



**Indraprastha College for Women**  
**University of Delhi**



# Nairantarya (नैरन्तर्य)

**DEPARTMENT OF MATHEMATICS**  
**MAGAZINE**

**2025**

# Behind the Cover

## Nairantarya 2025 – Infinitely Continuous

~Where thought flows without end, and learning never pauses.

Derived from ancient Sanskrit, “Nairantarya” (नैरन्तर्य) translates to ‘unbroken continuity’ – a flow that persists without interruption. This word shifts everything into perspective, particularly in mathematics where every idea connects to another, every solution leads to a new question, and every discovery calls for further exploration.

At the center of the infinite, “Nairantarya” unveils the mask of limitless thoughts, where reasoning takes flight and glows with clarity and intent. It is a purpose with an unbounded and endlessly anchored composition, highlighting the symmetry of thought. The Nairantarya Infinity cover breathing life into the cross-logic design, sets a backdrop bursting with layered curves-flowing and spiraling, representing learning that loops, expands, and increases thought. Sculpted numerals use motion and depth to embody seamless movement, fueling the unfurling of ideas.

Set against a richly layered background, the design features infinite loop patterns that subtly form shapes reminiscent of the infinity symbol ( $\infty$ ). There are no sharp breaks — only smooth transitions, mirroring continuous mathematical functions or the ever-evolving flow of knowledge.

Logic guides the journey of progress, a voyage through evolving streams of the mind. Smooth sustenance preserves unfolding rhythmic, as reason revisits intricate threads in lavish whirls- creating an uninterrupted flow rooted in the bound essence of nature.

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# ABOUT THE DEPARTMENT

## INTRODUCTION



Mathematics has been a part of Indraprastha College for Women since 1933. Initially it was introduced as a Discipline Subject in BA Program (called BA Pass at that time). Mr. G. Goswami remained the only faculty member from 1933 to 1948. Later in 1954 college started B.A.(Hons) in Mathematics and four years after this M.A. in Mathematics was also introduced.

Our students meet stupendous success in diverse fields ranging from teaching to serving MNCs. Students are encouraged to develop their computational skills, critical and analytical thinking and problem solving skills which are very important to compete in the 21st century era dominated by computers and a global economy facing enormous unprecedented challenges coupled with opportunities. Mathematics Academic Society: 'TRIJYA' is a platform for students to exhibit their talents beyond academics extending to developing organisational and management skills besides providing an opportunity to interact with the outside world.

The department always strives to ensure that students contribute to today's society. The students are trained to critically assess numerical and graphical information, learn to formulate strategies for solving problems, and acknowledge the importance of being intellectually curious throughout their lives.

Courses Available -

[https://sites.google.com/a/ip.du.ac.in/math\\_department/curriculum/courses](https://sites.google.com/a/ip.du.ac.in/math_department/curriculum/courses)

# MESSAGE FROM TEACHER-IN-CHARGE



**Ms. Monika Bansal**

It gives me immense pleasure as the very first edition of the magazine 'Nairantarya' by the Department of Mathematics gets released. This is a testament to the hard work and consistent efforts of the editorial board led by Dr. Vagisha Sharma.

Congratulations to the entire editorial team for bringing out this magazine. This magazine is a sacred space where you will not only learn from others, but an important platform where you can share your ideas, and it will reflect your passions for the subject.

To all my students, the skills you've honed during your time at IPCW—critical thinking, problem-solving, and the ability to approach uncertainty with confidence—are the very tools that will help you shape your future and the future of those around you.

Always remember that your journey is unique and special, trust in the path you are on.

Wishing you the best.  
May God bless you all.

# Faculty Profile



Dr. Vagisha Sharma  
Associate professor  
B.A.(Hons.), M.A., M.Phil., Ph.D. Mathematics

Ms. Dolly Jain  
Assistant Professor (Senior grade)  
B.A.(Hons.), M.A., M.Phil. Mathematics



Dr. Gunjan Khurana  
Assistant Professor  
B.Sc.(Hons.), M.A., M.Phil., Ph.D. Mathematics

Ms. Monika Bansal  
Assistant Professor  
B.Sc.(Hons.), M.Sc., M.Phil. Mathematics  
Teacher-in-charge, Department of Mathematics



Dr. Chander Shekhar  
Associate professor  
B.Sc.(Hons.), M.Sc., M.Phil., Ph.D. Mathematics



Ms. Ritika Gulati  
Assistant Professor  
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Ph.D. Mathematics (Pursuing)

Dr. Manju Sharma  
Assistant Professor  
B.Sc. (Hons.), M.Sc., B.Ed., Ph.D. Mathematics



Dr. Vijay Kumar Tripathi  
Assistant Professor  
B.Sc., M.Sc., D.Phil., B.Ed., PGDCA

Dr. Pardeep Kumar  
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Mr. Ashutosh Rajput  
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B.Sc.(Hons.), M.Sc., M.Phil.,  
Ph.D. Mathematics (Pursuing)

Dr. Suman  
Assistant professor  
B.Sc.(Hons.), M.Sc., Ph.D. Mathematics



# CHIEF ADVISOR



Dr. Vagisha Sharma - Chief Advisor

# CHIEF EDITORS



Sneha Tyagi  
B.Sc (H) Maths  
2<sup>nd</sup> year



Ishita  
B.Sc (H) Maths  
2<sup>nd</sup> year

# The Student Editorial Board



Sneha Tyagi  
2<sup>nd</sup> year



Ishita  
2<sup>nd</sup> Year

## 1st year:



Anshika Singh



Asma Sunil



Jahnavi Singh



Jiya Swami



Pari Goel



Radhika Gola



Suhana Garg



Vaishnavi Upadhyay



Vani

# Message from Alumna

"From Blank Pages to Breakthroughs – My Journey"

Dear Juniors,

As I sit down to share a piece of my life with you, I hope it serves as a reminder that success doesn't always follow a straight path—and that it's okay to stumble, as long as you stand back up stronger.

I graduated from IP College with a degree in Mathematics (Hons), followed by a Master's in the same field. But soon after, I found myself at a standstill—blank, directionless, and unsure about my future. All I knew was that I had a deep-rooted passion for teaching. I set my sights on clearing the NET exam, but life had different plans. My first attempt ended in failure. I tried again—another failure. Doubt crept in, and I began to wonder if I was chasing a dream that wasn't meant for me.

But something inside me refused to give up. I decided to give it one final try—a last trial. And that's when it happened. I cleared NET with JRF, securing an All India Rank of 22. That moment changed everything. It taught me a lesson I carry with me even today: Nothing is impossible. Anyone can do anything if they truly believe and work for it.

From there, life took a turn. I began my teaching career as an Assistant Professor at Hindu College and later moved to Keshav Mahavidyalaya. Even with a full-time job, I never stopped learning. I pursued and completed my PhD—something I once thought was out of reach.

But success, to me, isn't just about personal milestones. After my PhD, I chose to give back to society. I became involved in social work—mentoring students, conducting free CAPF interview sessions, and contributing to various welfare initiatives. Each step has added meaning and fulfillment to my journey.

To all of you reading this—please remember, your journey will be uniquely yours. There will be struggles, doubts, and detours. But don't let them define you. Let them refine you. Trust yourself, stay consistent, and don't fear failure—it often carries the seeds of your greatest success.

Dream big, work hard, and never stop believing in your story.

Because if I can do it, so can you.

With warm wishes,  
Dr Richie Aggarwal  
Batch of 2005-2008

# Message from Alumna

Studying mathematics was not a path I had 100% planned of. I got mesmerised with the college building and decided to not change colleges any further! Sounds stupid right, well that worked in my favor.

Being here and studying mathematics developed two crucial things for me - logical ability and problem solving : a core skill required for my work, and confidence along with soft skills: an important skill required in any profession, and definitely more in analytics and consulting.

People believe that there is only limited professions one can work in after studying mathematics, mostly being a professor or teaching. Instead mathematics equips you for quite a lot of professions. Instead this generation of AI, everything can be done using chatGPT, what remains with an individual is their ability to have a logical understanding of problem and drive towards a solution. So, as long as problem solving ability and logical inputs are in place, you can choose a career, develop one relevant skill for it (like coding or whatever else) and you are good to go!

-Radhika  
Batch of 2014-2017



**Tracing the  
roots**

# MATHEMATICS

## WHY MATHEMATICS IS CALLED MATHEMATICS?

The word "mathematics" comes from the Greek word "mathema", which means "knowledge", "learning", or "science". In ancient Greece, mathematics was considered a field of knowledge and learning, hence the name "mathematics".

### The Evolution of the Term

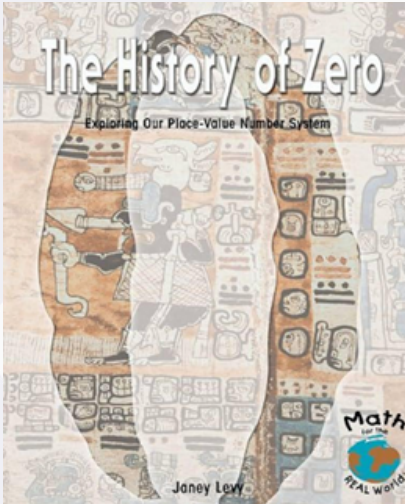
The term "mathematics" was first used in the 16th century to describe the study of numbers, shapes, and patterns. Over time, the field of mathematics has expanded to include many other areas of study, such as algebra, geometry, calculus, and more.

### Why "Mathematics" and Not Something Else?

The name "mathematics" has stuck because it accurately reflects the nature of the field. Mathematics is a pursuit of knowledge and understanding, and the name "mathematics" captures that essence.

-Vani  
B.Sc.(H) Maths  
(1<sup>st</sup> year)

# WHO INVENTED ZERO?



## WHO GAVE THE SYMBOL TO IT ?

### INTRODUCTION

While the concept of zero as a place holder and a number in its own right developed in India, Aryabhata, a 5th-century mathematician, is credited with introducing the concept of zero within his place-value system, though he didn't explicitly use a symbol for it.

**Aryabhata's Contributions:** Aryabhata, a renowned Indian mathematician and astronomer, lived in the 5th century AD. He is credited with introducing the concept of zero within his place-value system, which was essential for the development of the decimal system.

Although he didn't explicitly use a symbol for zero, his work on place value inherently required the concept of zero as a placeholder. He used the word "kha" (meaning "void" or "empty") to signify the absence of a digit in a place value system, which served a similar purpose to zero.

**Brahmagupta's Role:**

Brahmagupta, another Indian mathematician who lived in the 7th century, formalized zero as a number and developed mathematical rules for its use. He treated zero as a placeholder and defined its arithmetic properties, such as adding and subtracting zero.

0  
1  
2  
3

# INFINITY UNVEILED



## The boundless realm of infinity

### DISCOVERY

The concept of infinity, meaning "unboundedness", evolved from philosophical ideas in ancient Greece (apeiron) to a mathematical tool. John Wallis introduced the symbol  $\infty$  in 1655. Georg Cantor later formalised actual infinity with set theory in the 19th century, distinguishing different "sizes" of infinity, revolutionising mathematics.

### MATHEMATICAL FORMALISATION

The true revolution in understanding infinity came in the 19th century with the groundbreaking work of Georg Cantor. In the late 19th century he revealed a surprising truth about actual infinity: not all infinite sets are the same "size". He introduced the concept of cardinality to measure the "number of elements" in a set, even infinite ones. For instance, the set of natural numbers and the set of even numbers have the same meaning; there's a one-to-one correspondence between them. Surprisingly, the set of real numbers has a larger cardinality ( $c$ , the cardinality of the continuum), proving that there are "more" real numbers than natural numbers.

The set of integers, rational numbers, and even algebraic numbers are all countably infinite. However, the set of real numbers is uncountably infinite, meaning it is a "larger" infinity than the countable infinities.

# LIMITS AT INFINITY

One of the most powerful way mathematician can work on infinity is through limits. A limit describes the value of function or sequence approaches as the input get closer to a certain point-often infinity.

for example the sequence:

$$\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots$$

get smaller as the denominator increases. Though it never reaches to zero but, it converges to zero. In mathematical terms:

$$\lim_{n \rightarrow \infty} \frac{1}{n} = 0$$

This is a powerful idea that infinite time processes lead to finite result. It's the foundation of calculus especially when studying the area under the curve and the behaviour of function at extremes.

But not all the sequences converge .

The harmonic series:

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$$

grows without bound. Despite its shrinking terms it diverges that is the infinity insights.

## CONCLUSION

Infinity is more than just a big idea—it plays a major role in how we explore and understand the world through math. From solving everyday problems to tackling deep questions about space, time, and data, infinity helps us reach beyond limits and see the bigger picture in mathematics.

-Vaishnavi Upadhyay  
B.Sc(H) maths  
1st year



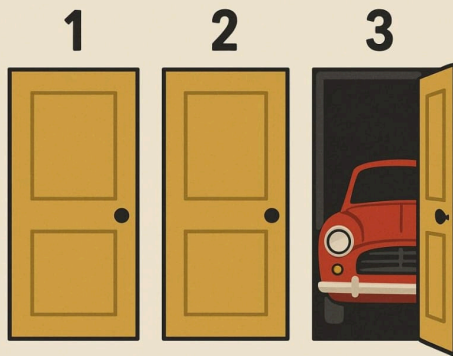
# Infinity



# Mathematical Concepts

# The Monty Hall Problem

## MONTY HALL PROBLEM



### *Do you know??*

The number 9 is called number of completion or magical , as any number you add , the sum of the digits in the result will always be equal to the sum of number selected priorly,

$$9 + 142 = 151$$

$$1+4+2 = 1+5+1$$

$$\text{Also, } 1089 \times 9 = 9801$$

The Monty Hall Problem is a famous probability puzzle that challenges our intuition in a surprising way.

Imagine you're on a game show, "Let's make a deal", hosted by MONTY HALL.

There are three doors; behind one door is a car, and behind the other two doors are goats. You're asked to choose one of the doors. You choose door 1, but you don't open it yet.

The host, who knows what's behind each door, opens one of the other two doors, revealing a goat. Monty then gives you the option to either stick with your first choice or switch to the remaining door.

Many people think that after Monty reveals a goat behind one of the other doors, the remaining two doors each have an equal probability of hiding the car, so each should have a 50 % chance.

However, this is not the case. Let's break it down.

-> If you stick with our original choice, your chances of keeping the car remain  $1/3$ . This is because when you made your initial choice, there was a  $1/3$  chance that you picked the car and a  $2/3$  chance that you picked the goat.

-> If you switch to the other door, your chance of winning the car increases to  $2/3$ .

The key insight is that Monty's action of revealing a goat provides additional information that skews the odds in favour of switching, making it a better strategy than sticking with your initial guess.

-Suhana Garg  
B.Sc.(H) Maths  
(1<sup>st</sup> year)

# Metatron's cube

Metatron's cube is a unique geometric figure which is mysteriously connected with the universe. This is a figure used in various religious traditions, often considered to be the scribe of God in mystical Judaism and getting its name after the archangel Metatron. It is widely discussed in spiritual contexts and also has significant mathematical connections.

## Structure:

Metatron's cube is made from 13 circles of the same size that are arranged in a specific way that forms a complex figure, yet symmetric. The centre of the circle is connected by straight lines that form a complex connection. There are many core shapes that emerge from Metatron's cube that are hexagons, equilateral triangles and unique shapes such as the flower of life, which is an ancient symbol made up of multiple evenly spaced, overlapping circles, and five Platonic solids, which are the tetrahedron, cube, octahedron, dodecahedron and icosahedron, better being embedded in the figure.

## Mathematical significance:

It is not only visually striking but it also embodies fundamental concepts in geometry it is studied in many fields such as symmetry group theory in group theory it is considered as a representation of certain symmetry groups due to its rotational and reflective symmetry and sacred geometry which is the study of geometric pattern and shape believe to have symbolic and mysticals and significance and links to the understanding of universal patterns in proportions found in nature.

## Connections with nature in real life:

Nature : The Fibonacci sequence, whose spiral patterns are seen in pinecones, sunflowers and seashells, adheres to the principles found in Metatron's cube.

Physics : Quantum mechanics and cosmology often delve into the geometric pattern of Metatron's cube . The study of spacetime curvature, particle physics and string theory explores the complex geometry by using this figure.

Architecture : Classical and modern architecture, including famous structures such as the Parthenon and the Great Pyramids, often incorporate the principles of sacred geometry.

- Suhana Garg  
B.Sc.(H) Maths  
(1st year)

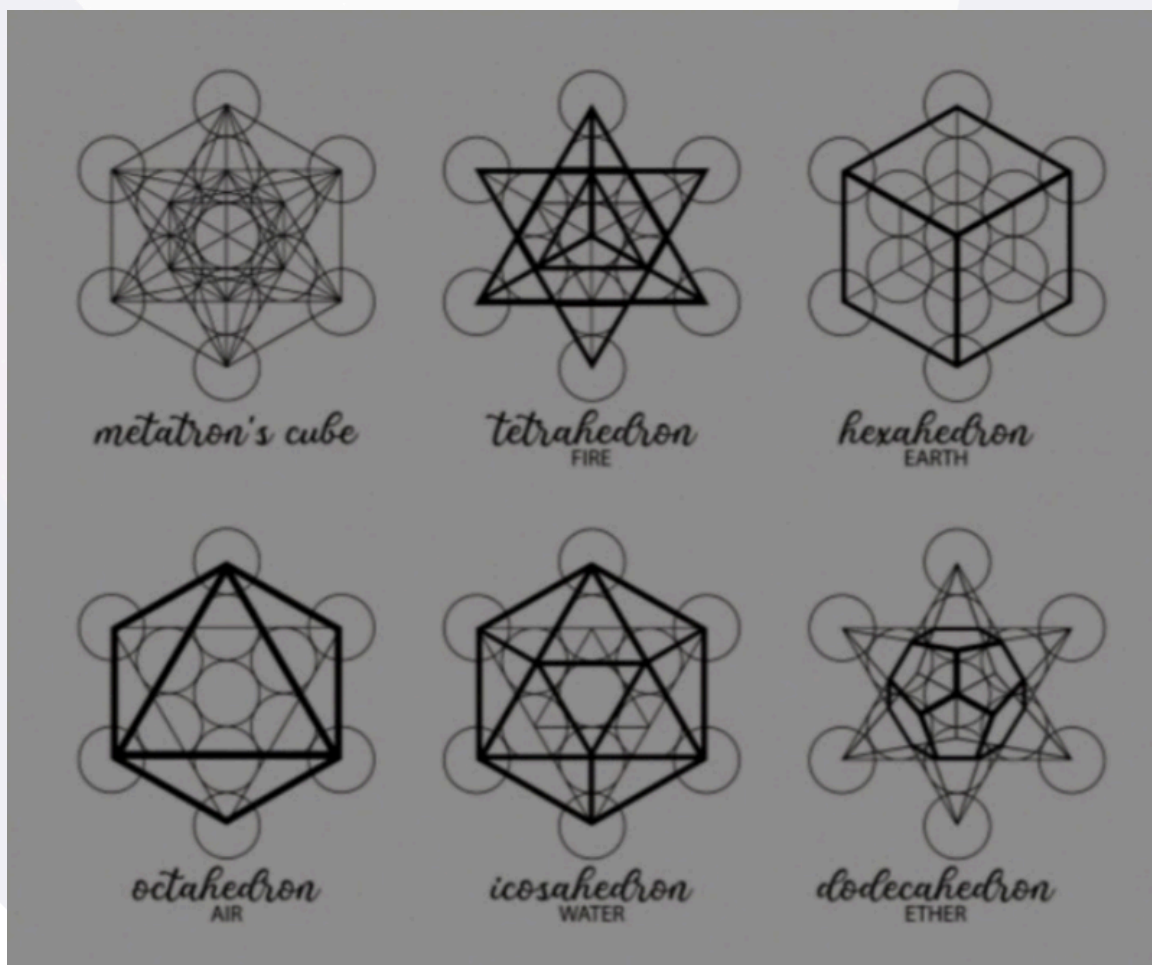
## Mysticism and spirituality

It is often considered a powerful symbol in various spiritual traditions that is believed to have the secret of the universe. Some spiritual connections are Archangel Metatron: In Jewish mysticism, Metatron is the highest-ranking archangel said to be the scribe of God who records the deeds of humanity; the cube symbolises divine order and balance in the flow of energy throughout the universe.

Cosmic order : It governed the representation of fundamental structures of the universe, such as laws of physics, the mathematical order of nature and the harmony of the cosmos.

Healing and energy work : It is thought to channel divine energy and provide spiritual healing by bringing harmony and balance to the body and mind. Also, Metatron's cube is used in alternative healing practices.

- Vaishnavi Upadhyay  
B.Sc. (Hons) Maths  
1st year



# Benford's law

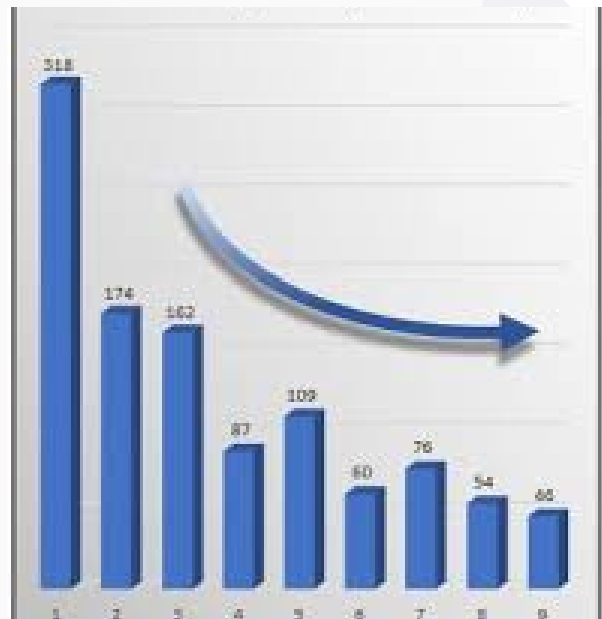
Benford's law states that if in a general scenario we are given a large dataset of naturally occurring numbers, like company expenses, stock prices or tax returns, then the leading digit or the first digit of most of the numbers is likely to be small digits like 1, 2 or 3. Also, the number 1 appears most frequently as the first digit (about 1/3rd or nearly 30% of the time); digit 2 appears less than 1, and digit 3 appears less than 2, and so on. The no. 9 appears the least frequently (less than 5% of the time).

According to this law, such large datasets are not uniformly distributed; rather, they form a logarithmic distribution, with the highest numbers having their first digit to be 1 and then decreasing similarly to the log graph.

## Examples and Real Case Scenarios

### 1. Tax Return Scams

In the 1990s, an accountant named Mark Nigrini found that Benford's law can be an effective red-flag test for fabricated tax returns. Usually, authentic tax data follows Benford's law, but when people manipulate the financial information, the fabricated numbers often deviate from the expected distribution. Nigrini's research highlighted that the IRS could apply Benford's Law to flag tax returns with numerical patterns inconsistent with natural financial data, thereby identifying potential fraud.



### 2. A Company Faking Revenue Numbers

Suppose a company wants to increase its revenue falsely to attract investors. So, the CFO invents fake sales transactions, thinking random numbers will look natural (which normally people assume is the right thing to do in most fraudulent cases). However, real sales figures (from customers, invoices, etc.) should follow Benford's Law, and fabricated numbers tend to have too many 5s, 6s, 7s, or 9s. Auditors analyse the revenue data and see too many high first digits, indicating fraud.

Real Case: There was an Enron scandal in 2001 which involved bizarre financial fraud, and the forensic accountants found that Enron's financial statements deviate significantly from Benford's law, which later confirmed the manipulation.

- Sneha Tyagi  
B.Sc.(H) Maths  
2nd Year



The background features a light blue gradient with intricate black line art. On the left, a dense grid of curved lines forms a complex, organic shape. On the right, a vertical structure of circles and lines, resembling a stylized ladder or a series of interconnected nodes, is positioned. At the bottom left, a circular diagram with a diagonal line and several points is visible. The overall aesthetic is clean, technical, and mathematical.

**Mathematicians**

**गणितज्ञः**

# Brahmagupta



"A debt minus zero is a debt.  
A fortune minus zero is a fortune.  
Zero minus zero is a zero."

— Brahmagupta,  
Brahmasphutasi  
d-dhanta  
(628 CE)

Brahmagupta was an ancient Indian Mathematician and Astronomer who lived during the 6th and 7th centuries CE. He is considered one of the most significant figures in the history of Indian mathematics and made substantial contributions to various branches of Mathematics and Astronomy. Here are key aspects of Brahmagupta's life

and work:

Brahmagupta was born in 598 CE in Bhinmal, a town in present-day Rajasthan, India. Not much is known about his personal life, but he likely lived during the Gupta dynasty, a period often referred to as the "Golden Age" of ancient Indian mathematics.

Unfortunately, historical records about the personal life of Brahmagupta are limited, and not much is known about his personal details or experiences.

The primary source of information about Brahmagupta's life and contributions comes from his own writing, particularly his mathematical and astronomical treatise, the "Brahmasphutasiddhanta" meaning "The Opening of the Universe." This mathematical and astronomical treatise covers various topics, including Arithmetic, Algebra, Geometry, and Astronomy and provides insights into his mathematical genius knowledge he sought to convey.

Brahmagupta made substantial contributions to arithmetic, including advancements in the understanding of zero and negative numbers. He provided rules for performing calculations with zero and negative numbers, although he considered the product of two.



Mathematics  
is the bridge  
between the  
divine and the  
physical;  
understanding,  
It is to  
understand  
the order of  
the cosmos

In the "Brahmasphutasiddhanta", Brahmagupta presented solutions to quadratic equations, including both positive and negative roots. He introduced methods for solving linear and quadratic indeterminate equations. Brahmagupta's work in geometry included the calculation of the area of cyclic quadrilaterals. He provided a formula for the area of a cyclic quadrilateral in terms of its side lengths, known as Brahmagupta's formula. The "Brahmasphutasiddhanta" also contains astronomical content. Brahmagupta discussed the motion of planets, lunar and solar eclipses, and the longitudes of the planets. He formulated rules for calculating the positions of celestial bodies. Brahmagupta's mathematical ideas had a significant impact on Islamic mathematics during the medieval period. His work was translated into Arabic and became influential in shaping the development of mathematics in the Islamic world. Brahmagupta's contributions to mathematics and astronomy were essential in the evolution of mathematical thought in India. His work laid the groundwork for subsequent advancements in algebra and trigonometry. Brahmagupta's legacy is particularly notable for his systematic approach to mathematical concepts. While Brahmagupta is less well-known than some other ancient Indian mathematicians, his contributions played a crucial role in the development of mathematical knowledge in South Asia and beyond. His work, especially the "Brahmasphutasiddhanta", remains an essential source for understanding ancient Indian mathematics.

- Kiran Kumari  
B.Sc.(H) Maths  
2nd year

# Bharti Krishna Tirthaji Maharaj



Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaja (1884–1960) was a renowned scholar and spiritual leader and also known as the reviver of Vedic Mathematics. He was born as Venkatraman Shastri in Tamil Nadu, and from a very early age, he displayed extraordinary interest and intelligence in mathematics, Sanskrit, and philosophy. Throughout his life, he earned several degrees, including M.A.s in six subjects, reflecting his extraordinary memory and analytical powers. Even after gaining so much in academics, he was attracted towards spirituality. In 1919, he took monastic vows, i.e., sannyasa, under Swami Satchidananda Saraswati and adopted the name Bharati Krishna Tirtha. At that time, our Vedic mathematics was largely forgotten due to colonial oppression and the loss of texts we faced because of the British, as they burnt so many of our libraries and full-volume books. Bharati Krishna Tirthaji revived it by reconstructing techniques from

Vedas, structuring them into a system, and spreading awareness through his writings. His efforts have led to a renewed interest in India's mathematical heritage, making Vedic Mathematics a widely recognised alternative method for calculations today. As the Shankaracharya of Govardhan Peeth, Puri, he spent his later years teaching, writing, and lecturing globally, including in the USA and UK, gaining international recognition. His teachings influenced many scholars, including Dr. S. Radhakrishnan (former President of India) and several Western mathematicians. He intended to publish more volumes on Vedic mathematics, but due to ill health, he could not complete them. Before he could publish his findings, On February 2, 1960, he passed away at the age of 75 in Puri, Odisha. His disciples compiled his notes and posthumously published his work as "Vedic Mathematics" (1965), which became the foundation of the modern study of Vedic . Bharati Krishna Tirthaji's legacy bridges ancient Indian wisdom and modern education. His work has influenced scholars, educators, and competitive exam aspirants worldwide, emphasising logical thinking, problem solving, and analytics. Beyond mathematics, his work is the best example of knowledge (vidya) and spirituality (adhyatma).

Sneha Tyagi  
B.Sc.(H) Maths  
2nd Year

# THE MAN WHO KNEW INFINITY



Srinivasan Ramanujan was an Indian mathematician often regarded as one of the greatest mathematicians of all time. Though he had no formal training in pure mathematics, he made substantial contributions to mathematical analysis, number theory, infinite series and continued fractions, including solutions to mathematical problems that were considered unsolvable.

By the age of 12, he himself mastered an advanced trigonometry book written by S.L. Loney, and at 16, he himself again mastered a book with 5,000 theorems on real and applied mathematics written by G.S. Kari.

Ramanujan was a gifted child; वो बने ही mathematics के लिए थे, but he didn't have any degree because he failed.

Yesssss, he failed....., in all subjects, except mathematics due to his unwillingness about other subjects, and he couldn't enter

any university, and so he didn't get any degree.

But because of his hard work and great mathematical skills, on 6th December, 1917, he was elected to the London Mathematical Society, and he was the second Indian to be elected as the fellow of the Royal Society on 2nd May, 1918.

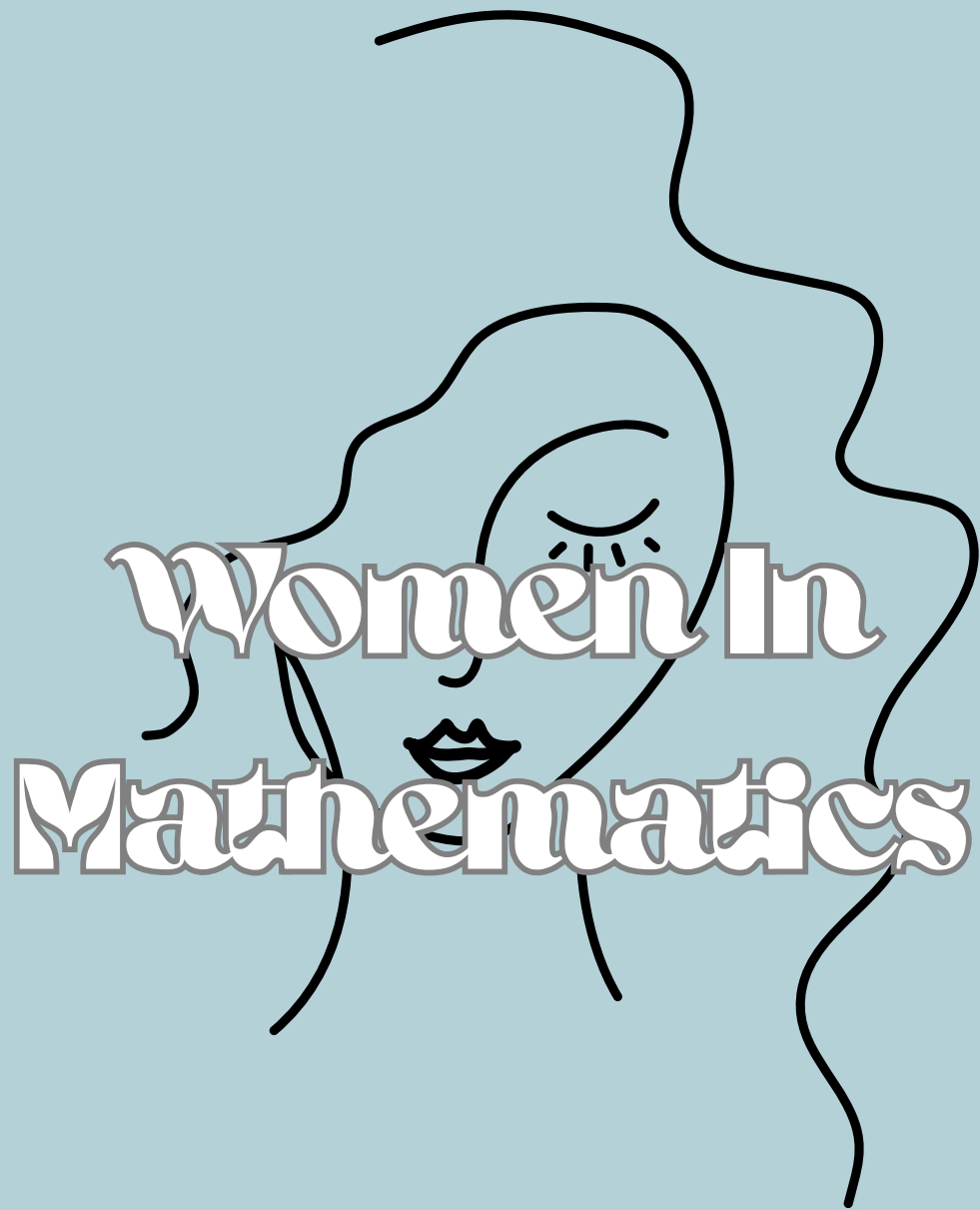
At age 31, Ramanujan was one of the youngest fellows in the Royal Society's history. But unfortunately, Ramanujan had been struggling with poor health for several years, and his condition worsened after he returned to India in 1919, and he died on April 26, 1920, at the age of 32 because of hepatic amoebiasis (infection in the large intestine).

But he and his mathematical contributions will live on forever in our hearts.

-Vani  
B.Sc.(H) Maths  
1<sup>st</sup> year

“The man knew when he was right. One could check the results one after another and find they were correct.”

— G.H. Hardy, British Mathematician and Ramanujan's mentor



# Numbers don't see gender

A general misconception that has prevailed in the field of mathematics for years is that math is a man's subject. It has often been portrayed as a field dominated by men. Whenever we heard of any mathematician narratives highlighting mostly male mathematicians, this deeply ingrained stereotype has subtly shaped societal expectations and even self-doubt among women who are interested and want to pursue the subject. This stereotype isn't rooted in capabilities but in the long-standing societal norms. Earlier, women were openly considered to do household chores, especially in India. Women were discouraged from pursuing higher education, especially in the fields of science and mathematics. The belief that mathematics is a men's subject is a misconception only. The reality is that math is not an inherited trait or a gender-based subject; rather, it is a skill that can be mastered through practice. Lack of opportunities and gender-biased discouragements lead to a lack of female role models in the field and hence discourage some women from exploring their potential in the subject. But there are women who break barriers and show their exceptional performance in the world of mathematics.

One such example is Indian mathematician Shakuntala Devi. She is often referred as the human computer who got her named in the Guinness Book of Records she defied societal norms expectations by her extraordinary abilities.

There are several more women. Such as Marie Curie who was the first woman to get Nobel Prize in different science fields that is physics and mathematics. Ada Lovelace who was the first computer programmer one who laid foundation for modern computing programming.

The stereotype is a relic of outdated societal norms and totally inaccurate. After all in the world of mathematics there are no limits only endless possibilities for everything the fact is there it is a universal subject where logic precision creativity and practice only matters. As numbers see no gender then why should we.

-Vaishnavi Upadhyay  
B.sc(H) Maths  
1st year

# Shakuntala Devi



Shakuntala Devi was an Indian mental calculator, astrologer, and writer, also known as the "*Human Computer*". Her talent earned her a place in the 1982 edition of The Guinness Book of World Records posthumously. Born on November 4, 1929, in Bangalore, India, Shakuntala Devi's mathematical prodigy surfaced early in her life. Raised in a humble family, her father noticed her solving complex mathematical problems at the tender age of three, leading to the acknowledgment of her exceptional abilities. Despite lacking formal education in mathematics, Shakuntala Devi's innate numerical talent flourished independently of traditional academic structures. She had also without any formal edu. performed simplification of formulas and showed her talent at the University of Mysore.



It was in Oct. 5th, 1950, when BBC interview of Human prodigy held, she solved complex Maths instantly asked by the host, not only this but she also pointed out that the question given was wrong initially. Devi strove to simplify numerical calculations for students. She wrote several books in her later years, including novels as well as texts about mathematics, puzzles, and astrology. She was so good at rapid calculations as once she was asked 23rd root of 201 digit number and she replied within 50 seconds!. A movie in Indian cinema has been made on her life too featuring Vidya balan as her. Her demise on 21st April, 2013 left us shattered, may such genius be reborn again on this holy grounds of Indian. Such woman not only built history for their name but also opened gates for many girls, struggling to study in the fields of STEM at that time in India.

-Jahnvi Singh  
B.Sc.(H) Maths  
1st year

# Katherine Johnson



Creola Katherine Johnson (née Coleman; August 26, 1918 – February 24, 2020) was an African/American mathematician whose calculations of orbital mechanics as a NASA employee were critical to the success of the first and subsequent U.S. crewed spaceflights. During her 33-year career at NASA and its predecessor, she earned a reputation for mastering complex manual calculations and helped pioneer the use of computers to perform the tasks. The space agency noted her "historical role as one of the first African-American women to work as a NASA scientist". In 1969, she calculated the trajectories of Neil Armstrong's historic mission to the moon on Apollo 11. Yet unlike the white male astronauts she helped launch into space, no one knew of the groundbreaking work Johnson and dozens of other Black women did for NASA and space exploration.



Johnson's work included calculating trajectories, launch windows, and emergency return paths for Project Mercury spaceflights. Her mathematical capability and ability to work with space trajectories with such little technology and recognition at the time were very great. She graduated from The West Virginia University and was also awarded with Presidential Medal of Freedom (2015), NASA Achievement Award (2016). Despite being exceptionally great at such genius things, she had to face a lot of racial and gender discriminations since her pioneer of education. Her influential personality not only addressed the prejudice against African race but also opened new opportunities for the people of her race. A marvellous movie "Hidden Figures" is made on her and her colleagues Mary Jackson and Dorothy Vaughan that not only shows their struggle but also their dedication towards space.

-Jahnvi Singh  
B.Sc.(H) Maths  
1st year

# Sofia Kovalevskaya



Sofya Vasilyevna Kovalevskaya, was a Russian mathematician who made groundbreaking contributions to analysis, partial differential equations and mechanics. She was a pioneer for women in mathematics around the world. She was also the first woman to earn a doctorate in mathematics, the first woman appointed to a full professorship in northern Europe and one of the first women to work for a scientific journal as an editor. Kovalevskaya's parents provided her with a good early education. Her father being a lieutenant general at The Russian Imperial, let her study after seeing her dedication in calculus and maths at the age of 11yrs old. She was fluent in many languages too, her poems included speakings of English, French, and German. Despite being her obvious talent in mathematics, she couldn't read further as Women were not allowed to study in Universities at that time.



In 1888 she became the first woman to be elected a corresponding member of the Russian Academy of Sciences and in the same year she was awarded the Prix Bordin of the French Academy of Sciences for a paper on the rotation of a solid body around a fixed point. Kovalevskaya also gained a reputation as a writer, an advocate of women's rights, and a champion of radical political causes. She composed novels, plays, and essays, including the autobiographical *Memories of Childhood* (1890) and *The Nihilist Woman* (1892), a depiction of her life in Russia. A Russian Childhood, plays (in collaboration with Duchess Anne Charlotte Edgren-Leffler) and a partly autobiographical novel, *Nihilist Girl* (1890). She died of influenza in 1891 at age forty-one, after returning from a trip to Genoa, she was granted a Chair in the Russian Academy of Sciences.

-Jahnvi Singh  
B.Sc.(H) Maths  
1st year



# Vedic Mathematics

# MATHS IN SECONDS

## Finding Squares in Vedic Mathematics

Here are a few Sutras (formulas) and methods used for squaring numbers:

### 1. Squaring Numbers Ending in 5 (Ekadhikena Purvena Sutra)

- \* Sutra meaning: One more than the previous one.
- \* Method:
  - \* Take the digits before the final '5'.
  - \* Multiply these digits by one more than themselves. This will be the left part of your answer.
  - \* The right part of your answer is always 25 ( $5^2$ ).
- \* Example: Find  $65^2$ .
  - \* Digits before '5' are 6.
  - \* 6 times  $(6 + 1) = 6 \text{ times } 7 = 42$ . (Left part)
  - \* Right part is 25.
  - \* Therefore,  $65^2 = 4225$ .

### 2. The Duplex Method (Dwandwa Yoga Sutra) - General Method

- \* Sutra meaning: Combination product.
- \* Method: This method works for squaring any number, regardless of its size. The "duplex" (D) of a number is calculated as follows:
  - \* For a single digit a:  $D(a) = a^2$
  - \* For a two-digit number ab:  $D(ab) = 2 \text{ times } a \text{ times } b$
  - \* For a three-digit number abc:  $D(abc) = 2 \text{ times } a \text{ times } c + b^2$
  - \* For a four-digit number abcd:  $D(abcd) = 2 \text{ times } a \text{ times } d + 2 \text{ times } b \text{ times } c$
  - \* And so on...
  - \* The squaring process involves finding the duplexes of parts of the number and arranging them with carries.
- \* Example: Find  $32^2$ .
  - \* Digits are 3 and 2.
  - \*  $D(3) = 3^2 = 9$ .
  - \*  $D(32) = 2 \text{ times } 3 \text{ times } 2 = 12$ .
  - \*  $D(2) = 2^2 = 4$ .
  - \* Arrange and carry:  
$$\begin{array}{r} 9 \ 12 \ 4 \\ +1 \\ \hline 10 \ 2 \ 4 \Rightarrow 1024 \end{array}$$
- \* Therefore,  $32^2 = 1024$ .

# MATHS IN SECONDS

## Finding Cubes in Vedic Mathematics

### 1. Cubing Numbers Near a Base

- \* Method: First, choose a convenient base (10, 100, etc.).
- \* Find the difference (d) of the number from the base.
- \* The cube of the number is given by:  $(\text{Number} + 2d) \times \text{Base} + d^2 \times 3 + d^3$  (with appropriate adjustments for place values and carries).
- \* Example: Find  $12^3$  (Base = 10).
- \* Difference  $d = 12 - 10 = 2$ .
- \*  $(12 + 2 \times 2) \times 10 + 2^2 \times 3 + 2^3$
- \*  $(12 + 4) \times 10 + 4 \times 3 + 8$
- \*  $16 \times 10 + 12 + 8$
- \*  $160 + 12 + 8 = 180 + 0 = 1728$ .
- \* Therefore,  $12^3 = 1728$ .

### 2. Cubing Two-Digit Numbers (Using a formula based on $(a+b)^3$ )

- \* Method: For a two-digit number ab (where a is the tens digit and b is the units digit):

- \* Calculate  $a^3$ .
- \* Calculate  $a^2b$ .
- \* Calculate  $ab^2$ .
- \* Calculate  $b^3$ .
- \* Arrange them as:  $a^3 \mid a^2b \mid ab^2 \mid b^3$
- \* Double the middle two terms:  $\mid 2a^2b \mid 2ab^2 \mid$
- \* Add them column-wise, carrying over digits as needed.

- \* Example: Find  $23^3$  ( $a=2$ ,  $b=3$ ).

- \*  $a^3 = 2^3 = 8$ .
- \*  $a^2b = 2^2 \times 3 = 4 \times 3 = 12$ .
- \*  $ab^2 = 2 \times 3^2 = 2 \times 9 = 18$ .
- \*  $b^3 = 3^3 = 27$ .
- \* Arrange:  $8 \mid 12 \mid 18 \mid 27$
- \* Double middle terms:  $\mid 24 \mid 36 \mid$
- \* Add with carries:

$$\begin{array}{cccc} 8 & 12 & 18 & 27 \\ 24 & 36 & & \end{array}$$

-----  
12 9 6 7 (Carries: 1 from 27 to 18, 3+1 from 54 to 12, 3+8)

- \* Therefore,  $23^3 = 12167$ .



**Mathematical  
Metaphors**

# गणित में गठित

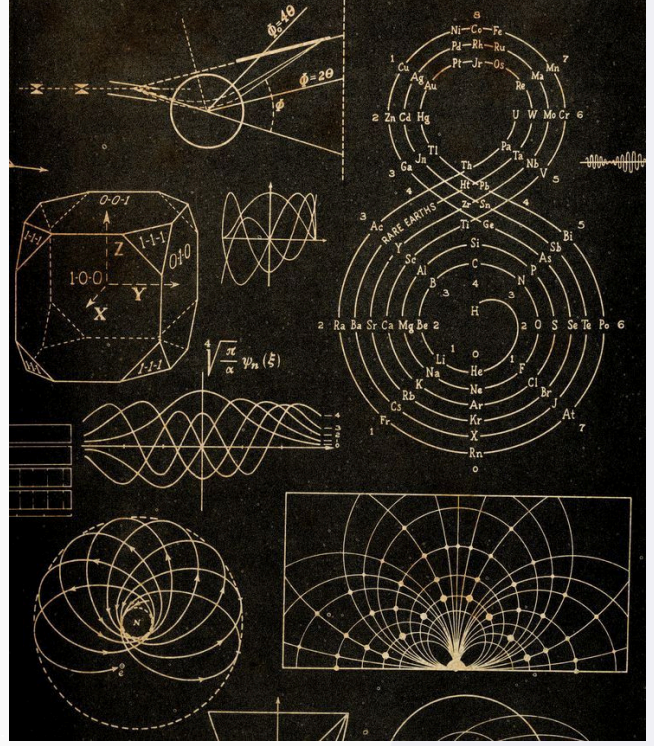
कोई मुश्किल समझता है,  
कोई मुश्किल बताता है,  
यह विषय ही ऐसा है  
इससे हर कोई डरता है  
हर कोई डराता है।

इसमें...

एक रेखा, यह मुड़ती नहीं, रुकती नहीं  
कोई शुरुआत नहीं, कोई अंत नहीं  
जहां हर बिंदु एक सत्य हैं  
कोई नुकीले कोने नहीं, कोई दांतेदार आँसू नहीं।

रेखाओं का नृत्य , कोणों का खेल  
तर्कों की माला, सत्य का मेल  
गणित का दर्पण, खोले हर राज  
सत्य की खोज में, ज्ञान का साज।

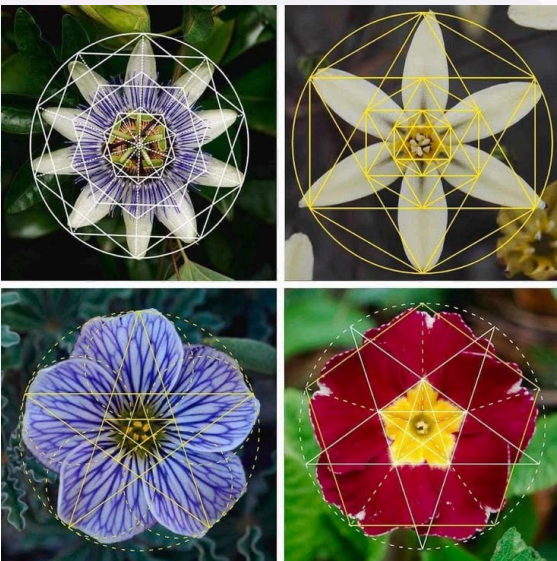
हर पत्ती, हर फूल, हर जीव में गणित  
प्रकृति की सुंदरता, सजीव में निर्मित  
आँखों से देखो, मन से समझो  
प्रकृति का गणित, जीवन से खोजो |



पहाड़ों की ऊँचाई, ढलानों की गणित  
सागर की लहरें, सब गणित में गठित  
फूलों की पंखुड़ियां , पेड़ों का आकार  
प्रकृति की सुंदरता , सब गणित का सार।

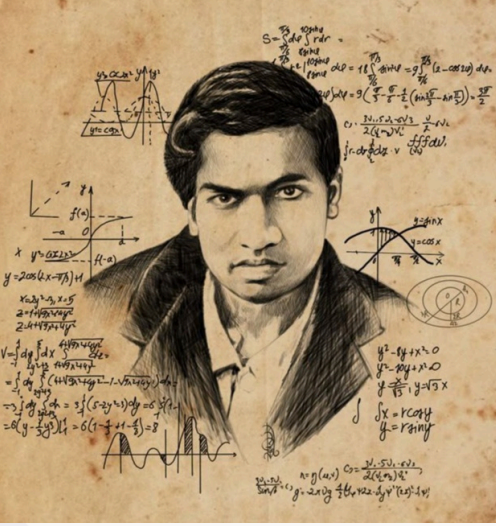
लेकिन क्या कभी बिना शून्य के जिंदगी सोची है  
अरे! सोच ही नहीं पाओगे  
नोट गिनने के लिए 9 के बाद अंक कहाँ से लाओगे।  
आर्यभट्ट ने शून्य को खोज कर दिया  
तो वहीं ब्रह्मगुप्त ने शून्य का प्रयोग सिखाया।

π एक अंक ऐसा भी , जो अनंत है  
ना सिर्फ शुरू हैं लेकिन ना इसका कोई अंत है।  
π (पाई) के अनंत अंक, एक छिपी हुई कला है।  
गणित के अंदर तो झाँको, कुछ सीखोगे जरूर यह  
मेरी सलाह है ।



~ Jiya Swami  
B.Sc.(H) Maths  
1st year

# गरीबी से प्रतिभा तक



श्रीनिवास रामानुजन

यह कविता है उस व्यक्ति की मेहनत की, उसके अनगिनत किए प्रयास की, अनेकों असफलताओं के बाद मिली सफलता की, उनके द्वारा रचे इतिहास की।

मैं हूँ श्रीनिवास रामानुजन जिसे आप महान गणितज्ञ मानते हो, आज इच्छा हुई आपको बहुत कुछ बताने की जो शायद आप न जानते हों।

22 दिसंबर 1887 को जन्म हुआ तमिलनाडु में, माता पिता दोनों की ही खुशियां नहीं थी काबू में। माता-पिता और गुरुओं सभी का मैं चहेता था, पर बचपन भी मेरा काफी मुश्किलों में बीता था।

शुरुआती तीन साल तक तो मैंने बोलना शुरू ही नहीं किया, ये बच्चा है या है मुसीबत लोगों ने तो यह तक था कह दिया।

फिर विद्यालय जाना शुरू किया, पढ़ाई में मेरा खूब मन लगता था। गुरुजन कहने लगे कक्षा में मुझसे अक्वल कोई आ ही नहीं सकता था।

खेलकूद में उछलने-कूदने में मैं ज्यादा शामिल नहीं था, अब ये मत सोचना मैं शारीरिक तौर पर इसके काबिल नहीं था।

अपने जीवन में गणित को हर जगह आजमाने लगा, ये गणित मुझको क्या सताता, मैं खुद ही इसको सताने लगा।

फिर 11वीं कक्षा में मेरी life में एक और twist का मेल हुआ, गणित में तो 100 पर बाकि, सभी subjects में मैं फेल हुआ।

फिर 12वीं में पढ़ाई प्राइवेट से की, फिर भी पास नहीं हो पाया। पिता जी को लगा शायद किसी गलत संगति का मुझ पर है साया।

खूब डांटा, गुस्सा किया, मेरी वजह से काफी परेशान हो गए। फिर वक्त ने भी मेरा यहां ज़रूरतों ने ज़्यादा इम्तेहान लिए।

परिस्थितियाँ बदलीं, समय बदला, मैं शायद थोड़ा और संभला। पर गणित के लिए मेरा प्यार life के किसी भी phase में नहीं बदला।

लोगों ने कहा — "पागल हो गया है, अब गणित का भूत उतार दे, देख परिवार की हालत को, जाकर उन्हें संभाल ले

# गरीबी से प्रतिभा तक

ज़िंदगी गणित के किसी arbitrary constant  
जैसी है,  
जो कभी same नहीं रहती है  
कभी दुख का समुद्र ला दे तो,  
कभी खुशियों की किरण देती है।

फिर निकल गया नौकरी की तलाश में ,  
परिवार की ज़रूरतों को कैसे नकार दूं  
पर गणित मेरा जुनून नहीं, अस्तित्व था,  
तो उसको कैसे छोड़ दूं?

फिर मुझे मिले वो लोग,  
जिन्होंने हुनर को मेरे जाना था,  
मेरी मेहनत को सराहा सबने  
As a mathematician मुझको पहचाना था।

विश्वभर में मेरा काम प्रसिद्ध हुआ,  
मुझे महान गणितज्ञ की उपाधि मिली।  
सपने में भी नहीं सोची इतनी  
अधिक मुझे यहां ख्याति मिली।

खैर,  
मैं आप सब को अपनी महानता  
या उपलब्धियां गिनवाने नहीं आया हूं ,  
मैं तो आपको बस ,  
harsh reality of life  
समझाने आया हूँ।

लोगों ने मुझे नकारा कहा ,  
खूब सुनाया काफी ताना कसा  
गणित के प्रति मेरे समर्पण को  
काम से भागने का एक बहाना कहा।

पर मैंने लोगों की बातों से ज़्यादा  
अपने सपनों पर भरोसा किया।  
जी जान लगाई अपने सपनों के लिए,  
ना ही उनसे कभी समझौता किया।

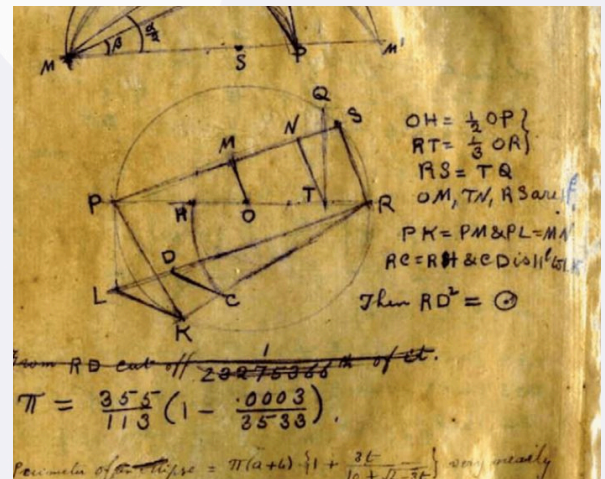
कितनी अजीब बात है न  
33 वर्षों की आयु में ही मैंने  
मौत को गले लगा लिया  
पर फिर भी मुझे ऐसा कभी नहीं लगा  
कि जीवन ने मुझे कोई दगा दिया

उस एक एक पल को मैंने  
जी भर कर जो जी डाला था  
कभी proof करने लग जाता कोई नई  
Theorem  
तो कभी जटिल प्रश्नों का हल निकाला था

मेरे जीवन का तो भाई  
एक सीधा सा सार था  
गणित ही मेरा सबसे बड़ा सपना  
और सबसे पहला प्यारा था

ना मैं महान, ना मेरा ख्वाब महान  
पर संघर्ष मेरा महान है  
पर इसमें भी ऐसा क्या अलग है  
जिससे आप लोग अनजान हैं

कुछ छोटी मोटी ठोकरों से सपने नहीं मरा करते है  
पतझड़ के आने जाने से भला  
उपवन कहा उजड़ते है



# गरीबी से प्रतिभा तक

याद करो जब पहली बार ये सपना  
तेरे सपनों में आया था  
ना जाने इसका कौन सा भाग  
तुम्हे इतना भाया था

इसे पाने की बेताबी ने तुझे हद से ज़्यादा अधीर किया  
क्या भूख, क्या प्यास, इसने तो  
तेरी नींद तक को था छीन लिया

सोते जागते हर वक्त बस  
हम अपने सपने को जीते थे  
कई बार लगा कुछ गलत हैं हम  
पर दिल ने कहा हम सही ही थे

आज थोड़ी मुश्किलें क्या देख ली तुमने  
अब चलने से तू डर रहा है  
कभी जीता था जिन सपनों के लिये  
आज उन्हीं से सम  
झौता कर रहा है ।



क्यूं भूल गया मुश्किलों से लड़ने वाला  
तू ही थोड़ी अकेला है  
पर तेरी विजय पराजय का निश्चय  
सिर्फ और सिर्फ तेरा है ।

जब कुछ करने की ठान ली है तो  
चुनौतियों से क्यूं घबराते हो  
हार या जीत तो बाद की बात है  
फिर अभी से क्यूं पछताते हो

बिन सपनों के सुन लो मित्र  
जीवन ही निराधार है  
और दुनिया क्या सोचेगी इस बारे में तो  
सोचना ही बेकार है

हर योद्धा युद्ध में लड़ते वक्त  
परिणाम की चिंता नहीं करते हैं  
वो जीतेंगे या हारेंगे  
ये युद्ध वो सुनिश्चित करते हैं

वक्त सबका बदलता है दोस्तों  
समय किसी का अपना नहीं  
इसलिए हर ठोकरो से तेरे सफर तरीके बदलेंगे  
पर तेरा सपना नहीं

यदि आप भी अपने सपने के लिए  
निरंतर मेहनत करते आओगे  
तो एक ना एक दिन आप भी  
Srinivas Ramanujan बन जाओगे

-Anchal Jha  
B.Sc.(H)Maths  
1<sup>st</sup> year

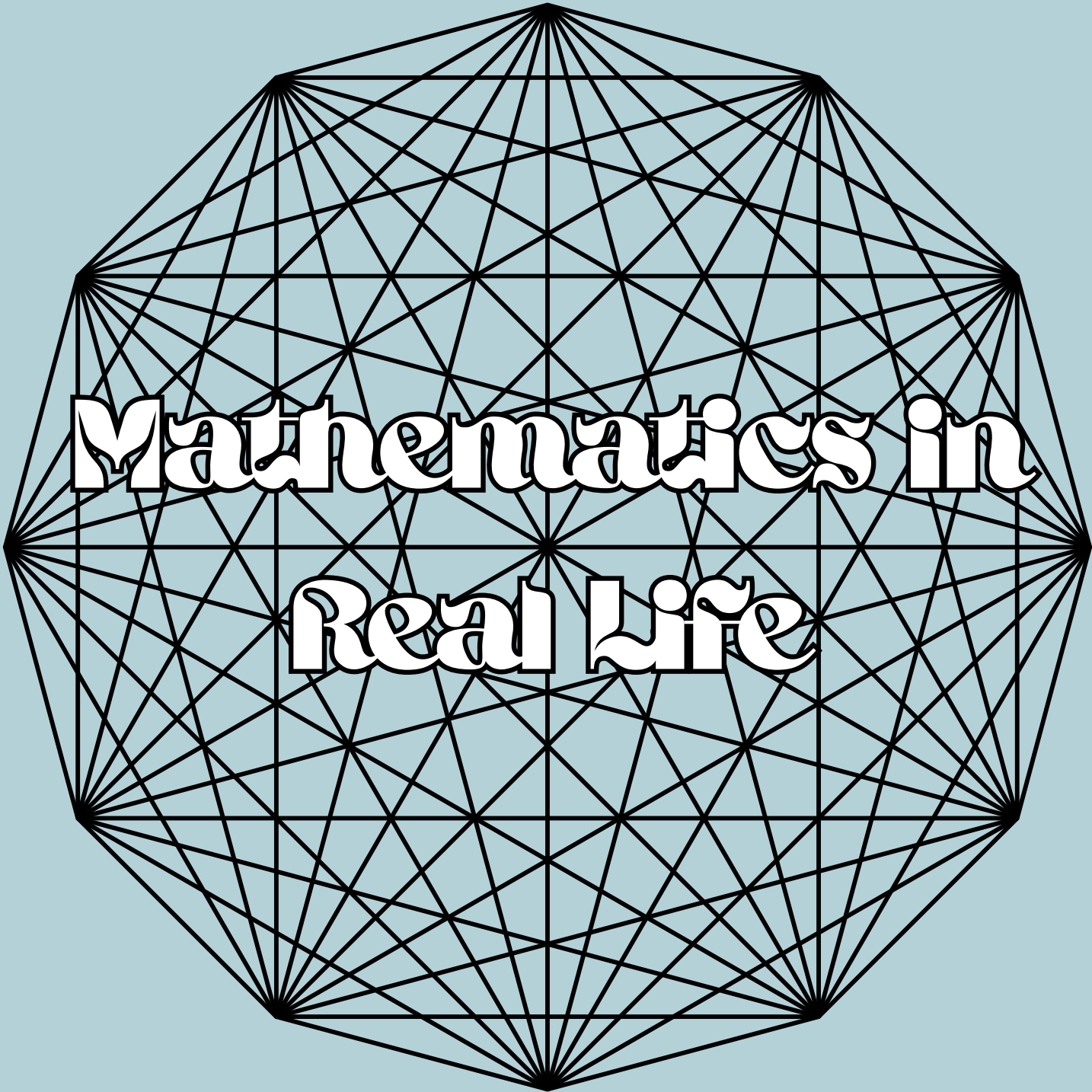
# The Golden Ratio

There is a number in nature's flow,  
A little more than one we know.  
One point six one eight, nature's code,  
Dancing with a golden glow—  
A secret of creation only nature shows.  
Da Vinci sketched with discerning eyes,  
From tiny buds to cosmic skies.  
Phi's gentle hand, in all it lies—  
A curved bridge through all I see,  
The golden ratio of Fibonacci sequence lines.  
From Euler's grace to Newton's might,  
Their theorems spark the greatest night.  
A universe in numbers spun,  
Proof that math and art are one.

-Anshika Pal  
B.Sc.(H) Maths  
1<sup>st</sup> year

“Without mathematics,  
there's nothing you can  
do. Everything around  
you is mathematics.  
Everything around you  
is numbers.”

- Shakuntala  
Devi



**Mathematics in  
Real Life**

# MATHEMATICS IN DAILY LIFE

A journey into how maths shapes our lives, technology, art, and more.

## • Why is Mathematics Important for Us?

Mathematics is not just about numbers—it's the foundation of innovation, logic, and problem-solving that touches every aspect of our modern lives.

## a) Mathematics in Modern Technology:

### 1. DATA ANALYSIS AND MACHINE LEARNING :

- Probability theory helps decode randomness and uncertainty.
- Statistical models allow us to summarize and make sense of raw data.

### 2. CYBERSECURITY AND CRYPTOGRAPHY :

- Secure communication is based on mathematical algorithms.
- Concepts like public-key cryptography are rooted in number theory.
- Digital signatures and authentication rely heavily on maths principles.

## b) Real-Life Applications of Maths:

### 1. FASHION DESIGNING:

- Designers use maths for accurate measurements and sizing.
- CAD software relies on mathematical algorithms for design creation and modification.

### 2. MUSIC AND HARMONY:

- Mathematics and music have a deep connection, dating back to Pythagoras.
- String instruments use ratios (like 2:1) to produce harmonious tones.
- Fibonacci Sequence and the Golden Ratio are used in composing music and arranging keys on a piano.

### Conclusion: Maths as a Game-Changer

Mathematics powers real-world solutions—be it healthcare, transportation, or sustainable technologies.

It's the engine behind technological evolution and human progress.

-Anshika Singh  
B.Sc.(H) Maths  
1<sup>st</sup> year

# Mathematics in Biology

Mathematics is present in various aspects of the human body. Even maths is in air, body, water and everywhere .....

Where Not?

Let's see how maths is in human body :

## 1. Symmetry

The human body has bilateral symmetry, meaning it can be divided into two mirror-image halves. This symmetry is a fundamental concept in mathematics.

**GOLDEN RATIO** - The more the alignment of face to the golden ratio (1.618), the more attractive it looks.



## 2. Fibonacci Sequence

The arrangement of leaves on stems, branches on trees, and even the structure of DNA follow the Fibonacci sequence (1, 1, 2, 3, 5, 8, 13, ...). This sequence appears in the human body, such as in the arrangement of seeds in a sunflower or the branching of blood vessels.

## 3. Geometry of Blood Vessels

The network of blood vessels in the human body follows geometric patterns, such as fractals and branching networks. These patterns help optimize blood flow and oxygen delivery.

## 4. Math in Movement

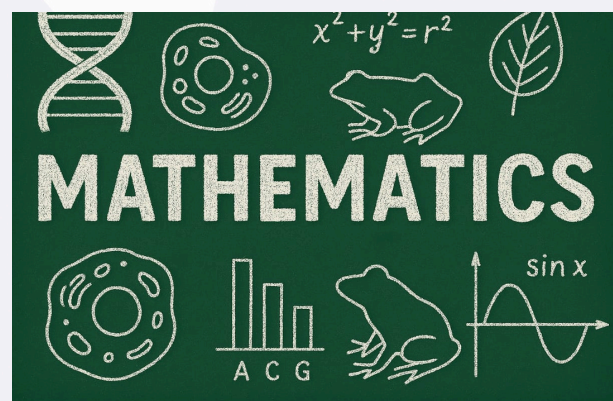
Human movement, such as walking, running, or throwing, involves mathematical concepts like trajectory, velocity, and acceleration.

## 5. Proportions

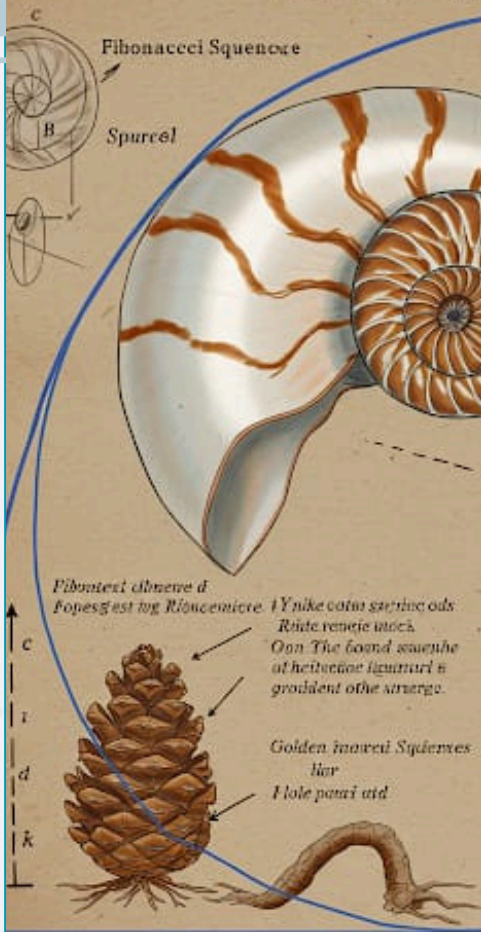
The human body has specific proportions, such as the ratio of arm to forearm length, or the ratio of hand to finger length. These proportions follow mathematical principles, like the golden ratio ( $\phi$ ). And make the RULE OF 9'S i.e. used in hospitals for finding surface area of human body.

## 6. Heart Rate Variability

The variation in time between heartbeats follows mathematical patterns, which can be used to diagnose cardiovascular diseases.



## Fibonacci Sequence



"Mathematics is the language with which we describe patterns—whether in nature, art, science, or society. Its power lies not only in abstraction but in connection." – Anonymous

### 7. Brain Function

Mathematical models are used to understand brain functions, including neural networks, synaptic plasticity, and cognitive processing.

### 8. Biomechanics

Mathematics is used to study the mechanical properties of living tissues, such as bone, muscle, and tendon.

### 9. Medical Imaging

Mathematical algorithms are used in medical imaging techniques like MRI, CT scans, and ultrasound to reconstruct images of the body.

### 10. Epidemiology

Mathematical models are used to study the spread of diseases, understand the impact of interventions, and predict the effectiveness of treatments.

### 11. Arm Span

Mathematicians say that the arm span to height ratio is one to one: your arm span goes once into your height.

So there's not a single field where there is no use of mathematics.

-Vani  
B.Sc.(H) Maths  
1<sup>st</sup> year

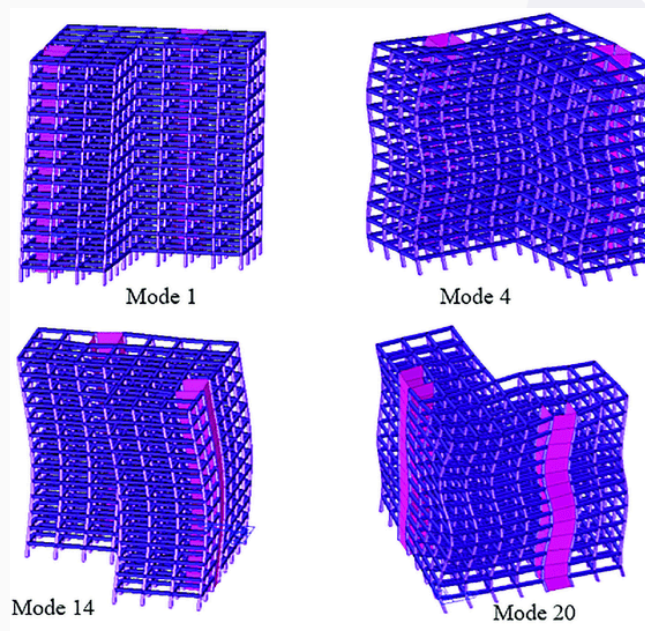
# Vibrational Model Analysis & Linear Algebra

Vibrational modal analysis is useful in understanding how mechanical structures move and vibrate when force acts upon them. Think of it as figuring out how a building sways during an earthquake or how guitar strings vibrate when force is applied to them.

1. When we study the movement of a mechanical system, we generally get a set of equations that describe how the system behaves over time. These equations can be written in a matrix form. Natural Frequencies (Eigenvalues): Solving these equations, we can get eigenvalues, which in vibration analysis represent the natural frequencies of the system.

2. Mode Shapes (Eigenvectors): Each eigenvalue has an associated eigenvector. These eigenvectors describe the patterns of motion, which are known as mode shapes, that the system prefers at different frequencies. Mode shapes give us information about how the system changes or moves when it vibrates at a specific frequency.

Why It Matters in Real Life:  
By understanding the eigenvalues and eigenvectors,



we can predict how the system will respond to external forces or vibrations.

A Simple Example:

Imagine plucking a guitar string. The sound it makes depends on how fast it vibrates (natural frequency) and the shape of its movement (mode shape). Now, picture a tall building in a storm. Modal analysis tells engineers how much it'll sway (with the help of eigenvalues) and where it might need extra support (with the help of eigenvectors).

Conclusion:

This modal turns the complex vibrations into clear, predictable movements, just like giving an engineer a cheat sheet to keep his work in a better form.

-Sneha Tyagi  
B.Sc.(H) Maths  
2<sup>nd</sup> Year

# Charm Pricing: Mathematics Behind the Illusion

That seemingly innocent '9' at the end of a price tag – ₹99, ₹499, ₹9.99 – is a ubiquitous sight in the world of retail. But is it just a coincidence, or is there any strategy behind this numerical madness? The truth lies in a fascinating interplay between basic arithmetic and the often-irrational workings of the human mind.

This pricing strategy, known as charm pricing, isn't about offering a truly significant discount in mathematical terms; it's about crafting a powerful illusion of a lower price, it leverages a psychological phenomenon that makes prices more appealing to consumers.

At its core lies a phenomenon known as the left-digit effect. When we encounter a price like ₹299, our eyes, and consequently our brains, tend to fixate on the leftmost digit first. We register the '2' before fully processing the subsequent '99'. This initial focus creates an anchor, leading us to categorize the price as being in the "two-hundreds" range. When we then compare this to ₹300, the shift in the leading digit feels far more substantial than the mere ₹1 difference. Our minds perform a rapid, often subconscious, comparison of these initial digits, leading us to perceive ₹299 as significantly cheaper.

We tend to round numbers and make mental shortcuts, which can lead to biases in our perception of prices. Charm pricing takes advantage of this bias by setting prices just below a round number.

Furthermore, the prevalence of prices ending in '9' has fostered an association in our minds. We've been conditioned to link these prices with sales, discounts, and good value. Seeing that '9' can subconsciously trigger a feeling of "getting a deal," even if the actual saving is minimal.

The mathematics behind charm pricing lies in understanding how consumers perceive and process numerical information. By applying mathematical models to consumer behavior, businesses can develop effective pricing strategies that drive sales and revenue.

So, the next time you see that enticing price ending in '9', take a moment to appreciate the subtle mathematical illusion at play – a testament to the fascinating intersection of numbers and the human mind.

-Pari Goel  
B. Sc. (H) Maths  
1st year

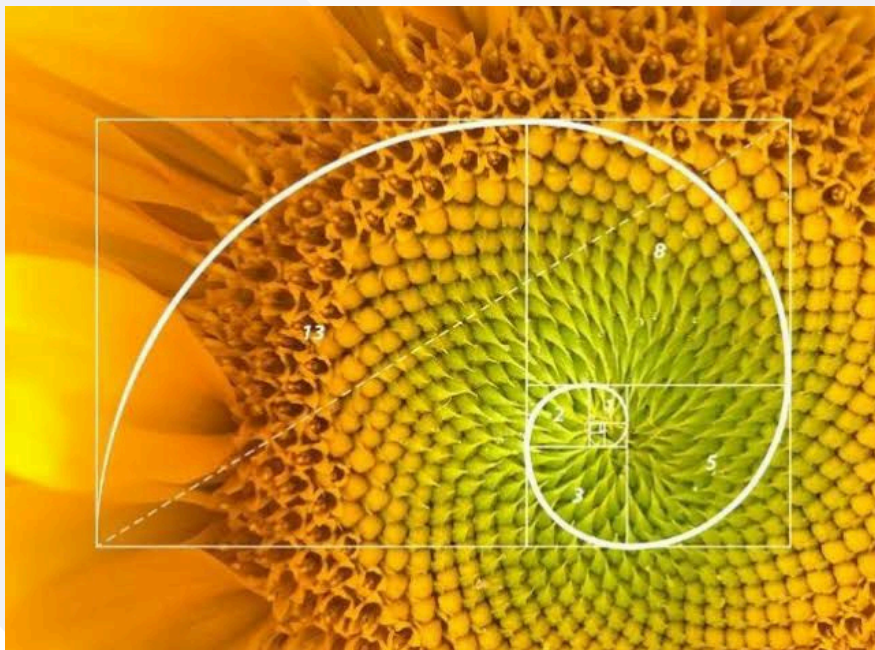
# The Golden Ratio: A Timeless Bridge Between Mathematics, Nature, and Design

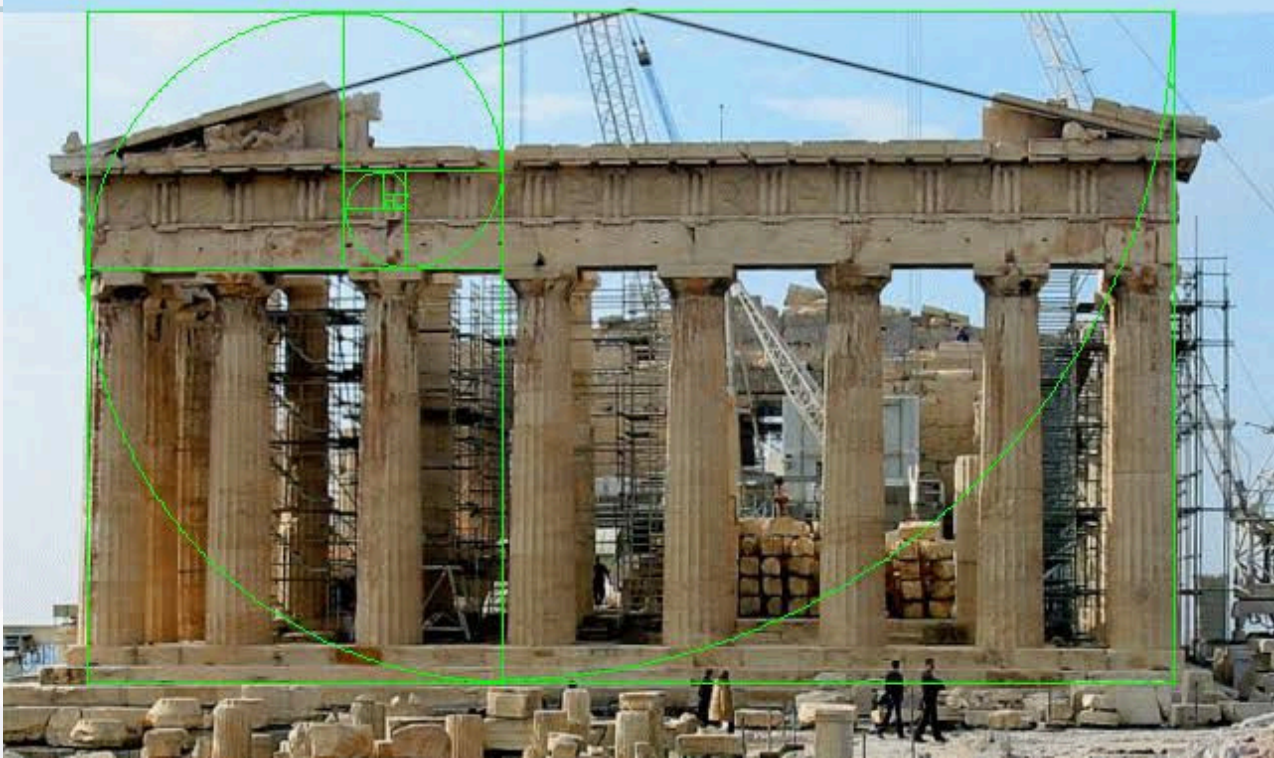
The golden ratio, denoted as  $\varphi$  (or phi), is irrational and has an approximate value of 1.618. The ratio occurs when a line has been divided in such a way that the ratio of the longer line segment and the total length of the line is equal to the ratio of the longer line segment and the shorter one:  $(a+b)/a=a/b=\varphi$ .

The ratio beautifully lies at the intersection of definitions and applications that can be found throughout nature and man-made affairs, thus earning heavy titles like the Divine proportion.

And to tell, the sunflower stands as one of the best examples of this ratio. The interlocking spirals of seeds in the sunflowers' centre are arranged mainly under the Fibonacci series – 1, 1, 2, 3, 5, 8, ... – by virtue of its ability to converge towards the golden ratio as one progresses through the sequence. Such an arrangement makes packing for seeds ultra-efficient and sunlight an excellent case of biology and geometry being complementary.

But that is not just the case with sunflowers. The same ratio finds ample representations in the spirals of seashells, trees, whirlwinds, and formations of galaxies. It is also said that biological proportions, spacing of facial features or lengths of limbs also often approximate  $\varphi$ . These wonderful flash occurrences do not agree with glamour. They happen to stem from the examples of structural efficiency, whereby physics, thence mathematics, govern their growth processes.





The Golden Proportion holds serious connotations in art and architecture. Designs for varying ancient Greek buildings, such as the Parthenon, are said to sprinkle  $\phi$  throughout their layout, automatically generating a sense of balance and symmetry. Renaissance painters, including Leonardo da Vinci, created works like *The Vitruvian Man*, which dealt with this ratio, thereby cutting across human anatomy and aesthetic appeal to mathematics. Nowadays, designers apply the Golden Ratio to the shape and layout of products, branding, and websites, attempting to engender a feel that is intuitive and pleasing to the eye.

The interesting thing about the Golden Ratio, even in the present day, is its transmutability. It hops over borders, ambling from mathematics to nature and from art to science. Found in the sunflower spiral or among masterpieces, it stands witness to a world transmuted through the delicate workings of mathematical logic – one that has continued down the ages to inspire, inform, and leave people awestruck.

~Asma Sunil  
B.Sc.(H) Maths  
1st year

# Mathematics in the Corporate World

In today's quickly changing data-driven age, mathematics is indispensable in all areas of business operations and transformations, as well as competition. Mathematics has, all the more, shifted away from being merely a subject in the classroom and has actively become the underlying strategy or way of thinking for decision-making in business. From finance, marketing, operations, and technical perspectives, mathematics put into the hands of these organisations the analytical tools and frameworks needed for informed choices.

Mathematics plays a very crucial part in investment risk management, investment strategy formulation, and forecasting market behaviour in finance. These methods, using time series techniques, probability models, and calculus-based pricing to map uncertainty, act on portfolios, or forecast future events based on incoming data. The other area is insurance and pension schemes, which employ actuarial mathematics in curbing the exposure to long-term risks regarding the interests of their financial solidity.

Operations research, with its mathematical optimisation techniques, forms the link between production management and resource allocation. The tools utilised by companies include linear programming and algorithmic modelling to enhance supply chain effectiveness and reduce operational expenses and control production timing. Applications abound in transportation, manufacturing, and retail.

Statistical methods are the backbone of corporate decision-making in marketing, sales forecasting, and segmentation. As the era of big data fades into that of AI, machine-learning systems will automatically convert consumer behaviour into a little content expression of their personalisation. From regression analysis to decision trees, through these mathematical means, firms may deal with an increasingly chaotic front line of data and delivery systems.

# Actuarial Science and Pension Plans

Actuaries use various cost methodologies to calculate pension plan costs

01

02

Actuaries also use the actuarial funding method to determine the amount of contributions required to fund a pension plan

Pension plans are subject to various regulatory requirements, including the Employee Retirement Income Security Act (ERISA)

03

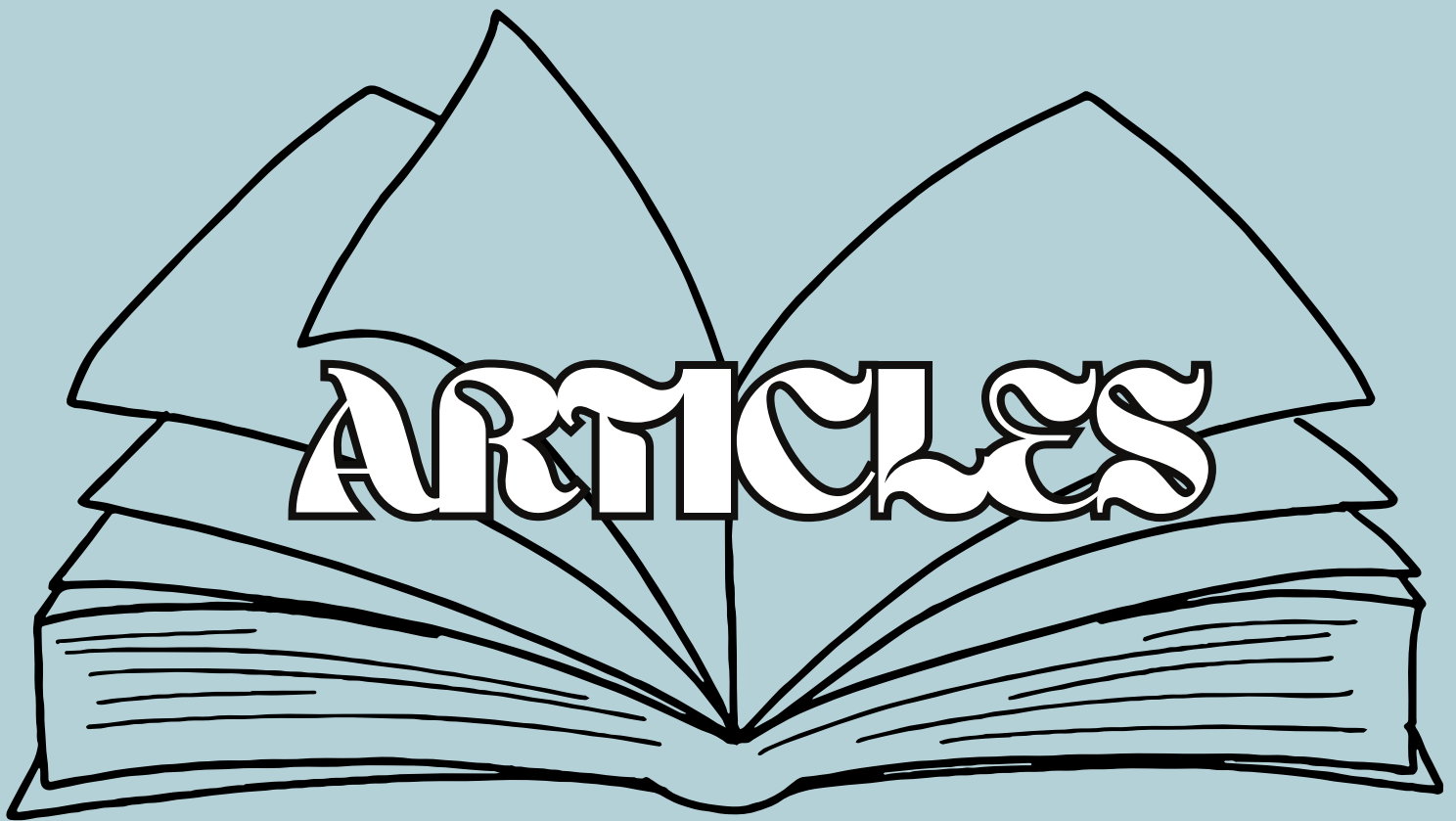
04

One issue that has emerged in recent years is the underfunding of many pension plans

Along with their professional experience, mathematically minded people are keenly sought by business for their logic-orientated characterisation of thought processes, ability to analyse and define problems, and consideration of detail. It is often these ideas with a math tint that become able to tackle complicated problems, build systems efficiently from the ground up, and adjust rapidly to situations that are entirely new.

Put that in perspective: it is no longer just a tool. Instead, math is a strategic weapon. It is innovation, efficiency, and intelligent decision-making. The higher the technological and data dependence among industries, the better the outlook for math as a corporate subject. Hence, an aspect that is considered imperative for the future working environment.

~Asma Sunil  
B.sc.(H) Maths  
1st year



# The Vibrant World of Mathematics Series

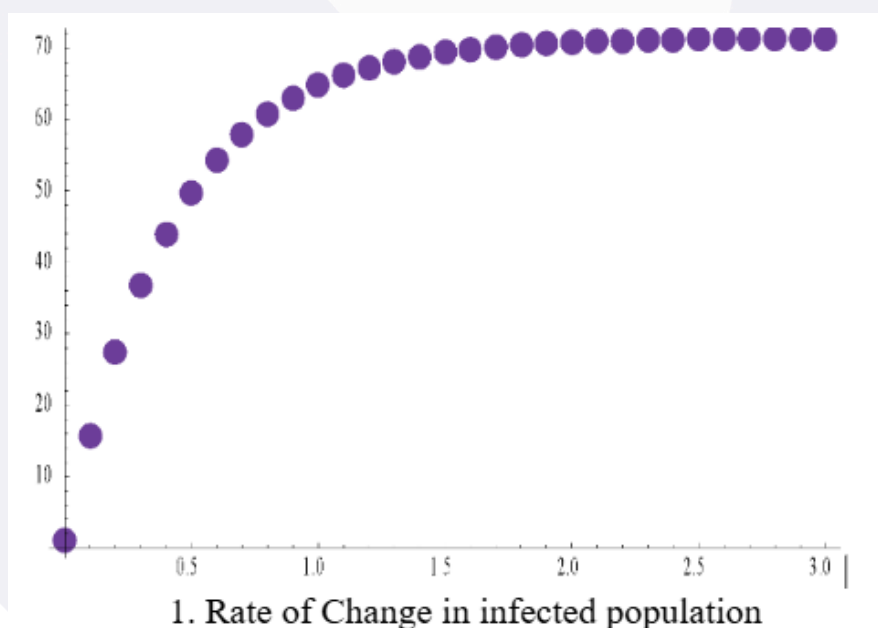
In this project we will try to observe the situation of COVID-19.

In this study, we take a fixed population which faced the problem of a spreading disease. In this problem the population can be divided into two groups, one healthy and the other one infected. This problem can be modelled with  $p$  being the rate at which a healthy person can be infected by the disease and  $r$  being the rate at which the infected can recover from the disease. Let  $x$  be the proportion of the population infected; then the change in the infected population with time can be modelled as  $\frac{dx}{dt} = p(1-x) - rx$ ,  $x_0 = 1$ .

Software Mathematica was used to solve this problem.

In this study, we will focus on how many people get infected after 1 month, whenever one person gets infected initially.

The exact solution to this problem found by us was that 71 healthy persons get infected within 30 days. But this is a biological problem, and we know that this problem cannot have any exact solution; therefore, by using software, a graphical analysis was done, and the graph of this problem established the agreement between the exact and the approximate solution. The graph of this problem was found as



From the graph we can conclude that graph agrees with the exact solution approximately i.e. 71 person gets infected after 30 days.

The references used for this study are:

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[5] <https://motivate.maths.org/content/DiseaseDynamics/Activities/StandingDisease>

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Department of Mathematics  
&  
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Sem-VI

# Study Of Hyperbolic Functions Through Mathematica

## Introduction

This project will introduce the hyperbolic function, which we may have noticed on your calculator with the abbreviation “hyp”. We will see some connection with trigonometric functions and will be able to establish an agreement with some real-life problems. The first systematic consideration of hyperbolic functions was done by Swiss mathematician Johann Heinrich Lambert (1728-1777).

## Definitions

The hyperbolic functions have similar names to the trigonometric functions, but they are defined in terms of the exponential function.

The hyperbolic cosine function, written as  $\cosh x$ , is defined for all real values of  $x$  by the relation.

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

Similarly, the hyperbolic sine function, written as  $\sinh x$ , is defined as

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

The names of the two hyperbolic functions suggest to us that they have similar properties to the trigonometric function.

## Graphical agreement with real-life problems

In this we have studied the relationship of a family that has three members, like a father, mother and daughter, and observed the relationship between parents and child through Mathematica. For this

Consider Father =  $\cosh x$ , Mother =  $\sinh x$ .

If the daughter likes someone, denote it with a plus sign, and if the daughter does not like someone, take a minus sign with that.

Case : 1. If the daughter likes both, then take the relation function as  $f(x) = \sinh(x) + \cosh(x)$

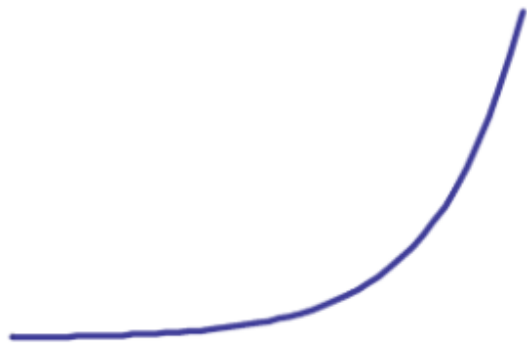


Fig. 1

**Conclusion:** From the Graph we can see the relationship is healthier between them and mutual understanding between parents and daughter is increased in this case.

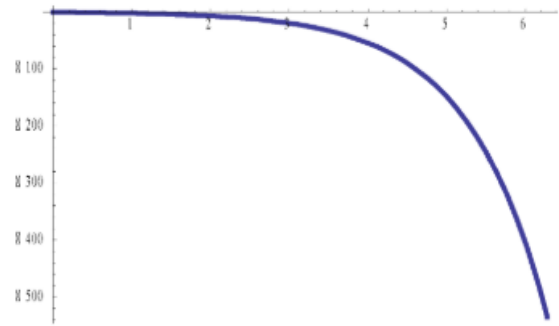
Case: 2 If daughter did not like one of the parent, then relation function defined as  
 $f(x) = \sinh(x) - \cosh(x)$



Fig. 2

**Conclusion :** From the graph we have noticed that mutual understation between daughter and mother is not good but overall relation is increased but with slow rate.

Case : 3 If daughter did not like both the parents, then relation function defined as  
 $f(x) = -\sinh(x) - \cosh(x)$



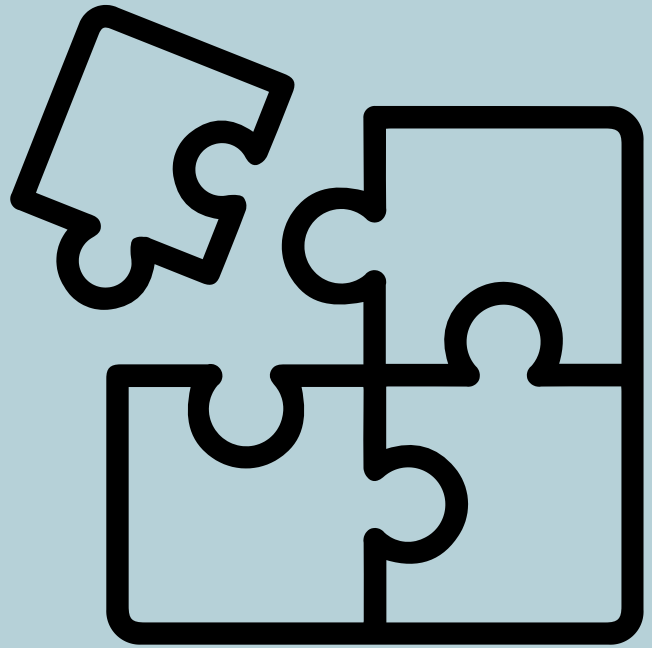
**Conclusion:** From the graph we have noticed that mutual understation between daughter and parents is not good and relation between them is faced some problems.

**Conclusion:** Clearly from the graph we have seen that hyperbolic function have established great agreement with real life problems.

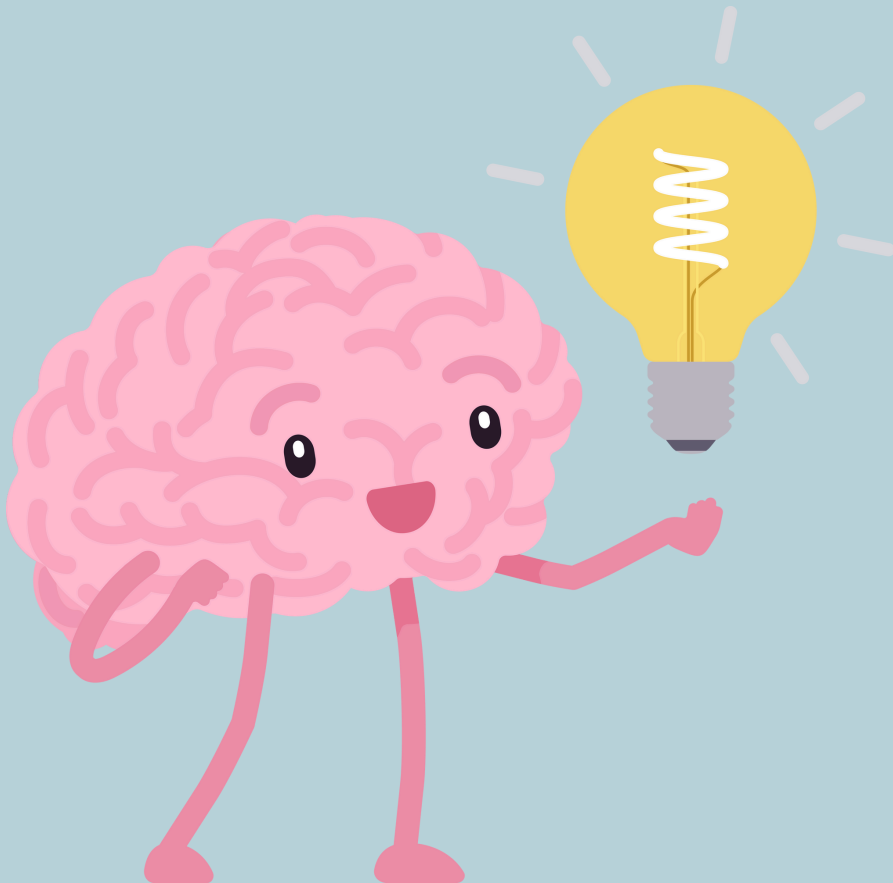
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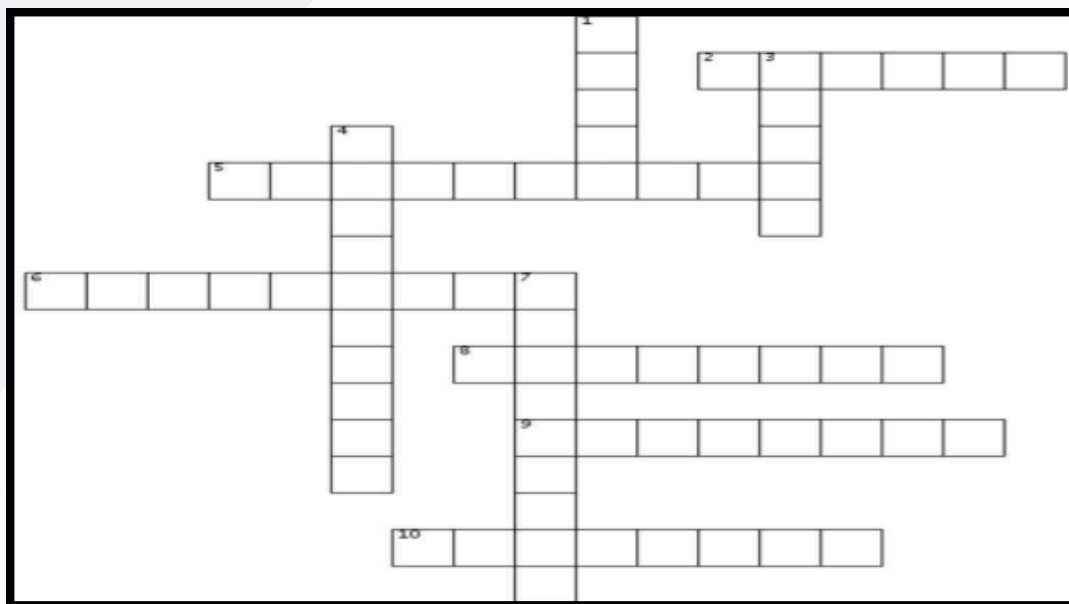
Tanya Sahu  
 B. Sc. (H) Maths  
 Sem-VI  
 Under the Supervision of  
 Dr Pardeep Kumar  
 Assistant Professor  
 Department of Mathematics



# Maths Mania



# Crossword Puzzle



## Across

2. A quantity with both magnitude and direction, often represented as an arrow.
5. A fundamental concept in calculus, this type of function describes a curve's instantaneous rate of change.
6. A sequence in mathematics where each term is the sum of the two preceding ones.
8. The branch of mathematics that deals with the study of rates of change and the slopes of curves.
9. The process of finding the length of a curve or the area under a curve.
10. A curve that is symmetrical and described by a quadratic function.

## Down

1. A value that a function approaches as the input approaches a certain point.
3. The symbol used to represent a mathematical constant approximately equal to 2.71828.
4. The inverse of the tangent function.
7. A type of number used to describe the solution of polynomial equations, often represented by  $i$ .

-Suhana Garg  
B.Sc.(H) Maths  
1<sup>st</sup> year

# Puzzles

## 1. The Digit Deception

Puzzle:

There's a 3-digit number where:

- All digits are different.
- The number is divisible by 7.
- If you reverse the digits, the number becomes divisible by 9.
- If you remove the middle digit, the resulting 2-digit number is divisible by 5.

What's the number?

## 2. The Missing Dollar Paradox (Twist Version)

Puzzle:

Three friends check into a hotel room that costs \$300. They each contribute \$100. Later, the manager realises the room is only \$250 and sends a bellboy to return \$50. The bellboy, being sneaky, gives each friend only \$10 back and keeps \$20.

Now each friend has paid \$90, totalling \$270. The bellboy kept \$20. That adds up to \$290. Where's the missing \$10?

## 3. Find The Lock

Riddle:

You have a 3-digit lock. The clues are:

- 682: One digit is correct and in the correct place.
- 614: One digit is correct but in the wrong place.
- 206: Two digits are correct but in the wrong places.
- 738: Nothing is correct.
- 380: One digit is correct but in the wrong place.

What is the 3-digit code?

?

-Pari Goel  
B.Sc(H)Maths  
1<sup>st</sup> Year

# Puzzles

## 4. Broken Calculator

You have a calculator that only has these buttons:

2, 3, +, ×, =

No other digits. No clear button.

Starting from zero, can you make the number 19 using only those buttons?

## 5. The Island of Liars and Truth-Tellers

Puzzle:

You arrive at an island with two types of inhabitants: liars (who always lie) and truth-tellers (who always tell the truth). You meet three islanders: A, B, and C.

A says, "B is a liar."

B says, "C is a liar."

C says, "A and B are of the same type."

Who is the liar?

## 6. The Poison Wine Puzzle

You are a king with 1000 wine bottles. One is poisoned. You have 10 prisoners to test with, and the poison will kill within 24 hours.

You need to identify the poisoned bottle within 24 hours, and you can only perform one round of testing.

What's the minimum number of prisoners required to find the poisoned bottle in one round?

## 7. An old man dies on his 25th birthday. How is this possible?

# Sudoku challenge

1.

4		6				5	9
			4		2		
	7						
		5	9	1		6	
	1	3				8	9
			2				1
5		8					
				3			8
	4			6	1		

2.

			5	3	4		8
	8			1		4	
	2		8				7
8				6			5
4					5	8	3
6	3		1				
					1	3	
				7			
	1	6	2				

3.

9		7		5			6
					3		1
8			6			4	
	4		9				
	8						7
					2		4
		4			5		2
2	3		1				
7				8		3	1

4.

	5		2	4			1
1					5		
	2			8	3		
						9	5
8							7
7		4					
			9	3			2
			8				4
	6			2	1		8

# Kakuro challenge

## Rules:

1. Fill empty white cells with numbers between 1 and 9.
2. Prefilled numbers serve as clues and should be used to help solve the puzzle.
3. Numbers in each sum group should add up to the provided "clue".
4. No number can be repeated within a single sum group.
5. Clues can be greater than 9, but the numbers used to calculate them cannot.

	3	4						15	3
4				16	6			3	
10							14	16	
			16						
			21						
	3					11			
					3				
	6						10		
						4			
			19						
	4							3	4
6						10			
	7								4

# Solutions

## Sudoku challenge

1.

4	3	6	1	2	8	7	5	9
9	5	1	7	4	6	2	8	3
8	7	2	3	5	9	4	1	6
7	8	5	9	1	4	3	6	2
2	1	3	6	7	5	8	9	4
6	9	4	2	8	3	5	7	1
5	2	8	4	9	1	6	3	7
1	6	7	5	3	2	9	4	8
3	4	9	8	6	7	1	2	5

2.

1	6	7	5	3	4	2	8	9
5	8	9	7	1	2	4	6	3
3	2	4	8	9	6	5	7	1
8	9	2	3	6	7	1	5	4
4	7	1	9	2	5	8	3	6
6	3	5	1	4	8	9	2	7
7	4	8	6	5	1	3	9	2
2	5	3	4	7	9	6	1	8
9	1	6	2	8	3	7	4	5

3.

9	1	7	4	5	8	2	3	6
4	5	6	7	2	3	8	1	9
8	2	3	6	1	9	4	5	7
5	4	1	9	3	7	6	2	8
6	8	2	5	4	1	9	7	3
3	7	9	8	6	2	1	4	5
1	6	4	3	9	5	7	8	2
2	3	8	1	7	6	5	9	4
7	9	5	2	8	4	3	6	1

4.

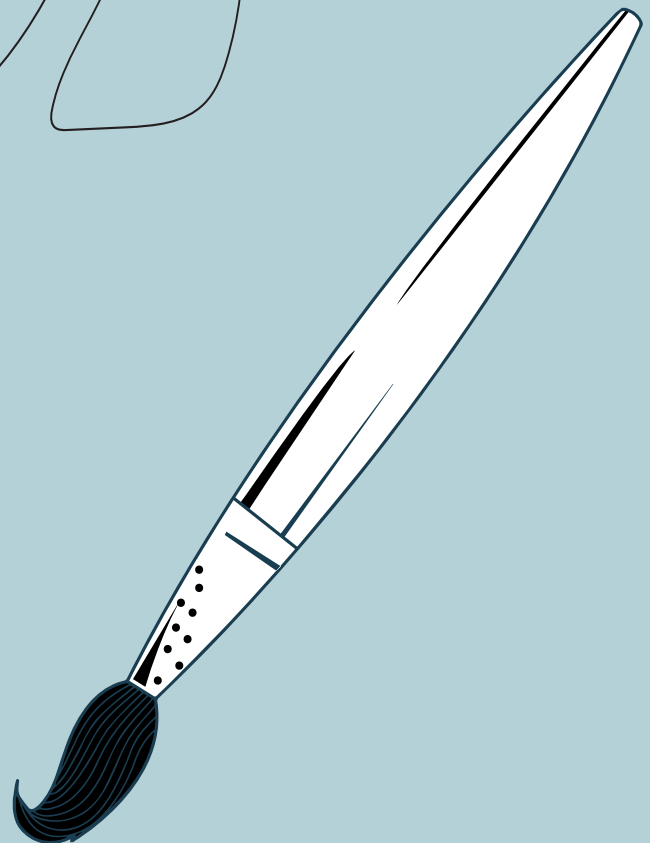
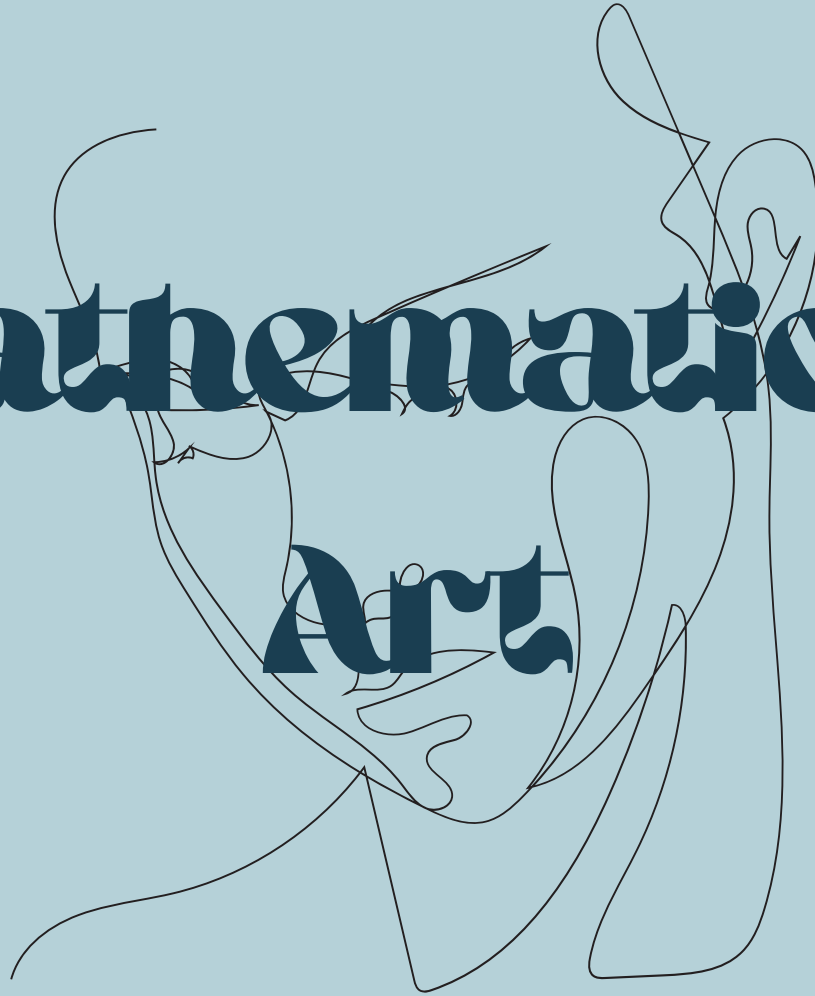
9	5	3	2	4	7	6	1	8
1	4	8	6	9	5	3	7	2
6	2	7	1	8	3	4	5	9
2	1	6	3	7	8	9	4	5
8	3	5	4	1	9	2	6	7
7	9	4	5	6	2	8	3	1
5	8	1	9	3	4	7	2	6
3	7	2	8	5	6	1	9	4
4	6	9	7	2	1	5	8	3

## Kakuro challenge

	3	4					15	3	
4	1	3	16	6			3	2	1
10	2	1	3	4	14		7	5	2
		16	4	2	6	1	3		
	3	2	1	3	11	8	2	1	
	6	3	2	1	4	10	6	4	
	19	7	6	2	1	3			
6	1	5		10	3	4	2	1	
7	3	4					4	1	3

**Mathematical**

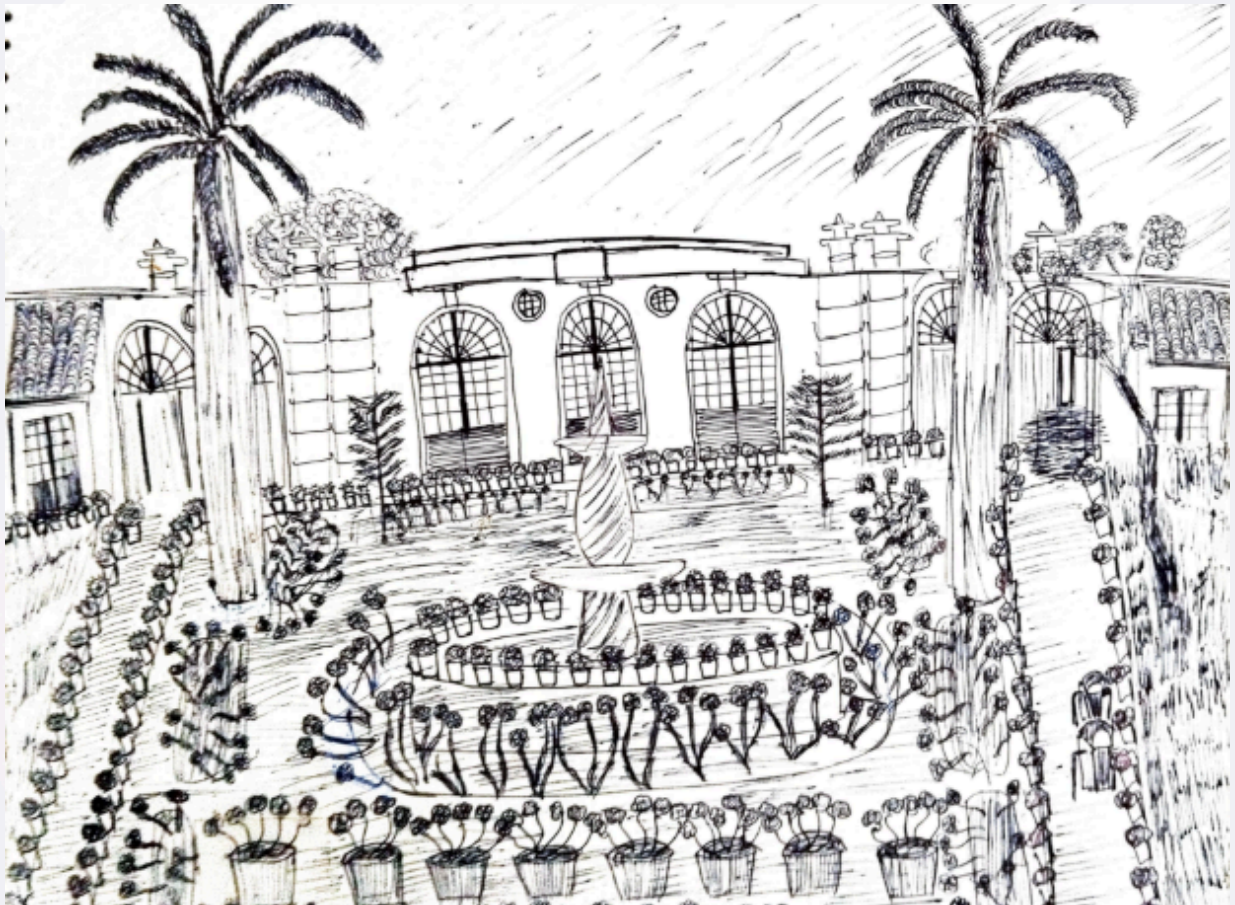
**Art**



# Math-e-Magical

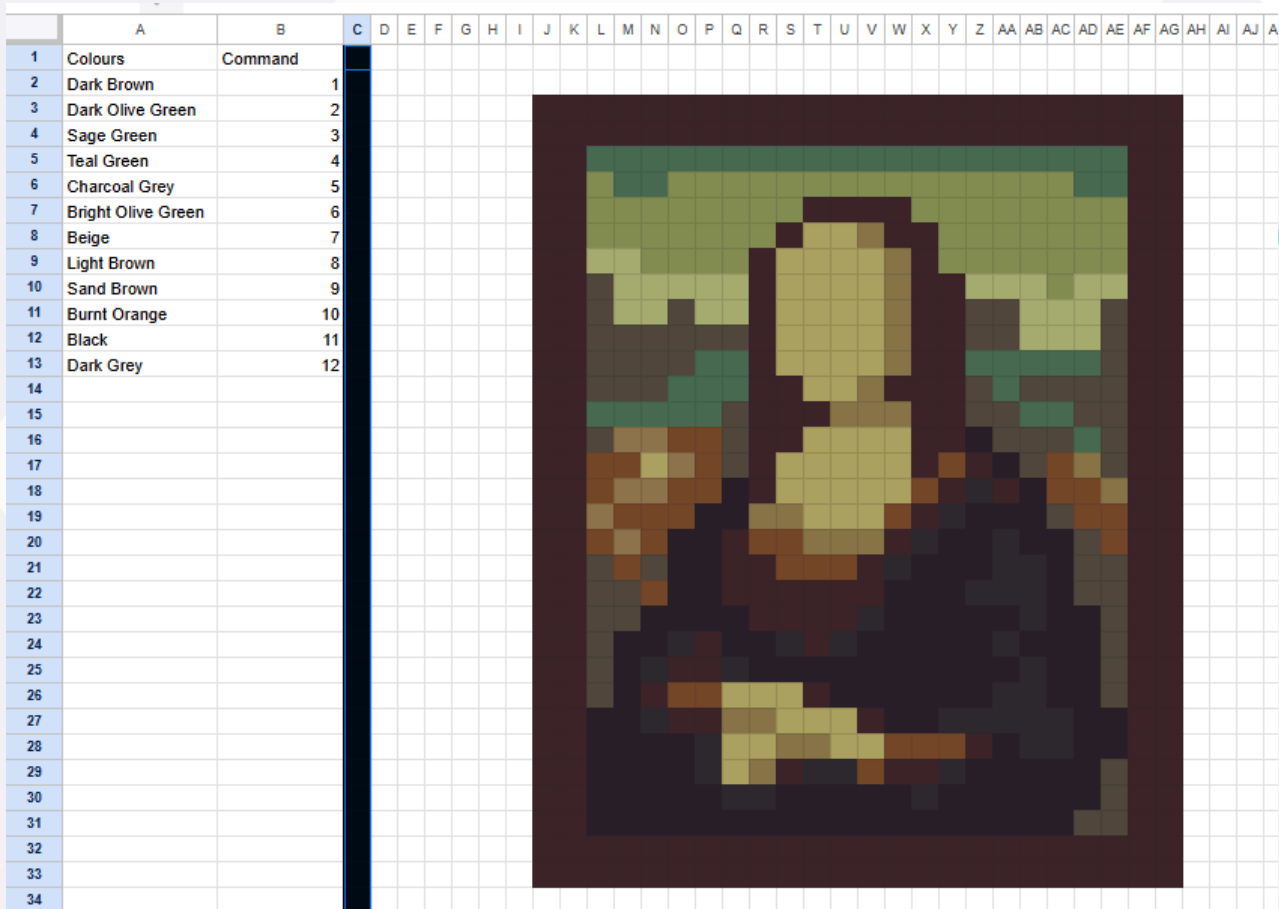


~ Jiya Swami  
B.Sc.(H) Maths  
1st year



-Dr. Gunjan Khurana  
Assistant Professor  
IP College

# Pixelated Mona Lisa



## Pixel Art : An integration of Maths in Art

### *Project Description:*

This artwork is a pixelated rendition of the Mona Lisa, one of the most iconic portraits in art history, recreated entirely using Google Sheets.

### Pixel Mona Lisa In Google Sheets Using Maths Logic

This digital artwork is a pixel-style recreation of the Mona Lisa, designed entirely in Google Sheets using conditional formatting. Instead of manually coloring each cell, the art was programmed using mathematical logic, making this a perfect integration of math and art.

- Radhika Gola  
B.Sc. (H) Maths  
1<sup>st</sup> Year

## How Maths Was Used:

Conditional Formatting with Logic: Each cell in the grid is conditionally formatted based on its value using the formula.

`=and(cell=number, first cell=number); i.e. =and($B$2=1, D1=1)`

## Color Mapping via Numbers:

- Each number in the sheet represents a color code.
- Conditional formatting rules are applied so that each number turns into a specific color.

For example:

- 1 → Dark Brown
- 2 → Dark Olive Green
- 3 → Sage Green
- and so on

## Artistic Process:

- The Mona Lisa was simplified into a grid and then translated into numerical values.
- Each number in the grid corresponds to a unique color, applied automatically via conditional formatting.
- The result is a stylized, blocky interpretation of the original painting—recognizable yet abstract.

*“By using conditional formatting formulas in Google Sheets, I was able to bring art to life with maths. Each number represented a color, and logic helped turn a spreadsheet into a pixel version of the Mona Lisa.”*

- Radhika Gola  
B.Sc. (H) Maths  
1<sup>st</sup> Year

# De Divina Proportione

## -Luca Pacioli

### THE TRUE CODE DA VINCI

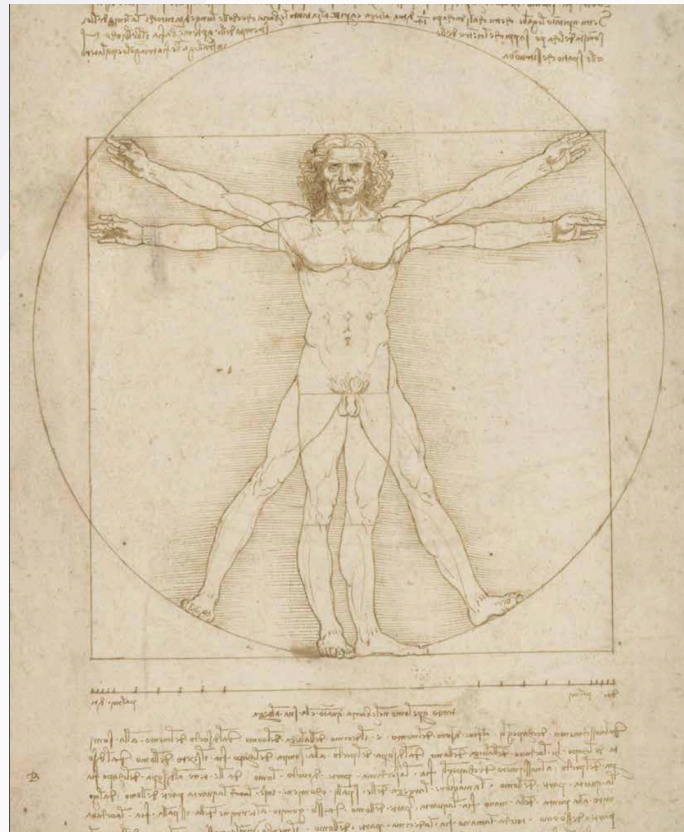
*De Divina Proportione* is a remarkable book on mathematics written by Luca Pacioli around 1497 and first printed in 1509. It is most renowned for its exploration of the golden ratio—approximately 1.618—which Pacioli referred to as the divine proportion due to its elegance and frequent appearance in art, nature, and design.

#### Key Contributors:

- Luca Pacioli: A Franciscan friar and mathematician, often regarded as the father of accounting. He authored the book and provided its mathematical foundation.
- Leonardo da Vinci: Created stunning illustrations of geometric forms, particularly the Platonic solids. His artwork brought Pacioli's ideas vividly to life, making the book visually captivating.

The term **De Divina Proportione** was historically used to describe what we now call the golden section—a mathematical ratio by which a whole is divided into two unequal parts so that the ratio of the smaller part to the larger is the same as the ratio of the larger part to the whole. This concept fascinated Renaissance thinkers due to its aesthetic appeal and structural harmony.

The fusion of art and science, exemplified by the 60 full-page illustrations completed by Leonardo da Vinci—the preeminent genius of the era—makes this book one of the most iconic works of the Italian Renaissance. Deeply interested in both nature and the mathematics of art, Leonardo collaborated with Pacioli and became a passionate advocate for perspective and proportion. He applied the golden ratio, also known as Phi, in many of his works, including *The Last Supper*, which was created around the same time as the illustrations for *De Divina Proportione*.



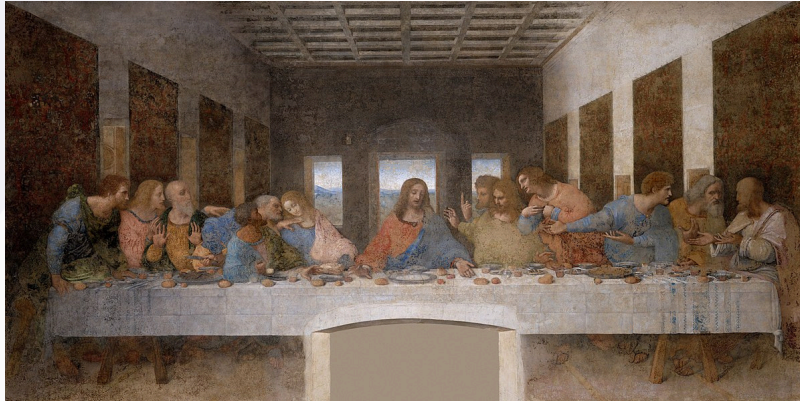
the Mona Lisa, whose face hides a perfect golden rectangle, and the Vitruvian Man, a profound study of the human figure in which Leonardo demonstrates that all major body parts are related by the golden ratio.

These works not only reveal his artistic genius but also his profound understanding of mathematical harmony in the natural world. By integrating geometry and proportion, Leonardo aimed to capture a universal sense of balance, illustrating that true beauty in art is closely tied to the laws of mathematics.

Leonardo's drawing combines a careful reading of the ancient text with his own observation of actual human bodies. In drawing the circle and square, he correctly observes that the square cannot have the same centre as the circle—the navel—but is somewhat lower in the anatomy. This adjustment is the innovative part of Leonardo's drawing and is what distinguishes it from earlier illustrations. He also departs from Vitruvius by drawing the arms raised to a position in which the fingertips are level with the top of the head, rather than Vitruvius's much lower angle, in which the arms form lines passing through the navel.

- Radhika Gola  
B.Sc. (H) Maths  
1<sup>st</sup> Year

# The Last Supper

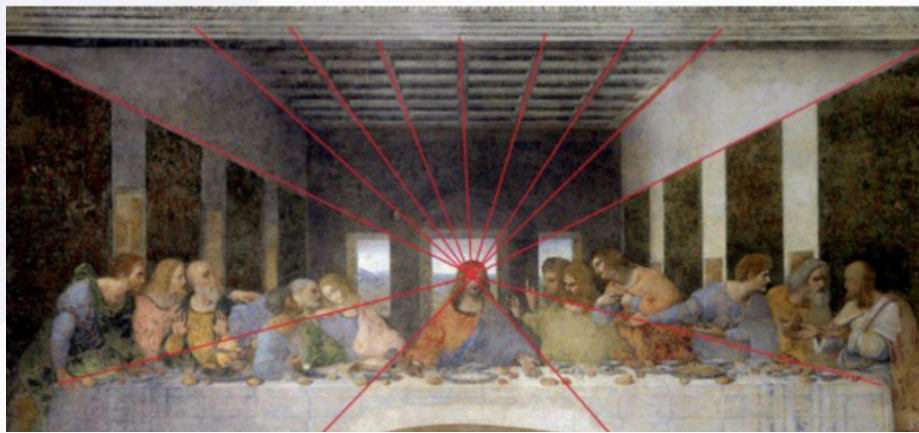


Leonardo da Vinci's *Last Supper* is a masterclass in the mathematics of perspective. In it, the architecture surrounding Jesus and the twelve apostles, as well as the subtle lines on the floor beneath the table, demonstrate a single-point perspective, or a "vanishing point," which serves as the subconscious focal point of the painting.

Leonardo da Vinci used his love of mathematics to embody the true spirit of the "Renaissance Man." In his notebooks, he recorded his ideas for numerous scientific inventions, many of which were precursors to modern technological tools. (For example, his "Aerial Screw" shares the same basic design as the helicopter.) But perhaps most inspiring is how he incorporated maths into everything he did, including his artistic works, surpassing mere beauty and proving once and for all that mathematics truly is the universal language.

## How Is Maths Used in Painting?

1. Linear Perspective (One-Point Perspective) — Leonardo used mathematical perspective to create depth. All lines (such as walls and ceiling beams) converge on a single vanishing point, which is placed directly behind Jesus' head. This naturally draws the viewer's eye to Jesus, the central figure.



*Vanishing point = Jesus' head = focal point*

**2. Geometric Composition** —The painting is symmetrical, with six disciples on each side, grouped in threes (another symbolic number). The entire scene fits into a series of rectangles and triangles.

Jesus is framed in a perfect triangle—a symbol of the Holy Trinity.

His body posture forms this triangle, and it is balanced and calm—unlike the chaotic gestures of the disciples.

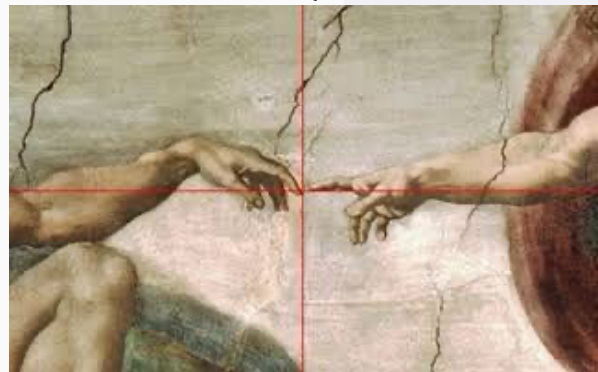
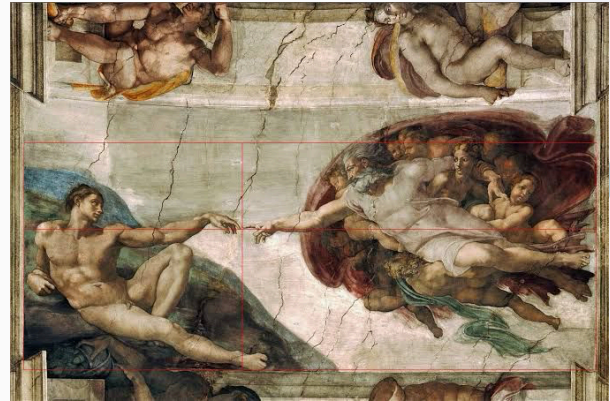
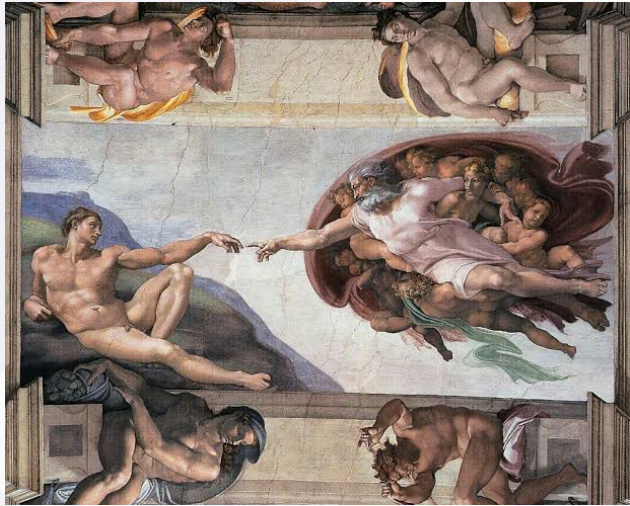
**3. Use of the Golden Ratio ( $\Phi$ ); (Phi  $\approx$  1.618)**—Leonardo da Vinci is believed to have employed the Golden Ratio in *The Last Supper* to achieve a sense of visual harmony and balance. The placement of Jesus at the center, along with the proportional arrangement of architectural and compositional elements, reflects the use of this mathematical principle to enhance the aesthetic structure of the painting.

**4. Symbolic Use of Numbers**—In *The Last Supper*, Leonardo da Vinci also incorporated symbolic use of numbers to convey deeper meaning. One of the most significant is the number three, representing the Holy Trinity. The apostles are grouped in threes, and there are three windows in the background—emphasizing divine perfection and unity. Additionally, the presence of twelve apostles symbolizes the twelve tribes of Israel and the foundation of the Church. These numerical choices reflect rich religious symbolism and reinforce the spiritual themes of the painting.

- 3 (groups of disciples, windows, triangles around Jesus) symbolizes the Trinity.
- 4 (walls, panels) represents the material world.
- 7 (number of visible spaces behind Jesus) often signifies spiritual completeness.

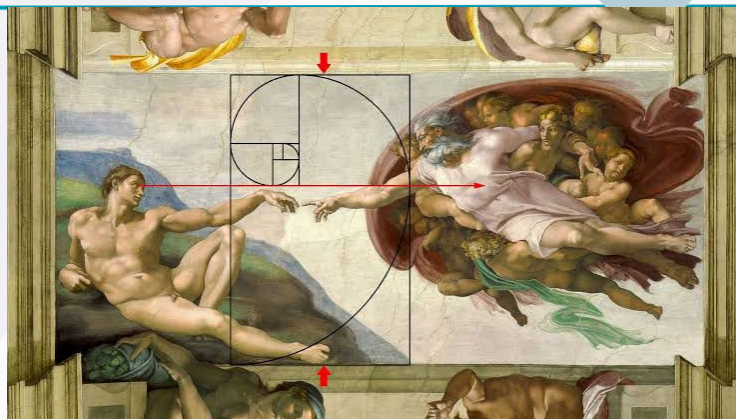
—Radhika Gola  
BSc (H) Maths  
1<sup>st</sup> Year

# The Silent Geometry of Michelangelo's: The Creation of Adam



High above the nave of the Sistine Chapel, where centuries of reverence have been directed skyward, Michelangelo's "The Creation of Adam" occupies its rightful place as one of the most iconic images in Western art. Painted between 1508 and 1512, this single moment, the near-touch between God and man, has transcended its religious context to become a universal symbol of creation, potential, and connection. Yet, behind its emotive power lies a structure of remarkable precision. Embedded in its composition is a quiet but profound use of mathematics most notably, the Golden Ratio, which governs the visual harmony of the scene. At a glance, the fresco appears fluid and instinctively balanced. Adam reclines, relaxed and grounded, while God surges forward with divine energy, enveloped in a swirl of figures and motion.

However, this grace is no accident. Michelangelo, deeply versed in classical proportion and Renaissance ideals, structured the painting with mathematical intent. When a golden rectangle is applied to the composition, the viewer discovers that the focal point, the almost-touching fingers, aligns precisely with the curve of the golden spiral. This subtle geometry, rooted in the ratio of approximately 1.618, draws the eye intuitively to the emotional and spiritual center of the work.



Adam's form, too, reflects mathematical order. His limbs, posture, and the space he occupies adhere to classical principles of proportion derived from Vitruvian ideals. The calm elegance of his body stands in deliberate contrast to the vitality and motion of God, creating a tension that is as visual as it is symbolic. Interestingly, the drapery surrounding God and the angels has long been noted for its resemblance to the human brain, a suggestion that Michelangelo, known for his anatomical studies, may have embedded a coded reference to human intellect within the divine form. If so, this would represent a sophisticated convergence of science, art, and theology, a hallmark of Renaissance humanism.

The overall composition of *The Creation of Adam* is anchored in symmetry and proportion, yet dynamic in its movement. Invisible lines of geometry, diagonals, arcs, and golden sections, organize the figures and guide the viewer's gaze across the canvas. Each gesture, each fold of cloth, each curve of muscle has its place within this structure, reinforcing a visual equilibrium that is deeply pleasing, even if not consciously perceived.

What elevates this fresco beyond its religious narrative is precisely this mathematical underpinning. Michelangelo did not merely depict the biblical creation of man; he encoded within it a reflection of universal order. The divine spark is not only in the outstretched hand of God, but also in the artist's command of form, proportion, and design. The Golden Ratio, found in nature and echoed throughout centuries of architecture and art, is here used to communicate something eternal — that beauty and meaning emerge not only from inspiration, but from structure.

In the narrow space between two fingertips, Michelangelo captured both the mystery of creation and the logic of design. It is in that delicate breath of distance, just before life is given, that we glimpse the extraordinary balance between the sacred and the rational, the artistic and the mathematical. *The Creation of Adam* is, in every sense, a masterpiece of divine proportion.

Asma Sunil  
Bsc Maths (H)  
First Year

# MATHEMATICS INTEGRATED ART



## ART AND MATHEMATICS:

Two worlds that seem miles apart—one driven by emotion, color, and expression, and the other by logic, patterns, and precision. Yet, when you look closer, you'll find that some of the world's most captivating paintings, including those by Vincent van Gogh, Leonardo da Vinci, and Salvador Dalí, are deeply intertwined with mathematical beauty. Artists have long used mathematics, whether consciously or intuitively, to bring harmony, structure, and movement into their work.

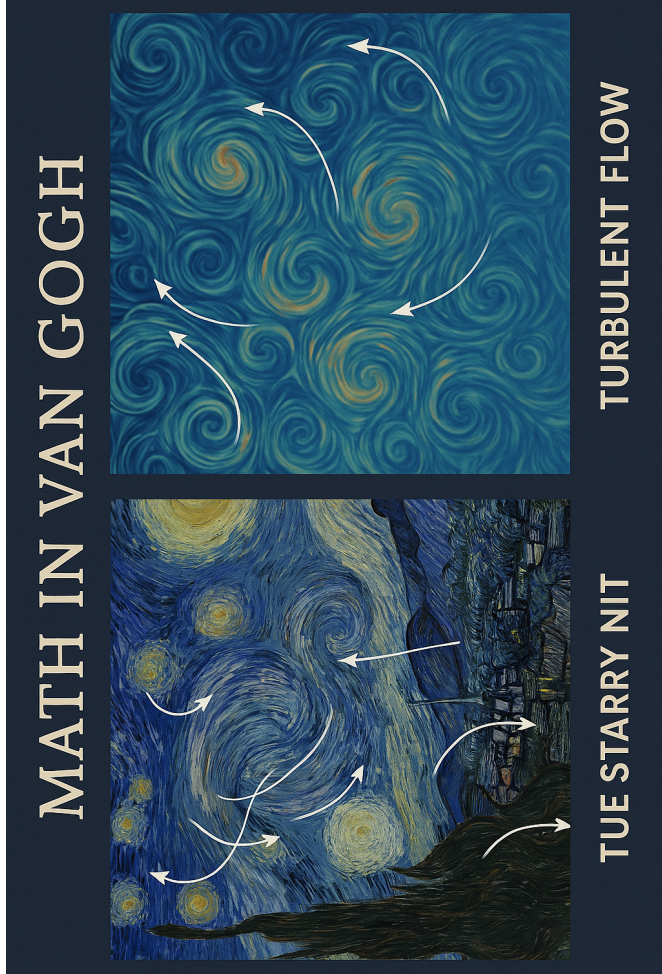
### I. Vincent van Gogh: The Starry Night

Math Concept: Turbulence and Fluid Dynamics

Scientists have analyzed Van Gogh's brushstrokes in *The Starry Night* and found that they match mathematical models of turbulent fluid flow (Kolmogorov scaling).

In simpler terms:

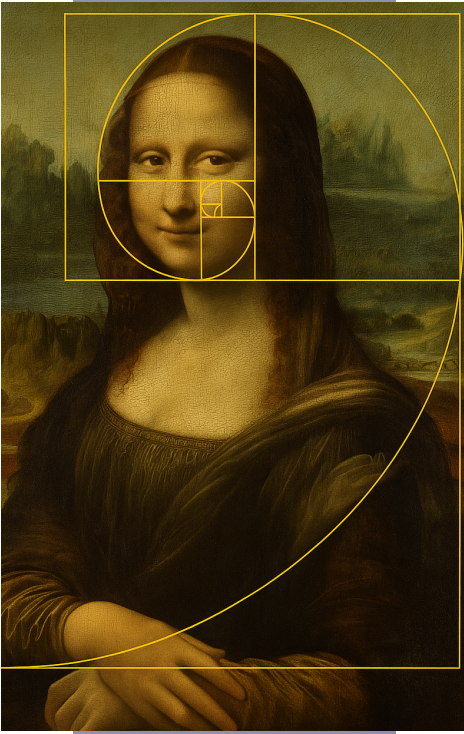
It's as if Van Gogh captured the invisible math of nature. His swirls follow the same energy flow that scientists observe when simulating air currents or water spirals, even though he had no formal knowledge of the physics behind it.



-Anshika Singh  
B.Sc.(Hons) Maths  
1st Year

## 2. Leonardo da Vinci Mona Lisa

### Math Concept: The Golden Ratio and Human Proportions



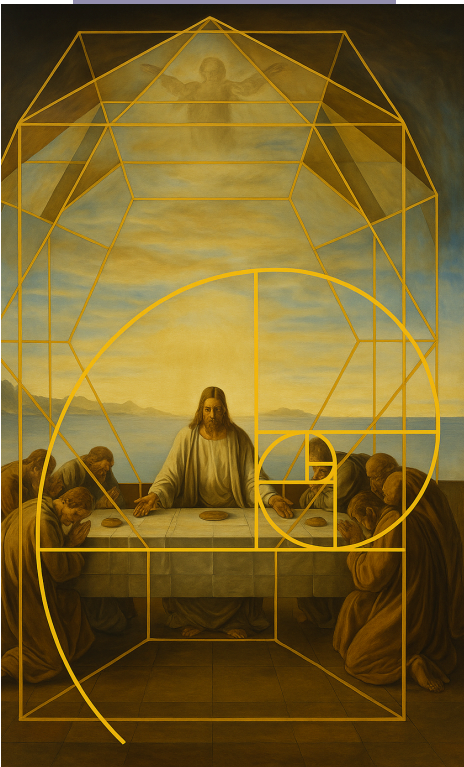
There's something about the *Mona Lisa* that has captivated viewers for over 500 years—her calm gaze, her mysterious smile. The dimensions of her face, from forehead to chin, and from cheek to cheek, align with the golden ratio. This special number, approximately 1.618, appears all over nature: in seashells, flowers, galaxies, and even the human body. Artists and architects have used it for centuries because it creates naturally pleasing proportions.

In simpler terms:

Imagine drawing a golden spiral, the kind you see in seashells, over the *Mona Lisa*. It fits her face and body beautifully, suggesting that Leonardo used math as a secret ingredient to make her look just right

## 3. Salvador Dalí -The Sacrament of the Last Supper

### Math Concept: Geometry (Dodecahedron)



Dalí was fascinated by science and mathematics. In *The Sacrament of the Last Supper*, he places Christ and his disciples inside a transparent dodecahedron, a 12-faced 3D shape.

In simpler terms:

Dalí used this complex geometric shape to give the scene a divine, otherworldly atmosphere. It symbolizes perfection and the universe, blending math, religion, and art in a single frame.

~Anshika Singh  
B.Sc.(Hons) Maths  
1<sup>st</sup> year



# Mathematics in Architecture

~Jahnavi Singh  
B.Sc.(H) Maths  
1st year



# Geometry and Symmetry

Mathematics plays a crucial role in the symmetry and geometry of architecture and art, providing structure, balance, and harmony. Architects like Antoni Gaudí and artists like M. C. Escher used geometric principles to create visually captivating works. Symmetry, proportions, and patterns not only enhance aesthetic appeal but also contribute to structural integrity. From the intricate tessellations in Islamic art to the golden ratio in classical buildings, mathematics forms the invisible framework behind beauty and design.

The same can be observed in ancient architectural buildings in India, such as temples, especially through concepts like reflection, rotation, and bilateral symmetry, achieved using precise geometry. It's fascinating how these structures demonstrate a remarkable understanding of mathematics, centuries before modern concepts were developed.

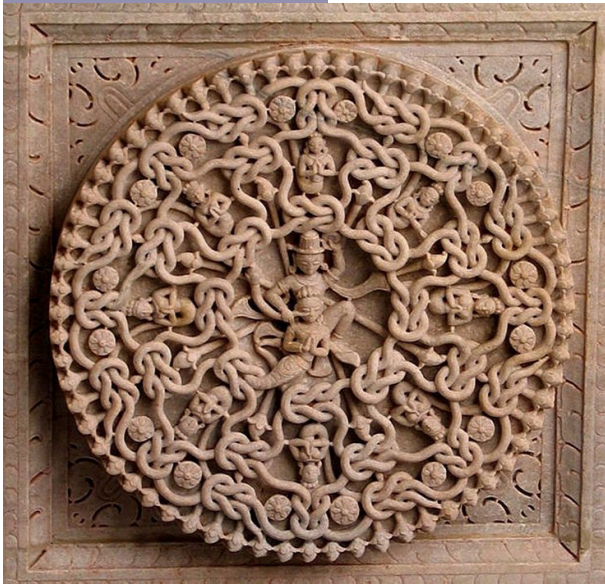
A mandala is a symmetrical diagram representing the universe, used as a blueprint in many Hindu and Buddhist temples. They often follow the *Vastu Purusha Mandala*, a grid-based design sacredly rooted in the cosmos, which includes rotational symmetry of circles, depicting the cosmic cycle and harmony. Geometric shapes like squares, circles, and triangles are arranged using precise proportions and ratios to create both spiritual and visual balance. Temples such as those in *Khajuraho* and *Angkor Wat* beautifully demonstrate the use of mathematical symmetry, where every element—from floor plans to carvings—follows intricate, repeating patterns grounded in geometry and symbolic meaning.



*Fig:* The perfection in both circular and bilateral symmetry can be seen in this temple of Lord Shiva in Shirol Taluka, Kolhapur, Maharashtra.



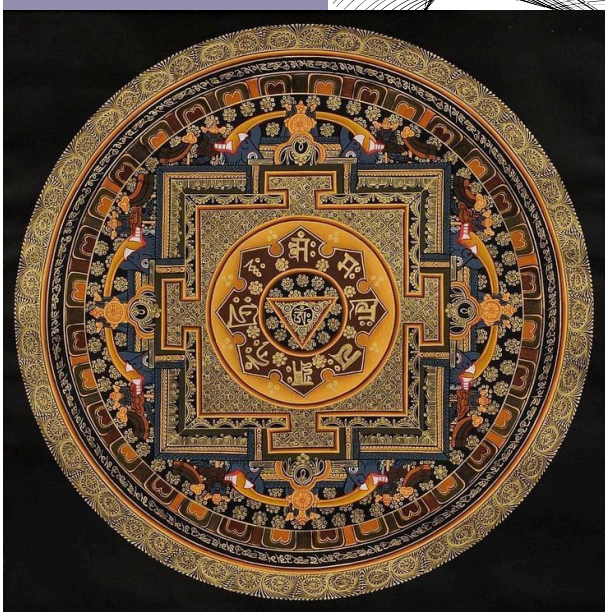
*Fig:* The perfection in bilateral visual symmetry is remarkably accurate in the Dwarkadhisha Temple, located in Dwarka, Gujarat.



*Fig:* The Ranakpur Jain Temple in Rajasthan, India, also known as Chaturmukha Dharana Vihara, is renowned for its intricate designs and architecture. The carvings represent the concept of Karma in Jainism and feature complex knot patterns symbolizing the interconnectedness of actions and consequences.



*Fig:* This central submerged architecture in the city of Ahmedabad, Gujarat, called the Adalaj Stepwell, showcases fine architecture with perfect visual symmetry, along with bilateral symmetry reflected in the water.



*Fig:* It features complex yet highly detailed patterns symbolizing the Earth, its energy, and how it is intertwined with life.

Islamic art and architecture are deeply rooted in mathematical principles, where complex patterns and precise geometry create a sense of infinite beauty and spiritual reflection. The use of *Arabesque*—a flowing, interlaced design of floral and vegetal motifs—demonstrates the application of symmetry and repeating geometric transformations. *Kaleen* patterns, often seen in carpets and tiling, follow intricate mathematical grids, showcasing radial and bilateral symmetry, tessellations, and modular designs. Architectural elements like the *Jharokha* or *Jaali*—a decorative overhanging balcony or window—often feature latticework based on geometric divisions, combining function with ornate patterning. These artistic features reflect a deeper philosophy where mathematics becomes a tool to express unity, order, and the infinite nature of creation, while avoiding figurative representation in accordance with Islamic aesthetic values.

Such references are seen in monuments like the Alhambra, Fatehpur Sikri, and many mosques around the world.

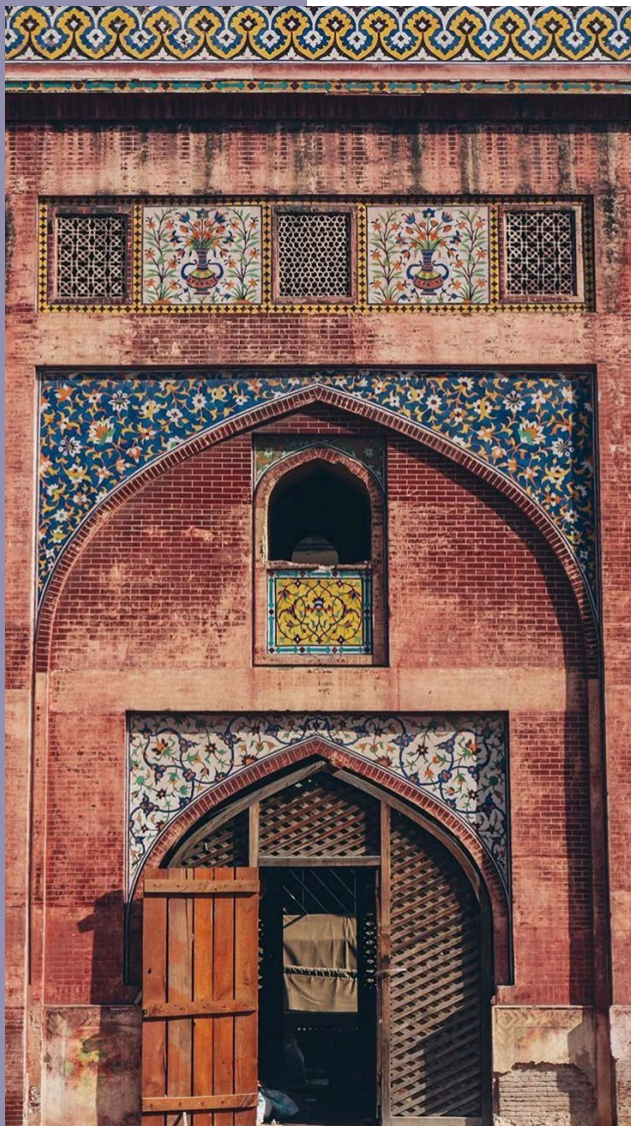


The Mosque-Cathedral of Córdoba in Spain, originally built as a mosque in 785 CE, was later converted into a Christian cathedral, reflecting both Muslim and Christian influences. It features floral motifs, and the dome is a notable element, displaying complex cross-ribbed structures and mosaics.

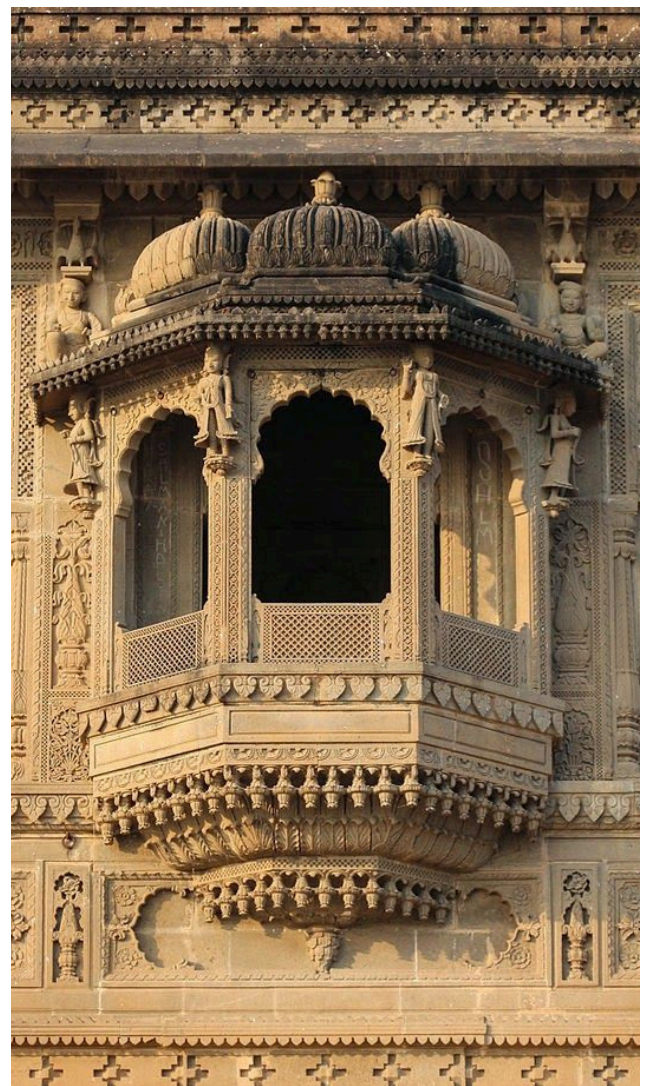


Symbolism: Blue in mandalas often represents infinity, purity, and life. A blend of Islamic and Persian influences can be seen in the shapes extending outside the mandala.

*Fig: Kaleen* (carpet) patterns from Islamic traditions show a beautiful blend of shapes and details, featuring highly symmetrical patterns.



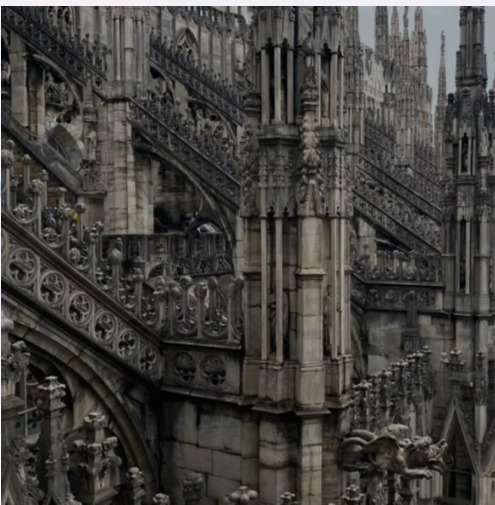
*Fig: Pictures from Lahore, Pakistan, of the Wazir Khan Masjid showcase the perfect arch designs of Mughal art styles from the 17th century. The Nakkashi along the roof of the mosque displays circular segregation and symmetry.*



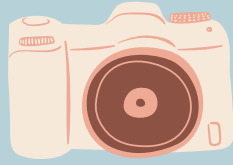
*Fig: The vibrant colors, along with the precise proportions such as circular, triangular, and star-shaped elements, are beautifully flaunted in integrated shapes. The Jharokha depicts an inverted parabola.*

## Christian/Catholic Structures

Mathematical geometry has long played a foundational role in Catholic and church architecture, where sacred spaces are designed to reflect divine order and harmony. From the precise proportions of Gothic cathedrals to the radial symmetry of rose windows, geometry is used to create both spiritual and structural balance. One of the most striking examples is the Sagrada Família in Barcelona, designed by Antoni Gaudí. This iconic basilica features hyperbolic paraboloids, helicoids, and other advanced geometric forms inspired by nature and mathematics. Gaudí's design uses symmetry, fractal-like branching columns, and catenary arches to blend natural structure with spiritual symbolism. Throughout Catholic architecture, geometric layouts—such as the Latin cross floor plan, domes based on perfect circles, and golden ratio proportions—underscore the belief that mathematical order mirrors divine perfection.



**Fig:** The high tower churches at Barcelona and Britain shows extreme hyperbolic and symmetrical along with bilateral rotational elements, an application of Applied Mathematics.



# Memory Page



# Students' Achievements



**Jasnoor Kaur Sethi**  
**3rd Year**

- **Shri P. M. Mathai and Smt. Sosamma Mathai Memorial Prize** instituted by Dr. Saramma Mathai for Highest Marks/CGPA in B.Sc. (H) Mathematics Part II
- **Krishna Bhatia Memorial Prize** instituted by Dr. Rita Bhatia for the Best All Rounder Student of Department of Mathematics
- **Sumitra Madhusudan Dayal Mithal Scholarship** instituted by Shri Akhilesh Mithal for Highest Marks/CGPA in B.Sc. (H) Mathematics Part I and Part II combined, plus tutorial performance



**Pakhi Sharma**  
**2nd Year**

- **Shri Harbans Lal Kohli Memorial Prize** instituted by Mrs. Sunita Marwaha for Securing Highest CGPA
- **C. L. Rustogi Memorial Prize** instituted by Mr. V. K. Rustogi for the Most Meritorious Student of B.Sc. (H) Mathematics Part I



**Vani**  
**1st year**

- **1st Position** in Students' Paper Presentation on Ramanujan Birthday
- **3rd Position** in Three-Legged Race in Khelo IP'25



**Jiya Swami**  
**1st year**

- 1st Position in Shivotham Art Competition held at IPCW
- 3rd Position in College-Related Art Competition at Freshers' Talent Hunt

**Pooja**  
**2nd year**

C.L. Rustogi Memorial Prize instituted by Mr.V.K. Rustogi for the Most Meritorious Student of B.Sc. (H) Mathematics Part I



**Samreedhi Ghosh**  
**1st year**

2nd Position in Students' Paper Presentation on Ramanujan Birthday

**Suhana Garg**  
**1st Year**

3rd Position in Three-Legged Race in Khelo IP'25



**Preeti**  
**2nd Year**

3rd Position in Smriti Event of Women Development Cell in Shruti'25

**Ritika**  
**2nd Year**

2nd Position in Mathematical Rangoli Competition in Paridhi'24





**Pawni Tomar**

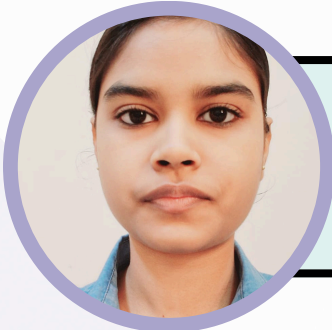
**2nd year**

**1st Position in Code Relay 2024 organised by the  
Computer Science Department**

**Sneha Tyagi**

**2nd Year**

**2nd Position in Mathematical Rangoli  
Competition in Paridhi'24**



**Muskan**

**2nd year**

**1st Position in Code Relay 2024 organised by the  
Computer Science Department**

**Ritika**

**2nd Year**

**3rd Position in Inter-Departmental  
Quiz Competition on Pi Day**



**Himanshi Pal**

**3rd year**

- **1st Position in Mathematical Rangoli  
Competition in Paridhi'24**
- **3rd Position in Inter-Departmental  
Quiz Competition on Pi Day**

**Jayantika**

**2nd Year**

**3rd Position in Intra-College Solo  
Folk Dance Competition**



# Books Suggested by Teachers

## Academics

1. Linear Algebra by Ward Cheney and David Kincaid
2. Numerical Analysis by S S Sastry
3. Ordinary and Partial Differential Equation by Dr. Raisinghania
4. Differential Calculus by Dr. Gorakh Prasad
5. Linear Algebra and Its Applications by Gilbert Strang
6. Differential Equations and their Applications: An Introduction to Applied Mathematics by Martin Braun
7. The Tao of Physics : Capra, Fritjof (Harper Collins Publisher)
8. The Quantum and the Lotus, by Matthieu Richard & Trinh Xuan Thuan; Three Rivers Press, New York.
9. Shivaji Sawant: Mrityunjay (translated), Bharatiya Gyanpeeth
10. Understanding Analysis by Stephen Abbott
11. Foundations of Complex Analysis by S. Ponnusamy

## Motivational/Inspirational

1. How to win friends and influence people
2. Power of your subconscious mind

# Credits and Acknowledgements

As we close the final pages of this magazine, we extend our heartfelt gratitude to everyone who made this publication possible.

## **Editorial Team**

A sincere thank you to our dedicated editorial team whose creativity, hard work, and passion have shaped every article and detail of this magazine.

## **Teacher-in-Charge (TIC)**

We express our appreciation to our Teacher-in-Charge, [Ms. Monika Bansal], for her unwavering support, guidance, and encouragement throughout this project.

## **Chief Advisor**

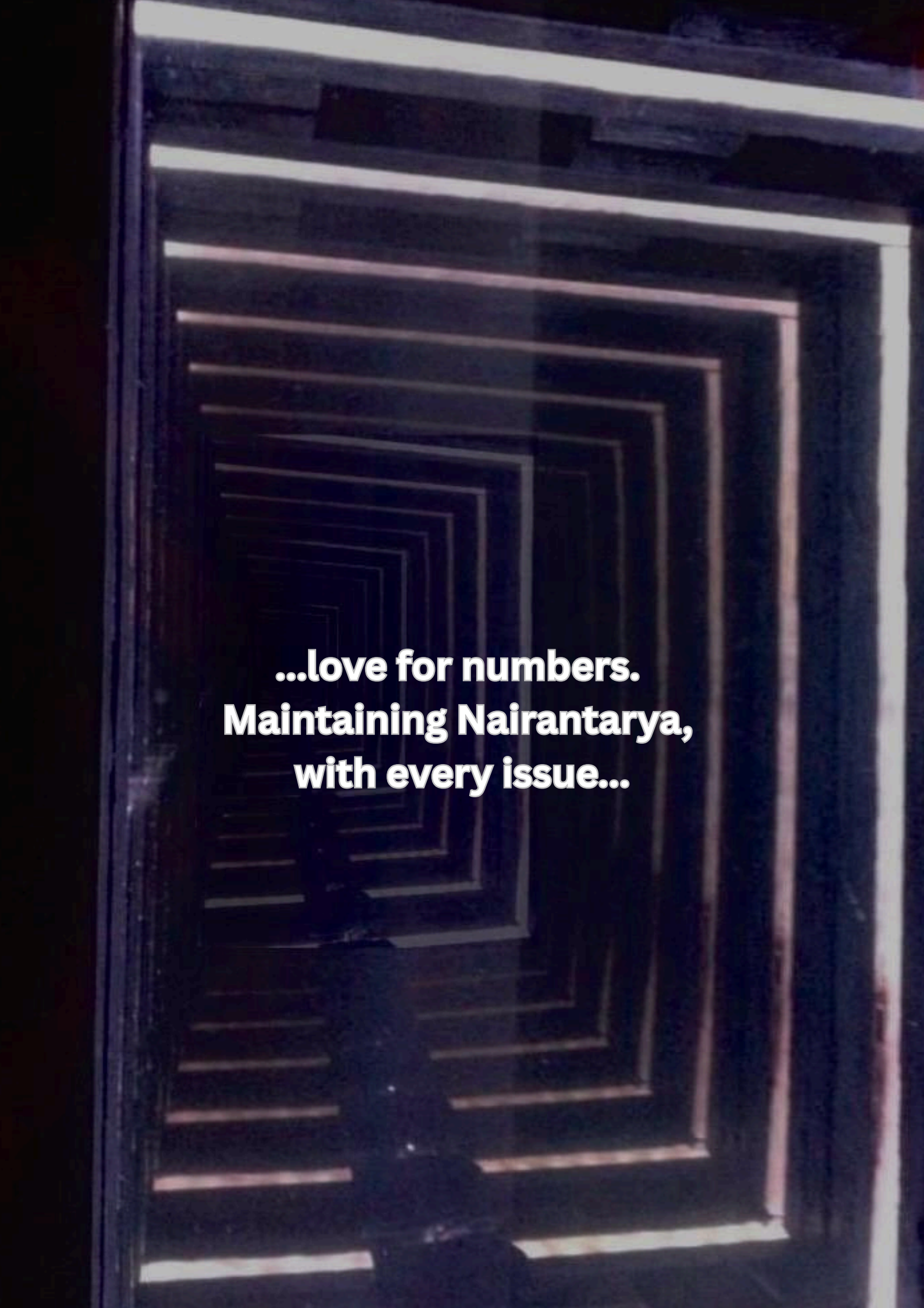
Special thanks to our Chief Advisor, [Dr. Vagisha Sharma], whose insights and mentorship have been invaluable in bringing this vision to life.

## **Image Credits**

The images featured in this magazine are not original. Full credit goes to their respective creators and sources. We sincerely appreciate the work of these photographers and artists, whose contributions have greatly enhanced the visual appeal of our magazine.

This magazine is the culmination of creativity, camaraderie, and a shared devotion to the art of storytelling. Our deepest thanks to all who walked beside us on this journey and helped bring these pages to life.

With gratitude,  
The Editorial Team



**...love for numbers.  
Maintaining Nairantarya,  
with every issue...**