods like CRC and checksums help detect transmission errors in Wi-Fi, Ethernet, and mobile networks. Similarly, banking and financial transactions rely on checksums to verify credit card numbers and prevent errors in digital payments. In storage devices, hard drives and RAM use parity bits and ECC (Error Correction Codes) to detect and correct corrupted data. While these applications improve reliability, rising cyber threats continue to challenge the effectiveness of traditional EDCs in safeguarding data.

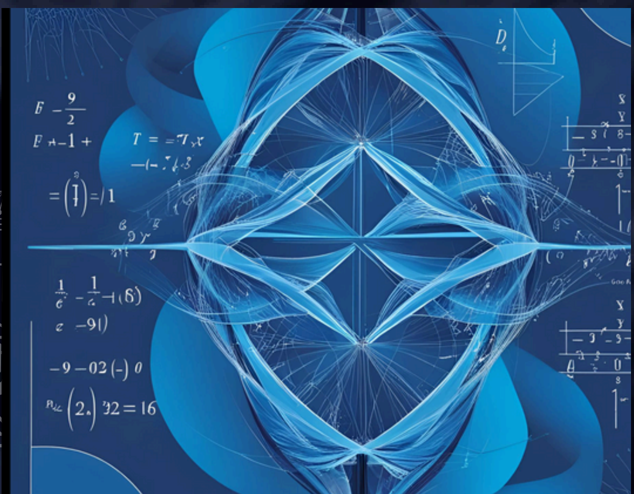
EDCs are all around us. They have long been used to maintain data integrity, but are they truly enough in today's ever changing world? While methods like parity checks, checksums, and Cyclic Redundancy Checks (CRC) can detect errors, they do not correct them, leaving data vulnerable. What happens when cybercriminals manipulate data in ways that bypass these checks? As data breaches, privacy concerns, and advanced hacking techniques rise, it's worth asking—are traditional EDCs still effective, or do we need more advanced solutions to keep up with the chaos of the revolution of AI?

NUMBER THEORY IN BLOCKCHAIN TECHNOLOGY

CONTENT - CHESHTA & SANIYA
DESIGN - SRISHTI DEY

The most versatile cryptographic algorithm is the Cryptographic Hash Function. It is a mathematical function that converts multiple inputs, such as messages or data, into fixed-length outputs. The principal object of a hash function is data integrity and it is widely used in cryptocurrencies to pass transaction information anonymously. For example, Bitcoin uses the SHA-256 hash function which takes any input and returns a 256-bit hash. For instance, the word "hello" would be hashed as:

SHA-256("hello")
=2cf24dba5fb0a30e26e83b2ac5b9e29e1b169f1e63c58d0a2e42bfae6e22e36d



CRYPTOCURRENCIES

Have emerged in recent years, the most significant of them being the bitcoin. This cryptocurrency incorporates an associated technology called the blockchain which consists of databases linked to one another in such a way that they are unalterable. This information is stored in an open-source decentralized environment, in which each block's information is confirmable by every participating computer. Have you ever wondered what makes blockchain secure? Well, the answer lies in number theory — a branch of math that plays a crucial role in keeping everything safe. In this article, we will explore the role of number theory in various key concepts of blockchain functions, including cryptographic hash functions, digital signatures, public-key cryptography, discrete logarithm problem, and more. Another fundamental component of blockchain security is the use of Digital Signatures.It is based on asymmetric cryptography also known as public key cryptography that uses public key (shared with others) for encryption and signature verification and private key (kept secret) for decryption and signing. The hash code is encrypted, using public-key encryption with the sender's private key. Anyone who knows the user's public key can verify the integrity of the message that is associated with the digital signature. Public key cryptography is crucial for ensuring secure internet communications. It enables confidential messaging and verifies user identities.

Discrete Logarithm Problem

is a tricky math puzzle that helps keep blockchain safe. Imagine you have a number, a modulus, and a result, and your job is to figure out the original number from these. This is hard to do without the private key, which is what keeps your information secure. This is one of the reasons hackers can't easily mess with blockchain transactions. Then there are Merkle Trees which are used to check if a block of transactions is valid. Instead of looking at each transaction one by one, blockchain uses a "root hash" that represents all of them. If one transaction changes, the root hash will change too, making it easy to spot if someone's tried to tamper with the data

For example, the RSA algorithm, used to secure Bitcoin transactions, relies on the fact that it's hard to factor large numbers into their prime factors. Here's how it works:

- Choose two prime numbers p and q.
- Multiply them to get $n=p\times q$
- Calculate the Euler's Totient Function $\phi(n)=(p-1)(q-1)$
- Choose an encryption key e, and find the decryption key d such that:

$e\times d\equiv 1 \pmod{\phi(n)}$

This ensures that data can be encrypted with one key (public) and decrypted only by the owner of the private key, making it very secure.

Continuing further, Proof-of-Work (PoW) is how Bitcoin works. In PoW, miners have to solve difficult math puzzles to add new blocks to the blockchain. The puzzles involve finding a hash (a sort of digital fingerprint) that matches certain conditions.

A key idea in number theory is prime numbers — numbers like 2, 3, 5, and 7 that can only be divided by 1 and themselves. These numbers are used in cryptography to create encryption systems that are hard to break.

For example, it could be a hash that starts with a lot of zeros. Solving these puzzles takes a lot of time and energy, which is what makes it so hard to tamper with the blockchain. There's also Proof-of-Stake (PoS), which is a more energy-friendly option than PoW. In PoS, people who have a lot of cryptocurrency can be picked to validate new blocks. The more you "stake," or lock up, the better your chances of being chosen. This system still uses math to keep things fair and secure.

In conclusion, number theory, a branch of pure mathematics, plays a crucial role in modern cryptography, contributing to the development of secure communication and data protection systems.

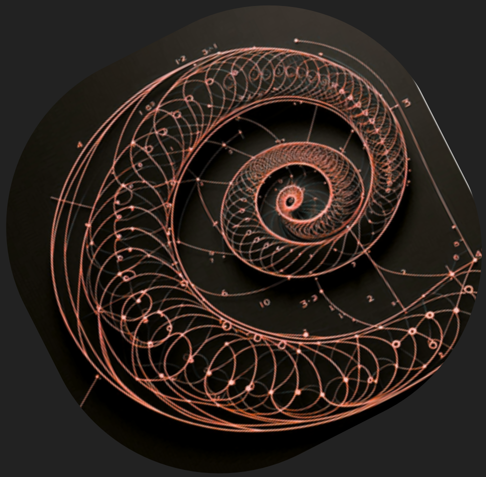
FIBONACCI SEQUENCE & ITS CONNECTION TO NUMBER THEORY

CONTENT- VRINDA KWATRA
DESIGN - DIZA PAULSON

Fibonacci, meaning "son of the Bonacci clan," was an Italian mathematician born around 1170 AD. In 1202, after returning to Italy, he published Liber Abaci (The Book of Abacus), which introduced algebraic and arithmetic concepts he had learned during his travels. One of the most famous problems in Liber Abaci led to the discovery of the Fibonacci sequence: A man places a pair of rabbits in an enclosed area. How many pairs of rabbits will there be after one year if each pair produces a new pair every month, and each new pair becomes productive from the second month onward?

Let **F(n)** represent **the number of rabbit pairs at the end of month n**. The recurrence relation follows:
$F(n)=F(n-1)+F(n-2)$
The solution to this problem is 144 pairs at the end of one year. After two years, the number increases dramatically to 46,368 pairs! The sequence generated ***1, 1, 2, 3, 5, 8, 13, 21, 34, 55***, and so on is now known as the ***Fibonacci sequence***, where each term is the sum of the two preceding terms. Fibonacci in the Rabbit problem ignores the first term of this sequence.

Keith Devlin, author of **Finding Fibonacci: The Quest to Rediscover the Forgotten Mathematical Genius Who Changed the World**, suggests that ancient Sanskrit texts using the Hindu-Arabic numeral system predate Fibonacci's discovery by centuries.



The golden ratio is the positive solution to the equation: $x^2-x-1=0$
It is an irrational number, expressed as: $(1+\sqrt{5})/2$
The **golden ratio** represents the division of a line segment into two unequal parts such that the ratio of the whole segment to the longer segment is the same as the ratio of the longer segment to the shorter *one*. It is denoted by ϕ (**phi**). This ratio was first introduced by Euclid in Elements, where he referred to it as the "extreme and mean ratio." The golden ratio also appears in the study of Archimedean and Platonic solids. It is closely linked to the Fibonacci sequence: **1,1,2,3,5,8,13,...** As the sequence progresses, the ratio of consecutive Fibonacci numbers approaches the golden ratio:

$$\lim_{n\to\infty} F(n)/F(n+1)=\phi$$

This means that for large n, the ratio of two successive Fibonacci numbers gets increasingly closer to ***1.618...***

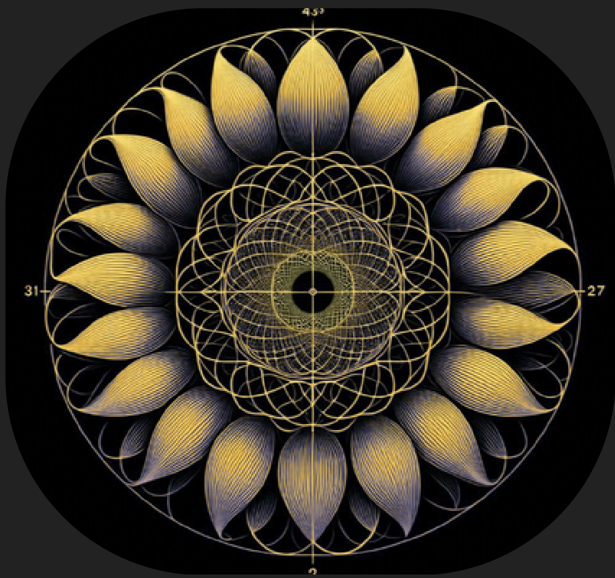
A Fibonacci prime is a number that belongs to both prime numbers and the Fibonacci sequence. First few Fibonacci primes are: 2, 3, 5, 13, 89, 233, 1597, 28657, 514229, 433494437, 2971215073, 99194853094755497, 1066340417491710595814572169, . . . As of September 2023, the largest known Fibonacci prime is $F_{3244369}$, which has 678033 digits. It was discovered by **Maia Karpovich in September 2023.** For finding larger Fibonacci primes, the method that we can use is the Lucas-Lehmer test which is used to check the primality of Mersenne numbers that are of the form:

$$M_n = 2^n - 1$$

Fibonacci numbers and the golden ratio appear in nature in many fascinating ways! Take bees, for example. Female worker bees inherit half of their DNA from their mother (the Queen) and half from their father. But male drone bees are different—they receive all their DNA only from their mother. This creates a special family tree:

- A male bee has one parent (the Queen).
- It has two grandparents (the Queen's parents).
- It has three great-grandparents (two from the Queen's mother and one from her father) and so on.....

This pattern follows the Fibonacci sequence! As the numbers get larger, the ratio between consecutive numbers gets closer to 1.618, the golden ratio.



Another beautiful example is found in sunflowers. If you look at the seeds in the center of a sunflower, they are arranged in spirals. When you count them, you'll often find:

- 21 spirals going one way and 34 going the other, or
- 34 spirals in one direction and 55 in the other

If you divide the larger number by the smaller one, you get a number very close to 1.618, the golden ratio!

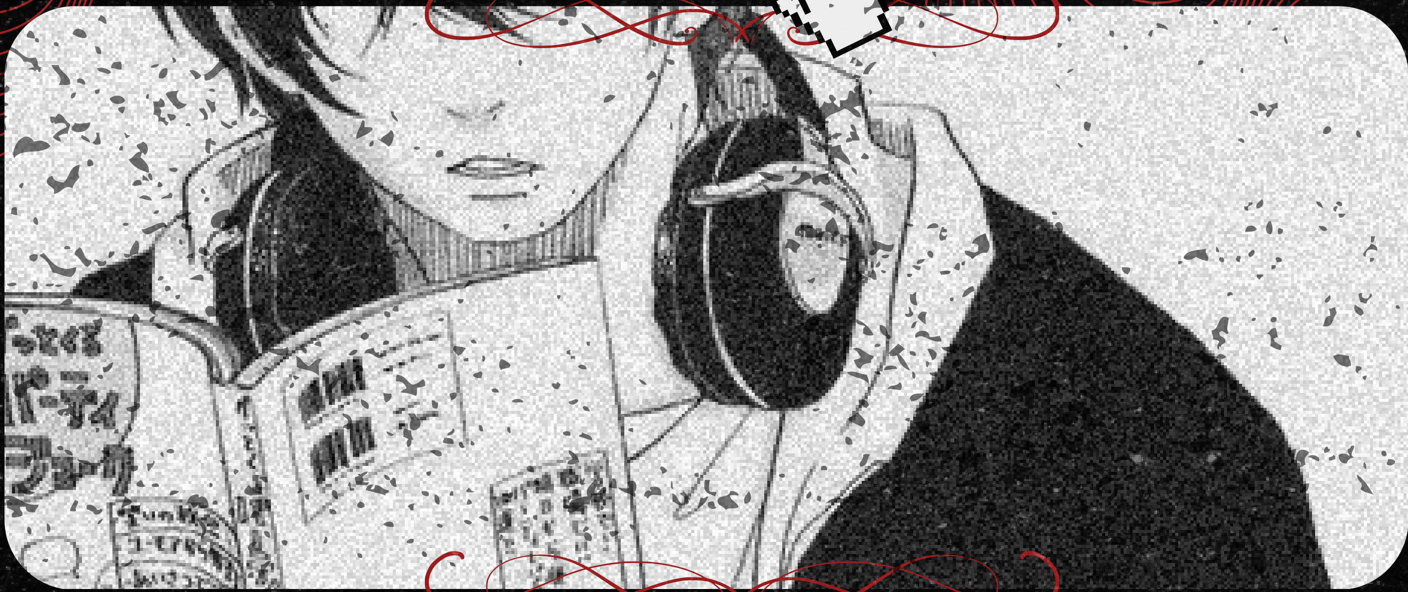
$$34 \div 21 \approx 1.619$$

$$55 \div 34 \approx 1.618$$

The Fibonacci sequence and the golden ratio are more than just abstract mathematical ideas—they are intricately woven into nature, art, and science. Whether in the reproductive cycles of bees or the spiral patterns of sunflower seeds, these concepts emerge in surprising yet consistently recurring ways.

THE COLLATZ CONJECTURE

DESIGN & CONTENT BY - DISHA SHARMA



MC: "The ultimate showdown begins! This is your MC, Zade, bringing you the biggest gaming match ever! First up, Chris—a veteran with sharp instincts and strategy. Facing him is Tay—a rising star ready for the impossible! Are you all ready for today's brand-new game? Let's reveal it together... 3... 2... 1... **THE COLLATZ CONJECTURE!"**

CHRIS: "Alright, 'Collatz Conjecture.' Sounds fancy. How hard could it be?"

MC: "Here's the deal, players: Your mission is simple—get every number down to 1. Fail, and the loop never ends! The Collatz Conjecture, also known as the 3x + 1 problem, is one of mathematics's most famous unsolved problems. It follows a simple rule: Start with any positive integer n. If it's even, divide by 2; if it's odd, multiply by 3 and add 1. Repeat the process, and every number should eventually reach 1—but no one has ever proven it works for all numbers. First number... 5! Chris, you're up!"

CHRIS: "Alright, 5 is odd. That means... 5 × 3 = 15, plus 1... 16.
16 → 8 → 4 → 2 → 1.,......Easy!"

MC: "Not bad! But that was just the warm-up. Now, we take it up a notch —introducing the Hailstone Sequence!" The Hailstone Sequence is what happens when you apply the Collatz Conjecture. The numbers rise and fall—just like hailstones in a storm—before finally settling at 1. And now, the real challenge begins..."Your next number is... 27!"

TAY: "Okay, 27 is odd. So, 27 × 3 = 81... plus 1... 82."
82 ÷ 2 → 41.
41 × 3 + 1 → 124...
124 → 62 → 31 → 94... 47... 142...

AFTER 111 CHAOTIC STEPS THE NUMBER FINALLY DROPS TO 1.

TAY: "It's wild how the Collatz Conjecture looks so simple—just divide by 2 or multiply by 3 and add 1—but no one can prove it always works."mathematicians have tested it for numbers up to 2^68, but without a formal proof, it remains one of math's biggest unsolved mysteries."

CHRIS: "Even today, mathematicians are still searching for a proof. Some are trying new techniques in number theory, while others are using advanced algorithms to find patterns. In 2019, Terence Tao showed most sequences follow patterns, but the mystery remains. In 1972, Helmut Hasse suggested a probabilistic approach, while Paul Erdős later doubted math was ready for it. Jeffrey Lagarias recently linked the problem to dynamical systems and deep number theory.

MC: "The Collatz Conjecture is one of many unsolved problems in mathematics that seem simple but defy proof. Its significance lies in its unpredictability—showing how number theory can behave in ways we don't fully understand. If solved, it could reveal deeper insights into mathematical structures and computational complexity."

CHRIS: "Number theory is fascinating because it takes something as simple as whole numbers and turns it into a labyrinth of unsolved mysteries. Problems like the Collatz Conjecture show how basic rules can lead to unpredictable patterns, and despite centuries of study, there are still questions about numbers that even the greatest mathematicians can't answer."

MC: "Well then, Chris and Tay, maybe one of you will make history by solving this decades-old mystery! But the real challenge? It's still out there, waiting for the mind that can finally prove the Collatz Conjecture!"

(DRAMATIC OUTRO AS THE SCREEN FADES TO BLACK!)

Digital Tools and its Applications

Dear Diary,
I never thought I would write anything about math here, but I just came across something that blew my mind and I have to write this down. It is called Digital Roots. Like, WHY did no one tell me about this before?? Anyways let me tell you this, it may sound hard, but TRUST ME it just makes things (ie: math) easier. Well, think of it like texting. When you start typing 'HAHAHAHA,' then you shorten it to 'HAHA,' and all of a sudden you feel lazy and go for 'lol'-that's exactly what digital roots do, lol. No matter how big the number is, at the end, it always simplifies to one small number.

It's kinda fun, actually. Like, imagine you have a huge pizza, and you keep slicing it into more and more pieces. But no matter how many times you slice it, it's still the same pizza. That's basically what digital roots do. They slice numbers down to their simplest form, but in the end, it the same number. So, digital root is pretty much that, you take a number add up its digits and keep doing that until you get a single digit. For example: the number 789
7+8+9=24.... 2+4=6

So, digital root of 789 is 6. That's it! It should lie between 0 and 9. But wait! There is more... There are few of its application too:

- There is this 'divisibility by 9' thing. If a numbers digital root is 9, that number is always divisible by 9. (I checked it myself because that sounded weird). Then I realised digital root is actually just the remainder when you divide the number by 9.

Sum	Digital Root	
1234	1+2+3+4=10 → 1+0 = 1	1
+ 411	4+1+1 = 6	+ 6
1645	1+6+4+5=16 → 1+6 = 7	7

So, when 789 is divided by 9, the remainder is 6.
See that's so cool.

- That's not it. Digital roots also help with quick calculation error checks. For example, we are adding 1234 plus 411 which is 1645. Now to check we add the digital roots of 1234 and 411 (ie: 1+6), that should come equal to the digital root of 1645 (ie: 7).
- Then I found out that digital roots show up in the number theory (where mathematicians find patterns that nobody else notices). Even in checksum formulas- Credit cards, barcodes, and even computer system use digital root to spot errors. All this time I thought that math was just about solving equations, but it turns out that it is the behind the scenes of our everyday life.

But of course everything has its own limitations. Like they have this trick that is divisibility by 9, that's it. it cannot be used in divisibility by 7 or 8 or anything else. Also, they are not giving us any new information like it is just repackaging something math already knows. And they won't even solve big math problem or any complicated equations. It's like a small trick not a huge deal.

But come on at least it is easy. No complicated steps, no formulas, it's just adding numbers till you get a single digit. And even though it's not some "life changing" math trick, it still is kind of useful. Like- divisibility check? Error detection? Spotting number theories? Not bad for something this easy. In the end, it's just a simple trick but I have to say it is pretty cool. Not every math thing has to be big deal. Does it change my life? No. But it is still pretty cool to know.

Until next time,
Soumya

CONTENT-SOUMYA
DESIGN - GAURI, PRANATI & KANIKA

The Riemann Hypothesis

Interviewer- Imagine a puzzle that has not been solved for over 160 years. A cauldron that has tantalized the brightest mind of mathematics. Welcome, everyone! Today we're cracking open one of the greatest mathematical mysteries of all time—the Riemann Hypothesis. Some say it holds the key to the deepest secrets of prime numbers, while others fear it might never be solved. Today we have invited an expert mathematician in the house who will help us navigate the Riemann Hypothesis mystery. Welcome! Could you break down this legendary mathematical puzzle for us?

Expert- Absolutely! The Riemann Hypothesis is like the ultimate math riddle. If proven true, it could change everything we know about numbers! It was proposed by Bernhard Riemann in 1859, and it suggests that all non-trivial zeros of the Riemann zeta function have a real part of 1/2, meaning they lie on a specific vertical line in the complex plane.

Interviewer- Alright, you've got me hooked! This zeta function sounds like a crucial piece of the puzzle. Can you break it down for us? What makes it so important?

Expert- Great question! The Riemann zeta function is a fancy way of summing up numbers like this:

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s}$$

for complex numbers s where R(s)>1. Mathematicians realized that its zeros—where the function equals zero—are mysteriously tied to prime numbers. The function has two types of zeros:

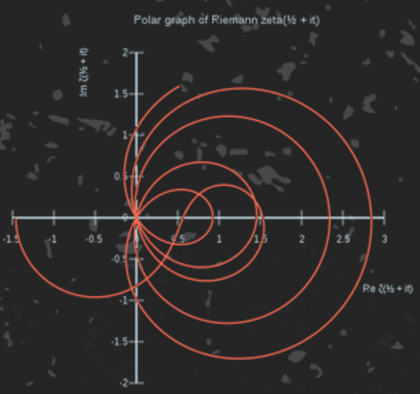
- Trivial zeros at negative even integers (S= -2, -4, -6, ...).
- Non-trivial zeros, which, according to the Riemann Hypothesis, should all sit neatly on the line R(s)>1.

Interviewer- So how will this help you gain a better understanding of prime numbers?

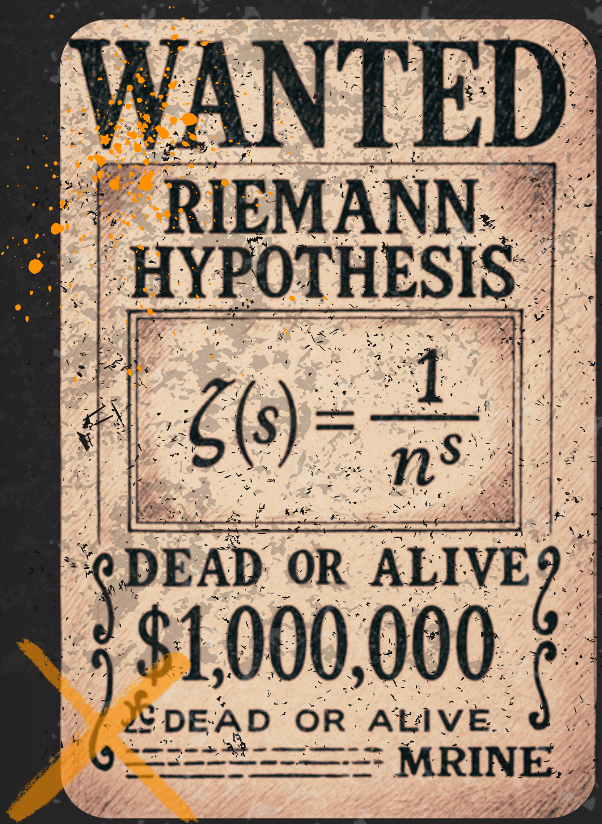
Expert- Prime numbers are like the building blocks of all other numbers, and their pattern has puzzled mathematicians for centuries. We'll explore the distribution of prime numbers and their deviation from the predictions of the Prime Number Theorem.

Interviewer- Wait... are you saying that solving this would completely change how we understand numbers? That's HUGE!

Expert- Indeed, proving this theory will enhance our understanding of prime numbers, leading to advancements in pure mathematics. It will also have significant implications for improvements in cryptography. Developments in number theory rely on the assumption that this hypothesis is true. It might change how quickly prime numbers can be predicted. While that could lead to breakthroughs in encryption, it might also mean that current encryption methods become vulnerable. So, solving this puzzle doesn't just rewrite math history—it could change the future of cybersecurity!



Interviewer- Whoa, so not only would solving this rewrite math history but there's also a bounty on its head? How much are we talking?



Expert- Yes! The Clay Mathematics Institute listed the Riemann Hypothesis as one of its Millennium Prize Problems, offering a cool $1 million for a proof or disproof.

Interviewer- 1859? That's over 160 years ago! What makes this problem so difficult that no one has solved it yet?

Expert- That's the million-dollar question—literally! So far, billions of non-trivial zeros have been checked with computers, and they all fall on the critical line. But that's not proof for all numbers! Many individuals have claimed to have solved this problem, but their solutions are not recognized by the mathematical community. The Riemann Hypothesis isn't just a math problem—it's a legend

Interviewer - Wow, what a ride! Thanks for taking us on this incredible journey through one of math's greatest mysteries. Who knows? Maybe one of our listeners will be the genius who finally cracks it!

CONTENT- SHRUTI
DESIGN- MUSKAN

PRIME DISTANCE:

P-ADICALLY SPEAKING

The P-adiac numbers, as fancy as it sounds are an extension of the more widely known rational numbers. The p-adic numbers were invented at the beginning of the twentieth century by the German mathematician Kurt Hensel (1861–1941). Though, with hindsight, some of Ernst Kummer's earlier work can be interpreted as implicitly using p-adic numbers.The “P” in p-adic stands for a given prime number p, we extend the concept based on the powers of p. Generally when we talk about the “closeness” of a number to another, we speak in terms of their absolute values. To differentiate this from rational numbers, in p-adic, we look at the powers of the prime, p, and measure the closeness in terms of its divisibility.

Taking closeness concept in 3-adic system:

Consider the numbers 3,9 and 27 in the 3-adic system.

3 is divisible by 3 (3^1)

9 is divisible by 9 (3^2)

27 is divisible by 27 (3^3)

From the p-adic perspective, all these numbers are close to 0 as they are divisible by increasing powers of 3 (the prime, p=3). Hence, this is how we differentiate closeness in rational and p-adic numbers.

Taking a deep dive to understand the closeness in p-adic numbers, we can look at a common characteristic to differentiate it in the following manner:
The real numbers have a finite number of digits to the left of the decimal point and possibly infinitely many digits to the right of the decimal point. However, as we will see, the p-adic numbers can always be written with finitely many digits to the right of the decimal point and possibly infinitely many digits to the left of the decimal point. For example 33.333333... is not a p-adic number, but ...333333.33 is.The p-adic in itself is a very complex topic, but ironically the applications of the same refer to times when it makes it easier for our good. A few interesting applications of the same are:

- **Number theory: P-adic numbers are what help us understand the behaviour of any given prime number for example the divisibility of a number by prime numbers like 2,3 5,7 ....**
- **Physics: In physics, scientists make use of p-adic numbers to understand how something works on a very small level, again bringing me back to the behavior.**
- **Cryptography: As previously mentioned how p-adic numbers are usually complicated, they also help in building up complicated codes like secret codes. Given the toughness, such codes are very hard to crack!**

In conclusion, p-adic numbers provide a unique and powerful tool for studying and understanding numbers in a much deeper and more detailed way—particularly when traditional methods fall short. Such different perspectives in mathematics give a way out to those who have a creative and innovative mindset and do not follow thoroughly the traditional style.

CULTURAL BELIEFS IN Number Theory

CONTENT- DIZA PAULSON
DESIGN- DISHA BANSAL

The realm of number theory is much more than some tedious calculations. It weaves together culture, human beliefs and experiences and the wisdom of our ancestors. From the wise Vedic Scholars to the Mathematicians of this modern world, let us find out what individuals from diverse fields have to say about the cultural beliefs in Number Theory:

Panditji (a Vedic Scholar): "Numbers play a significant role in Indian Culture. People started the day with praying three times to own Ista Devta or God and goes to the bed at the end of the day by praying three times to own Ista Devta. Auspicious rituals like yagnas require 108 offerings, a number linked to the earth, sun, and moon, which are also always revered."

Mathematician: "We view number theory, the study of integers and their properties, as a vibrant and essential area of mathematics It's used in cryptography and computer science. In the modern era, number theory has witnessed remarkable advancements with the advent of computers. The discovery of new prime numbers, such as Messene primes and prime gaps, continues to captivate mathematicians and researchers."

Rabbi (A Jewish Theologian): In Jewish culture, 7 is the most sacred number. Seven is completeness and wholesomeness. Eighteen is considered a special number in Jewish culture because it is the numerical value of the Hebrew word chai, meaning "life." Do you know that Jews give gifts and charitable donations in multiples of 18? In Hebrew language, each letter has a numerical equivalent."

Archeologist: "Archaeology and mathematics may seem like two vastly different fields, but their connection runs deeper. Spatial patterns, like artifact clusters or stone lines, reveal sites like a marketplace, while linear patterns of stones suggest an ancient road or wall. Radiocarbon dating is pure math, using radioactive decay to date materials and build timelines. So, numbers help us understand the past.

Folklorist: “Mathematics and mythology have been intertwined in many cultures. The myth of the Greek prince Theseus and the monster Minotaur, where Theseus, facing the fearsome Minotaur in King Minos's labyrinth, wasn't just brave; he was clever. Ariadne's gift, a simple ball of string, became his algorithm. Unravelling it as he went, he navigated the maze, defeated the beast, and found his way back, turning myth into a tale of problem-solving. Theseus navigates the labyrinth using a ball of string, can be interpreted as an early example of an algorithm or a mathematical solution to a problem.”

Artist:” The golden ratio phi, a mathematical concept is purely magical for us artists. It has been used in art and design to create aesthetically pleasing compositions by dividing lines and rectangles in a way that feels balanced and harmonious like the Mona Lisa" by Leonardo Da Vinci, "The Last Supper" by Leonardo Da Vinci, and The Parthenon, the ancient Greek temple. Then, there's the rule of thirds, a guideline commonly used in painting, photography, and design, where the subject isn't centred, rather, the main focal point can be to one side or at the top or bottom of the image.”

Auntie Mei (Cultural Historian): “It’s fascinating, how deeply embedded these cultural beliefs are in daily life—how we use numbers as symbols to influence our fortune, health, and happiness. The Pythagoreans of Ancient Greece explored the mystical and philosophical aspects of numbers, believing that everything in the universe could be explained through numerical relationships. Number theory in ancient Egypt was concerned with applications like arithmetic and measurement, as in the Rhind Mathematical Papyrus. In Chinese philosophy, numbers are deeply connected with the five elements—wood, fire, earth, metal, water. The number 4, is considered unlucky because it sounds like the word for ‘death.’ But 8 is a number of prosperities.”

A curious Reader: “So, I was thinking, numbers are everywhere! Weather, time, school, work, money, measurements, even phone passwords. Engineers build with them, doctors use them for blood counts. From TV channels to road construction to Google Maps, we're surrounded by numbers.”

GUESS WHO?

1. My most famous work is Elements and I have proved that there are infinitely many prime numbers. People call me the "Father of Geometry." Who am I?

2. I helped crack the Enigma Code during World War II. My work laid foundation for modern computing and artificial intelligence. Guess who I am?

3. Known for his pioneering work in algebra, arithmetic, and trigonometry. He introduced the concept of zero and developed methods to solve linear and quadratic equations. Who is he?

4. I am known as the mathematical prodigy who secured a place in "The Guinness Book of World Records" for my exceptional calculation speed and my name is popularly recognised as the "Human Computer"

5. A self-taught mathematical genius who have contributed to infinite series, number theory, mathematical analysis and continued fractions. The number 1729 is famous because of him and his birth anniversary is observed as the National Mathematicians Day.

6. I developed the principle of buoyancy, formulas for area and volumes and estimated π to be between 3.1408 and 3.1429 using the method of inscribed and circumscribed polygons. Who am I?\

7. He proved Fundamental Theorem of Algebra which states that every polynomial equation has a complex root and introduced bell curve in probability. One of Maxwell's famous equations in electromagnetism is named after him. Who is he?

ANSWERS:

1. Euclid 2. Alan Turing 3. Brahmagupta 4. Shakuntala Devi 5. Srinivasa Ramanujan 6. Archimedes 7. Carl Friedrich Gauss

CONTENT & DESIGN- SANIYA

SECTION 3: MATHEMATICAL HOROSCOPE

CONTENT BY - SUHANI
DESGIN BY - DISHA SHARMA

What if our mathematical strengths and weaknesses were written in the stars? By exploring the unique energies and traits of each sign, I uncovered a hidden world of mathematical insights. Let's dive into it.

ARIES (March 21 - April 19)

Traits: Energetic, impulsive and competitive.

Approach: Aries tackles problems head-on, with fiery enthusiasm. They will likely jump into a complex equation without hesitation, relying on instinct and speed. They might skip steps to get to the answer faster, sometimes leading to errors, but their boldness often leads to creative solutions.

Preferred Math: Algebra and anything that involves quick calculations.

Problem-Solving Style: Impulsive, energetic, and competitive.

TAURUS (April 20 - May 20)

Traits: Patient, practical and reliable.

Approach: Taurus takes a deliberate approach to problem solving. They meticulously evaluate data, consider multiple perspectives and rely on careful planning to ensure accuracy. They develop practical and effective solutions.

Preferred Math: Geometry and spatial reasoning.

Problem-Solving Style: Patient, persistent and detail-oriented.

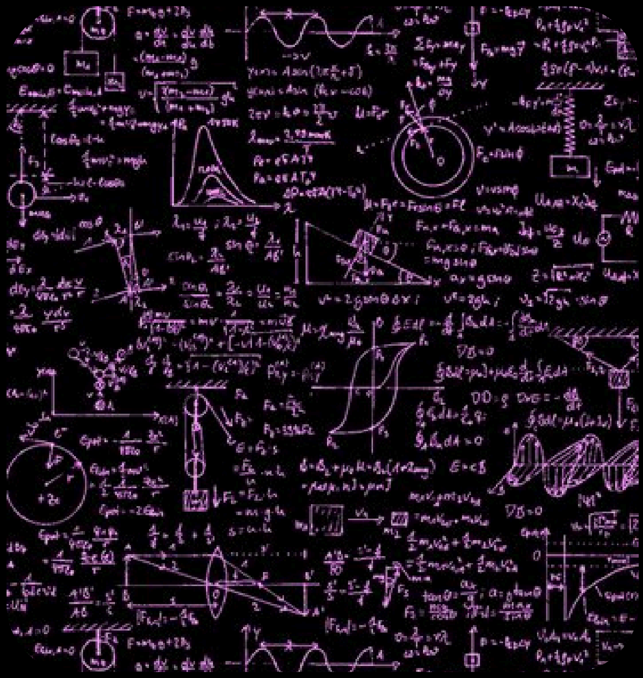
GEMINI (May 21 - June 20)

Traits: Curious, versatile and analytical.

Approach: Gemini's curious and versatile nature leads them to explore endless approaches. Since they are quick-witted and adaptable, they enjoy solving problems that require logical reasoning.

Preferred Math: Logic puzzles, probability and brain teasers.

Problem-Solving Style: Flexible, inquisitive and inventive.



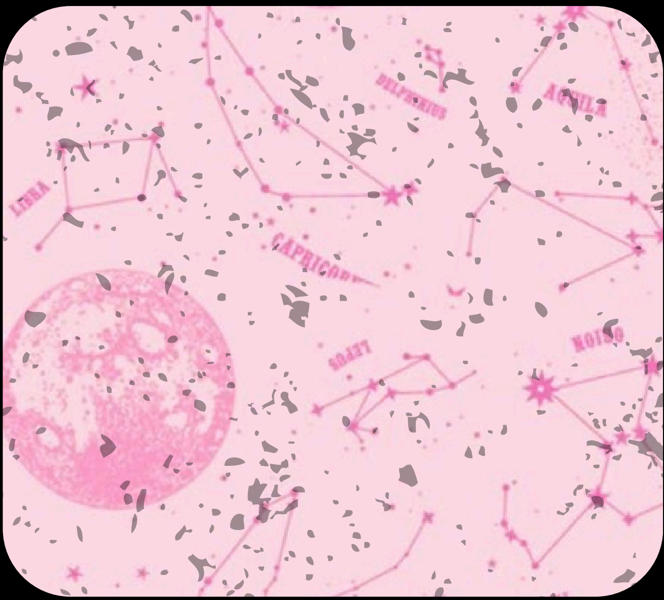
CANCER (June 21 - July 22)
Traits: Emotional, empathetic and nurturing.
Approach: Cancer's empathetic nature and emotional intelligence guide their problem solving approach. They are intuitive and often rely on their emotional instincts to solve complex problems.
Preferred math: Data analysis and statistics.
Problem-Solving Style: Intuitive, holistic and introspective.

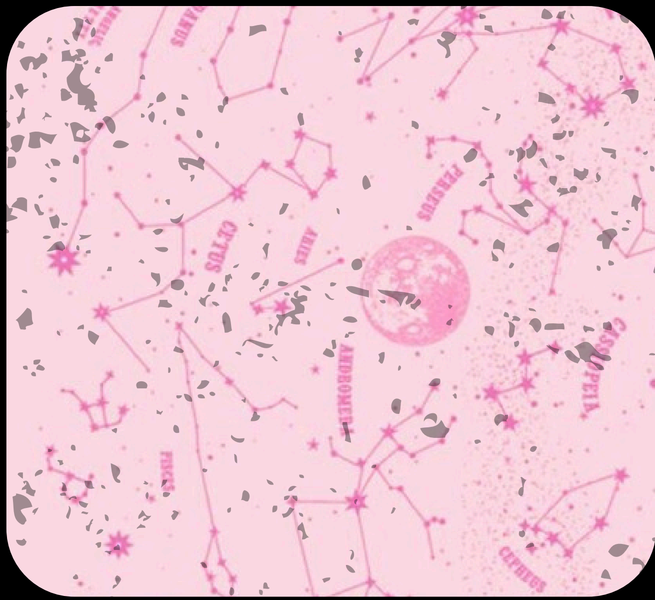
LEO (July 23 - August 22)
Traits: Confident, charismatic, prideful.
Approach: Leo's charisma shines in their problem solving style as they boldly tackle challenges and present their solutions with flair. They are natural leaders and enjoy taking charge of problems.
Preferred Math: Calculus and complex math.
Problem-Solving Style: Generous, passionate and confident.

LIBRA (September 23 - October 22)
Traits: Diplomatic, social and gracious.
Approach: Libra's diplomatic nature and sense of fairness guide their problem solving. They weigh multiple perspectives and seek balanced solutions, though it sometimes leads to indecision. They are mediators and enjoy finding solutions that benefit everyone.
Preferred Math: Graph theory and network analysis.
Problem-Solving Style: Cooperative, gracious and balanced.

VIRGO (August 23 - September 22)
Traits: Practical, analytical and perfectionistic
Approach: Virgo's analytical mind and attention to detail drive their problem solving style as they carefully evaluate the data and provide precise solutions. They are diligent and thorough in their approach. They often find solutions that others may have overlooked.
Preferred math: Number theory and cryptography.
Problem-Solving Style: Meticulous, methodical and precise.

SCORPIO (October 23 - November 21)
Traits: Passionate, probing and intense.
Approach: Scorpio approaches problems with intensity and penetration and they probe deeply into complex issues to uncover hidden patterns. Their passion for solving mysteries drives them to persist until they crack the code.
Preferred math: Advanced algebra and number theory.
Problem-Solving Style: Passionate, perceptive and transformative.





SAGITTARIUS (November 22 - December 21)
Traits: Adventurous, Independent, Blunt
Approach: Sagittarius's adventurous spirit and love of exploration lead them to tackle problems with enthusiasm and optimism. They are natural philosophers and enjoy exploring deeper implications of mathematical concepts.
Preferred Math: Trigonometry and geometry
Problem-Solving Style: Expansive, philosophical and enthusiastic.

AQUARIUS (January 20 - February 18)
Traits: Humanitarian, Rebellious, Unconventional
Approach: Aquarius's innovative and humanitarian approach makes them seek solutions that benefit greater good and challenge conventional thinking of the society. With a forward thinking mindset, they analyze complex issues and identify challenging patterns. They are natural problem solvers.
Preferred Math: Computer science and coding.
Problem-Solving Style: Visionary, independent and innovative

CAPRICORN (December 22 - January 19)
Traits: Disciplined, Ambitious, Persevering
Approach: Capricorn's responsible nature guides their problem solving. Their responsible nature ensures attention to detail and they are willing to put in the time and efforts required to master complex concepts.
Preferred Math: Engineering and physics problems.
Problem-Solving Style: Practical, systematic and rigorous.

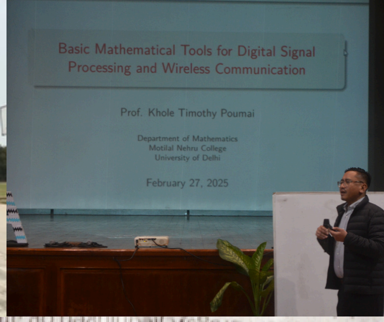
PISCES (February 19 - March 20)
Traits: Imaginative, sensitive, dreamy.
Approach: Pisces's approach is fluid, adaptable, and beautifully unconventional. Their imaginative nature allows them to visualize complex concepts and make connections between unrelated ideas.
Preferred Math: Algebraic and fractal geometry.
Problem-Solving Style: Creative, artistic and intuitive.

PLEASE NOTE THAT THESE MATHEMATICAL HOROSCOPES ARE MEANT TO BE HUMOROUS AND ENTERTAINING, RATHER THAN TAKEN AS SERIOUS ADVICE.

dept of MATHEMATICS 2025

DEPARTMENT REPORT

CONTENT BY - AVNI & ANAM
DESGIN BY - KANIKA SAROHA



MATHEMATICS WEEK

As part of Mathematics Week, the department of mathematics organized engaging activities to reflect on the beauty of mathematics. On 18th December, a contest invited students to share a song that best described their personal journey with mathematics. On 22nd December, an online screening of The Imitation Game was conducted in collaboration with Algorithm, offering insights into Alan Turing's life and contributions. The same day, the "From Zero to Zenith" post was shared, exploring the significance of the day, Ramanujan's legacy, fun facts, and reflections on The Man Who Knew Infinity. The celebrations received enthusiastic participation.

MATHARENA

On 25th and 27th of February 2025, the Department of Mathematics had their annual academic event, **MATHARENA!** After weeks of hard work, at 10 am on Tuesday, the programme started with the Inaugural ceremony. The President of the Department gave the welcome speech, followed by a spectacular rhythm of feet, a classic Jugalbandi of Kathak and Bharatnatyam.The faculty members and the chief guest then lighted the lamp, this marking an official beginning of the event. We were honoured to be joined by Prof. S. Dharmaraja, IIT Delhi and Dr. Vandana Khaitan, University of Delhi on Day 1. They shared incredible intellectual insights and left the audience in awe brimming with inspiration. We then started with a fiery competitions of "Kon Banega Ganitpati": The Ultimate Mathematical Quiz at Thevenet Hall, "Escape The Equation"- Mathematical Escape Room Adventure with its quirky questions and "The Mathematician's Convergence" Competition in collaboration with Algorithm at the Seminar Hall. The fun wasn't over, near the purple wall, three wonderful stalls were set up to indulge in sweet treats and gifts! With the most awaited award ceremony, Day 1 of Matharena came to an end! The second day began with an academically stimulating keynote lecture by Prof. Khole Timothy Poumai, University of Delhi. Then began the most awaited competitions, The Paper Presentation, The "Skewed Game", a mathematical twist to everyone's favourite and most feared game and a Battle of Wits at Zero Sum Debate: A Conventional Debate Competition in collaboration with The English Debating Society, Jesus and Mary College. Day 2 was also packed with five stalls with everything you could ask for from sweet & spicy treats to answering the tough questions at a Tarot Stall! Before the closing ceremony, the Math Department students shook the floor with the most energetic dance performances ever!

The closing ceremony was graced by Aryan Raghaw Shah Collective performing live, the students of JMC couldn't resist dancing to their favourite tunes! Lastly, we proceeded with the prize distribution, awarding the unwavering efforts of the ones who participated and won. Signing off with the Vote of Thanks by the Vice President of the Department, our spectacular event came to an end!

PLANTATION DRIVE

The Department of Mathematics, in collaboration with National Service Scheme, Jesus and Mary College, organised a plantation drive on 28th February, sponsored by AECC Study Abroad Consultancy in association with Brij Aikyam Foundation. We planted 50 rare seasonal plants in L Park, Jesus and Mary College. This initiative aimed to promote sustainability and environmental consciousness across the college campus. This didn't just beautify the campus but also underscored our collective responsibility towards the environment. Together, we are growing a greener tomorrow!

AECC SESSION

On 2nd April 2025, the Department of Mathematics, Jesus and Mary College, organized a guest lecture on "Emerging Global Trends in Education and Job Markets." The session was conducted by Mr. Rohan Lakhne, Academic Head at AECC Global, who has over 10 years of experience in preparing students for the GRE and SAT. Mr. Lakhne spoke about the changing landscape of global education, the rise of interdisciplinary learning, and emerging job market demands. The session concluded with an interactive Q&A, where students gained clarity on study abroad pathways and career planning.

GAME THEORY SESSION

The Department of Mathematics, in collaboration with the Department of Economics, organized a speaker session on "Applying Game Theory to Geopolitics" on 11th April 2025. The event featured Prof. Abhinay Muthoo, a renowned economist and game theory expert, currently associated with NIESR, London, and MDAE, Mumbai. Prof. Muthoo offered deep insights into the role of strategic thinking and mathematical modeling in international relations. The session blended mathematics, economics, and real-world issues, making complex ideas accessible and engaging. It concluded with an interactive Q&A and was a valuable interdisciplinary experience for students and faculty alike.

ACHIEVEMENTS

Anam- General Secretary of Sunny Mugs, The Poetry Society of JMC

Avni Jain- Vice President of Sunny Mugs, The Poetry Society of JMC.
Secured second position at the Paper Presentation Competition organised by Tensors, The Mathematics Society of Kirori Mal College for the paper titled, "The Trade of Accuracy and Privacy in Today's Age of AI: Analysing Differentially Private Models using theoretical Mathematics"

Divanshi Chhatani- Lead Organizer of TEDx JMC.

ACHIEVEMENTS

Diya Mariya Varghese- 2nd Prize in The Little Violet - St. Claudine Thevenet Quiz

Joisy James- 2nd Prize in The Little Violet - St. Claudine Thevenet Quiz

Lavanya Singh- President of Troubadours JMC

Neha- First Position in Mathematics Honours in first year

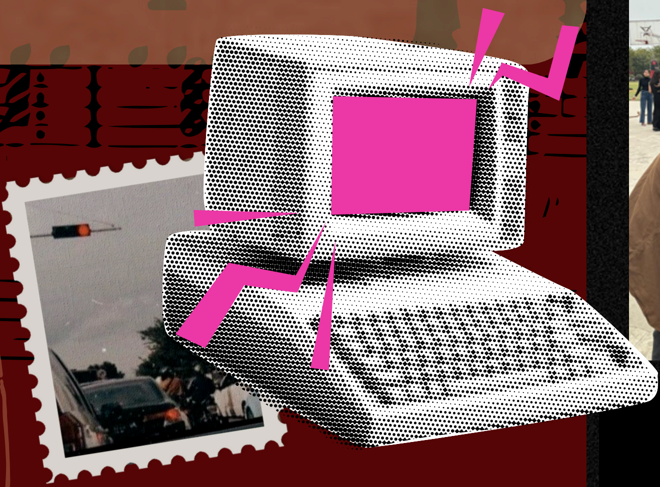
Reena- First Position in Mathematics Honours in second year

Riddhi Singhal- • Vice President of National Sports Organisation
-Secured 3rd Rank in Handball Delhi University Inter College

Rishika Aggarwal- First Position in Mathematics Honours in third year

Ritika Gandhi- Vice President of 180DC, JMC

Vrinda Kwatra- Secured second position at Impactus: from Pitch to Purpose at Enactus, MSCW, representing Project Iffat, an initiative by Enactus JMC.

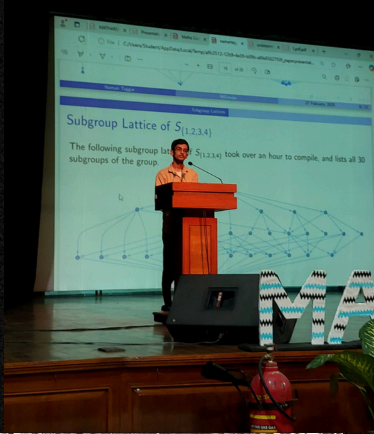


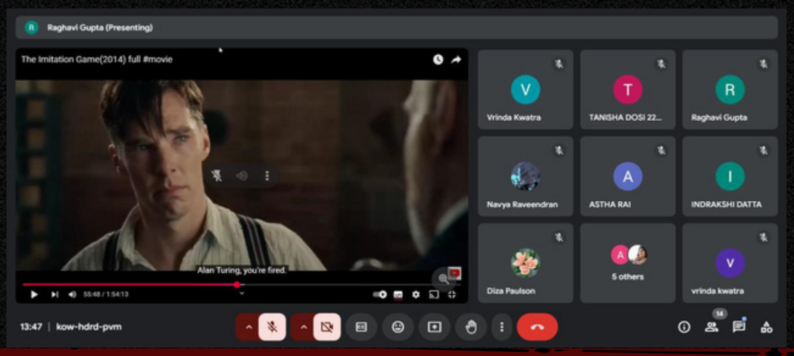
FACULTY

Prof. Alka Marwaha
Dr. Anu Ahuja
Ms. Rama Saxena
Ms. Richa Krishna
Ms. Sunita Narain
Dr. Ambika Bhambani
Dr. Indrakshi Dutta
Dr. Rashmi S.Thukral
Dr. Shruti Tohan
Dr. Khaiminthang Vaiphei
Dr. Pakhi Gupta

OFFICE BEARERS

PRESIDENT- Tanisha Dosi
VICE PRESIDENT- Raghavi Gupta
TREASURER- Sneha Gupta





mathArena

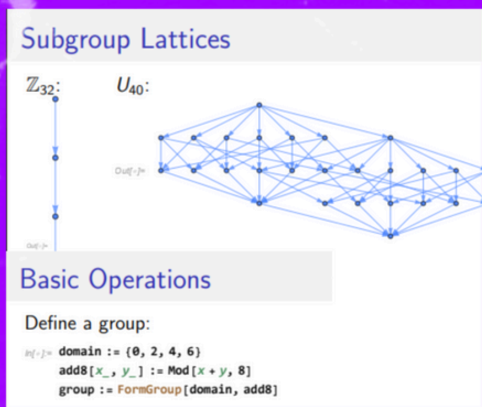
FEB 27 2025

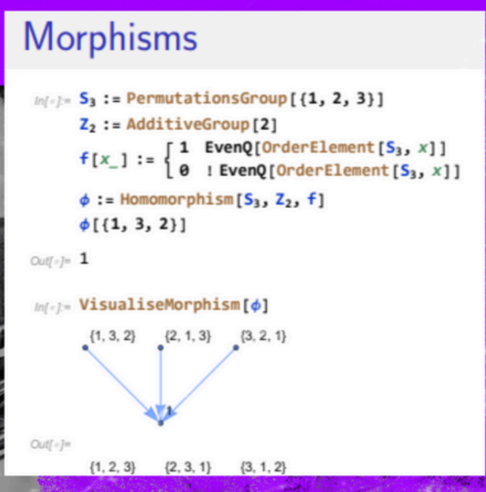
PAPER PRESENTATION COMPETITION

"MGroups: A Mathematical Package for Finite Group Theory"

1st Place, Naman Taggar, Sri Guru Tegh Bahadur Khalsa College. University of Delhi

To introduce MGroups, a Mathematical package developed by Mr. Taggar, that implements and helps in the exploration of finite groups. It facilitates studying various concepts ranging from basic group operations & properties, to advanced operations such as finding subgroups of large cyclic groups (order 1000+).





Packages like MGroups assist teaching and learning experience, and using them, even abstract branches of Mathematics can become quite interesting to explore. Using the package is extremely easy because of the user-friendly nature of Mathematica, wherein most of the tasks can be performed using single-line commands.

CONTENT BY - AVNI & ANAM
DESGIN BY - PRANATI KHANNA

Mathematicians' Convergence

Algorithm organised The Mathematician's Convergence, a creative writing competition as a part of Matharena'25 on 25 February'25. It followed a simple yet a mind twisting question: What if history missed a chapter? What if two mathematicians existed at the same time? This question inspired a creative exploration of mathematical concepts, historical figures, and imaginative scenarios, blending the worlds of math and literature in a captivating way.

The competition was judged by esteemed faculty members of Department of Mathematics of Jesus and Mary College, Prof. Alka Marwaha and Dr. Pakhi Gupta.

We witnessed enthusiastic participation and creative submissions! Arnav Gaur of Ramjas College won the first prize, on the prompt "The Paradox of Zero : A Conversation Beyond Time between G.H. Hardy and Bernhard Riemann" and Meghna Raj of Jesus and Mary College secured the second Prize, on the prompt, " Can the Emotions of a Raga Be Quantified?" Between Leonhard Euler and Saint Thyagaraja. The event was a resounding success, not only showcasing the participants' creativity but also sparking engaging discussions about the fusion of art, history, and mathematics.

BATCH OF 2025

girl so confused

Aneri
All hate 💋

Bonita
3 years, Countless theorems, infinite memories

professional professional professional professional professional yapper

Cheshtha
Math, memories and a little more confidence.

Divanshi
From equations to self-discovery — grateful for the journey and the ones who shaped it.

certified hater certified hater certified hater

Diksha
Running on caffeine, chaos, and questionable decisions.

icon icon icon

Divyanshi
All love 💋

hopecore

Diya
Survived on math, music, and miracles. Degree unlocked!

femininomenon

Harnoor
Graduated with honours in procrastination and caffeine management

diva diva diva

Joisy
If life gives you lemons, squirt someone in the eye.

BATCH OF 2025

Kavneet

Graduated on little sleep & the same energy as Fermat — left a theorem; disappeared.

Kishika

We all survived where the drama was imaginary but the struggle was real.

Mauli

Officially a problem solver!

Nandini

Don't cry because it's over. Cry because you've to pay your own bills now.

Navya

Taking memories, leaving doubts, and writing a new journey.

Priyanshi

Survived college, lived PG life, made forever friends, forgot basic math chasing theorems & somehow, we made it.

R Karunya

Stepping out with gratitude, stepping up with goals

Reena

Optimizing happiness, minimizing regrets

Ritika

100% sine, I made it!

BATCH OF 2025

Riya
Life is a one time offer, use it well.

Sanya
This degree gave me more than formulas—it gave me my constants

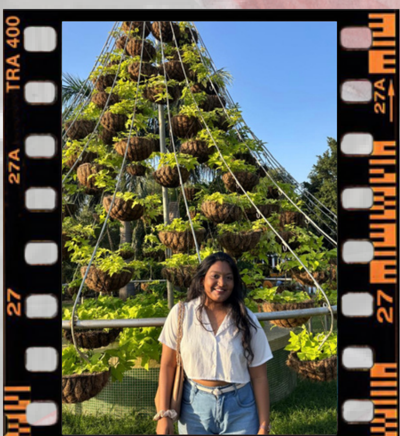
Simran
Passed college, made memories, found my people & I wouldn't trade it for anything.

Sneha
From solving equations to salvaging each other's drama- college was one epic problem worth solving!

Vanshika
Degree powered by 90% procrastination, 10% pretending to know things

Tanisha
Made memories, not GPAs

Vijay Bharti
It happened, because it was meant to be.



Yashi
Some people have their life to together. I have... snacks and panic.

Yadavi & Lavanya
"I'm with stupid" , "I'm stupid"

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