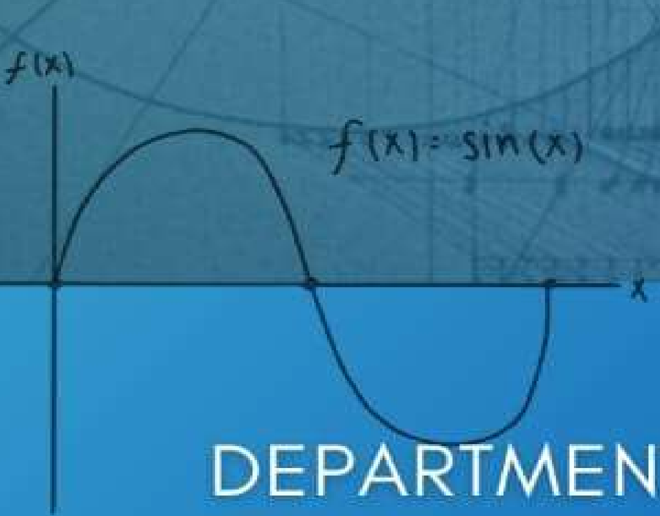
MATHOLIC

1st Edition

2024-2025



DEPARTMENT OF MATHEMATICS
MANGALDAI COLLEGE

MATHOLIC

1st Edition

2024-2025

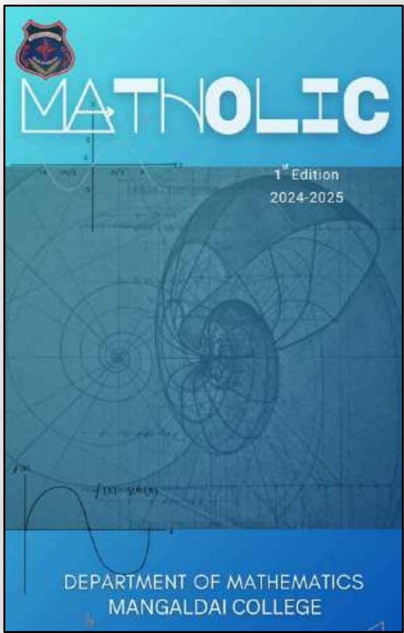
Department of Mathematics

MANGALDAI COLLEGE

MANGALDAI-784125,DARRANG,ASSAM

MATHOLIC: The Annual e-Magazine of Department of Mathematics, Mangaldai College Published by Head of the Department on behalf of all students, vol. 1st, Session: 2024-2025.

Editorial Board



To all the teachers who inspire and students who seek knowledge, the first edition of MATHOLIC is dedicated to your determination, effort and unwavering spirit...

ABOUT MATHEMATICS DEPARTMENT

The Department of Mathematics at Mangaldai College established in 1965, has been a cornerstone of academic excellence, dedicated to nurturing scientific intellect and analytical thinking in the Darrang district. With the introduction of Mathematics in the degree curriculum in 1968-69 and the major course in 1988-89, the department has continually evolved to meet the ever-growing academic demands. It upholds the vision of excellence in teaching and fostering a culture of curiosity, innovation, and critical thinking among its students.

The department is well-equipped with three major classrooms, a computer laboratory cum smart classroom, and a dedicated library. The departmental library, which began in 2003-04 with just 80 books, now boasts a rich collection of over 300 books, serving as a valuable academic resource for both students and faculty.

Keeping pace with technological advancements, the computer laboratory was upgraded in 2022-23 with 16 computers, equipped with specialized software like MATLAB and C+, along with free Wi-Fi access to support research and learning. Additionally, a smart classroom with an interactive flat panel enhances the teaching-learning experience, ensuring a dynamic and engaging academic environment.

With a legacy built on excellence and a future driven by innovation, the Department of Mathematics remains committed to shaping bright minds, fostering analytical thinking, and contributing to the ever-expanding world of mathematical sciences.

Dr. Kamala Kanta Borah, M.Sc, Ph.D
PRINCIPAL
Mangaldai College, Mangaldai

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Memo No. .... Date. 25.09.2024

Message from the Principal's Desk

It is really a joyous and proud moment for all of us that the department of Mathematics, Mangaldai College is going to publish a e- Magazine, ***Matholic*** from the year, **2024-25.** I am extremely happy to share my thoughts in this occasion. I do hope that the book will be able to delve into cutting edge research and foster deeper understanding in the field of Mathematics. The deeper understanding in Mathematics is paramount as it is the root of science. The continuous improvement, innovation and commitment towards excellence is key focus of the department and the college as well. This eBook will showcase not only the expertise and dedication of the students and department's faculty but also the enthusiasts in exploring the wonder of the Mathematics world. The holistic effort made by the department to publish the eBook for broadening the reach of scientific knowledge is praise worthy. I consider it a one of the contributing steps towards fulfilling the College's vision- **"Promotion of Higher Education, Social uplift and Development of Scientific temperament among the masses"**

Congratulations on the release of your eBook.

25/9/2024

Principal
Mangaldai College
Mangaldai

Internal Quality Assurance Cell (IQAC)

Mangaldai College, Mangaldai – 784 125

E-mail: mciqac@gmail.com; Phone: 8638493759

Accredited A Grade by NAAC

Memo No.: MC/IQAC/2025/ Date: 19-03-2025

Message from the Desk of Coordinator, IQAC

Dear Editorial Team of *Matholic*,

I am delighted to extend my heartfelt congratulations and best wishes to the Mathematics Department of Mangaldai College on the launch of the inaugural edition of *Matholic*.

This is a remarkable achievement, and I truly commend your efforts in creating a platform that not only highlights mathematical research but also fosters intellectual growth and collaboration within the academic community. I am confident that *Matholic* will serve as an invaluable resource for students, researchers, and educators alike.

May this e-magazine go from strength to strength, inspire many, and continue to promote the beauty and importance of mathematics in the years to come.

Wishing you all much success in this exciting new endeavour!

With warm regards,

(Dr Santosh Borkakati)
Coordinator, IQAC
Mangaldai College

MESSAGE

It gives me immense pleasure to know that our department of mathematics, for the first time, going to publish a e-magazine "Matholic." Matholic is not a E-Magazine, I hope, it will be a hub of our departmental activities and innovation. It will continue, in future, without any break and will achieve a golden destination.

Thank you

05/10/2024

Debajit Nath

Associate professor,
Dept. of Mathematics,
Mangaldai College

Message from the Head of the Department

I am proud that our students have initiated MATHOLIC, an e -magazine that reflects the dedication and curiosity of students and faculty who strive to explore the wonders of Mathematics, by bringing insightful articles and creative exploration. I wish all the reader an enriching experience.

Dimbeswar Kalita

Associate professor,
Dept. of Mathematics,
Mangaldai College

Message from the students' Union

It gives me immense pride and happiness to congratulate the Department of Mathematics, Mangaldai College, on the publication of their e-Magazine, Matholic, for the year 2024. This remarkable initiative not only showcases the academic excellence and innovative spirit of the department but also serves as a beacon of inspiration for students across disciplines. The eBook is a testament to the hard work, dedication, and creative endeavors of the students and faculty, who have tirelessly worked to bring this project to fruition. It reflects the department's commitment to fostering a deeper understanding of mathematics and its applications in a rapidly evolving world. I am confident that Matholic will ignite curiosity and a love for mathematics among readers, bridging the gap between complex concepts and practical applications. This effort resonates with Mangaldai College's vision of promoting higher education, encouraging scientific temperament, and uplifting society through knowledge and innovation. On behalf of the entire Students' Union, I extend my heartfelt congratulations to the Department of Mathematics and wish them continued success in all their future academic endeavors. May this eBook serve as a milestone and pave the way for many such achievements in the years to come.

With warm regards,

Jyotishman Kalita

Jyotisman Kalita
President
Mangaldai College Students' Union (2024-25)

Message from the Editors

We are proud in the fact that the respected teachers and the students of the Mathematics Department of our Mangaldai College is going to publish the first issue of the E-Magazine this year and I, with your blessings, kind help, and co-operation, have undertaken the responsibility of it and proceeded to realize it. Though I have tried hard to avoid any kind of errors, some unintentional ones may occur anywhere for which I would like to beg for your pardon. I would extend my gratitude to all those that have contributed to its realization. Efforts have been made to reflect the mind and feels of our friends and the trend of the recent time. It is expected that, in days to come, it will be continued to be published in series. This E Magazine will raise the intelligence of our friends, focus the growth of the quality education of our college and thus, establish the identity of our college in the society. It is earnestly hoped that this issue of the E-Magazine will come to light with the utmost charm and attraction, and it will gain a cordial affection from all.

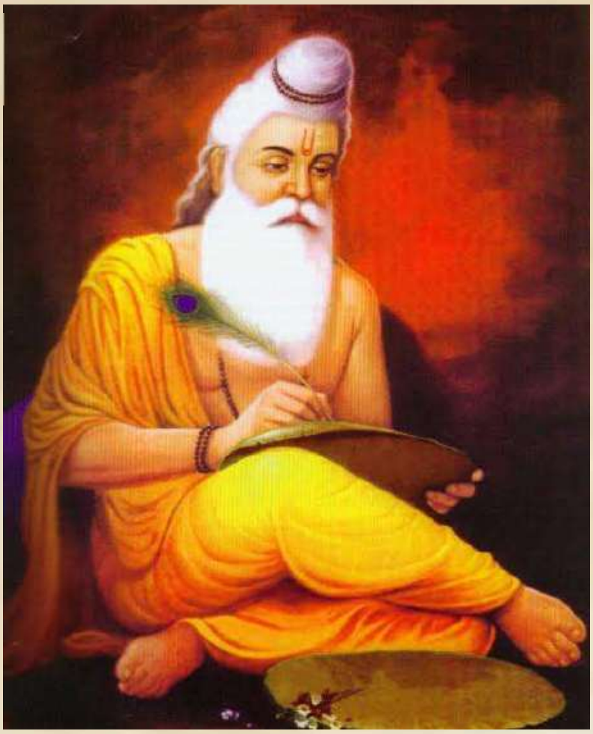
Best wishes to Mangaldai College, best wishes to Mathematics Department of Mangaldai College.

Thank You

CONTENT

1.
SOME PROMINENT MATHEMATICIANS OF INDIA

A.



Acharya Pingala
3rd-2nd century BCE

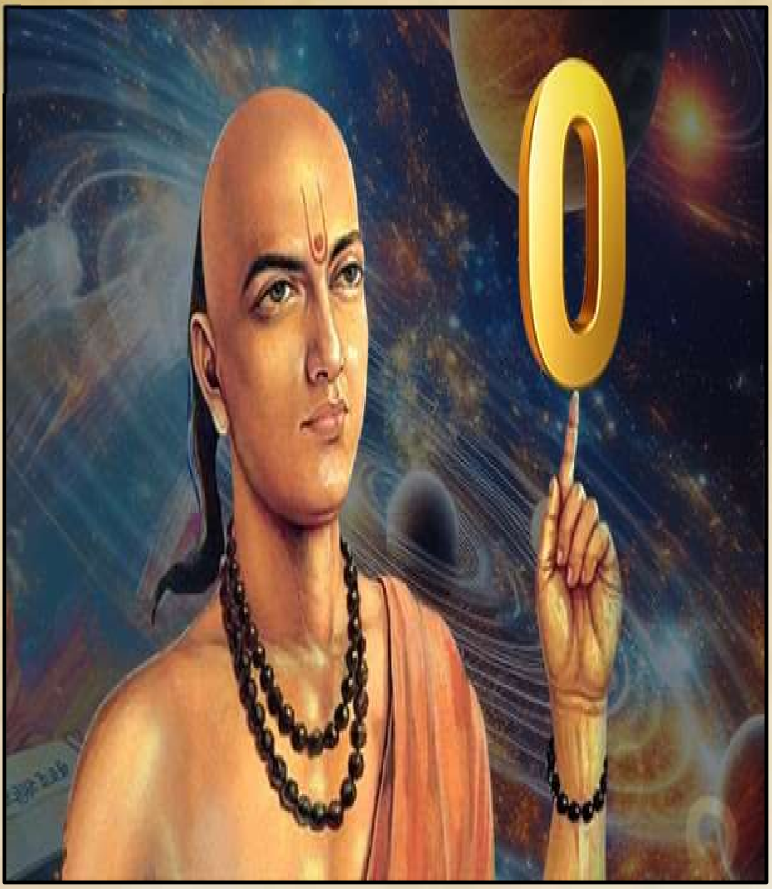
Pingala was an ancient Indian mathematician and scholar, believed to have lived around the 3rd century BCE. He is best known for his work on prosody, the study of poetic meters, in his treatise called the "Chandaḥśāstra." This text not only laid the foundations for Sanskrit prosody but also explored binary numbers and combinatorial mathematics.

Pingala introduced the concept of "meru-prastaara," which represents the arrangement of numbers in a triangular form, akin to Pascal's Triangle. He analyzed patterns in syllable lengths and developed rules for combining short and long syllables, paving the way for systematic poetic composition.

Moreover, Pingala's use of binary numbers—denoting short and long syllables—predated similar concepts in Western mathematics by centuries. His insights into combinatorial enumeration have influenced various fields, including computer science and information theory.

Pingala's contributions demonstrate the deep interconnection between mathematics and the arts in ancient India, highlighting how mathematical principles can underpin creative expression. His work remains a significant part of the history of mathematics, showcasing the intellectual richness of ancient Indian civilization.

B.



Aryabhata

476-550 AD

Aryabhata, born in 476 CE in ancient India, was a pioneering mathematician and astronomer whose work laid foundational principles for both fields. His most renowned text, the "Aryabhatiya," encompasses a wide range of topics, including arithmetic, algebra, and trigonometry, showcasing his innovative approach to mathematics.

In arithmetic, Aryabhata introduced the concept of zero as a placeholder and made significant advancements in number theory. He calculated the value of pi (π) with remarkable precision, estimating it to be approximately 3.1416. His work on quadratic equations and methods for solving them was groundbreaking, influencing later mathematicians.

In astronomy, Aryabhata proposed a heliocentric model, asserting that the Earth rotates on its axis and explaining celestial phenomena in a systematic manner. He also developed algorithms for calculating the positions of planets and eclipses, demonstrating a sophisticated understanding of celestial mechanics.

Aryabhata's contributions had a profound impact on mathematics and astronomy, not just in India but across the world. His legacy continues to inspire scholars and is celebrated as a testament to the intellectual prowess of ancient Indian civilization.

C. 

Sakuntala Devi

1929-2013

Sakuntala, also known as the mathematician Shakuntala Devi, was an exceptional Indian mathematician born on November 4, 1929, in Bangalore. Often referred to as the "Human Computer," she gained fame for her extraordinary ability to perform complex mathematical calculations rapidly and accurately without any mechanical aid.

From a young age, Sakuntala displayed remarkable talent in mathematics, demonstrating her skills in public performances and competitions. Her unique talents led her to be recognized globally, culminating in her inclusion in the 1982 edition of "The Guinness Book of World Records" for her ability to multiply two 13-digit numbers in just 28 seconds.

Beyond her calculating prowess, Sakuntala Devi authored several books on mathematics, including "The Book of Numbers" and "Mathability," aimed at teaching math concepts in an engaging way. She emphasized the importance of mathematical education and inspired countless students to appreciate the beauty of numbers.

Sakuntala Devi's legacy extends beyond her calculations; she championed the idea that mathematical talent can be nurtured through practice and understanding. She passed away on April 21, 2013, but her contributions to mathematics and education continue to inspire future generations. Her life exemplifies the power of intellect and passion in overcoming societal barriers.

Mathematics Phobia: Understanding, Causes, and Solutions

Dr. Jintu Mani Nath
Assistant professor, Dept. of Mathematics,
Mangaldai College
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Math anxiety, or mathematics phobia, is a prevalent issue impacting students, professionals, and parents. It involves intense fear, stress, and even physical discomfort when engaging with math, significantly affecting academic achievement, career prospects, and daily decisions. Tackling this issue requires identifying its causes and applying effective strategies to address it. This article delves into the definition of math anxiety, its root causes, the effects on individuals' performance and confidence, and practical solutions to help those affected overcome this challenge and build a positive relationship with mathematics.

What is Mathematics Phobia?

Mathematics phobia is a type of anxiety triggered by math-related tasks, from solving problems to merely thinking about math. This fear can range from mild unease to severe panic, often accompanied by symptoms like tension, rapid heartbeat, and avoidance behaviours. Unlike simple disinterest, it is a debilitating fear that can hinder academic and professional performance.

debilitating fear that can hinder academic and professional performance.

Research shows that up to 25% of students experience math anxiety during their education. This condition creates a negative feedback loop: poor performance increases anxiety, which further undermines confidence and ability. Math anxiety affects working memory and focus, both crucial for problem-solving, making improvement challenging. Breaking this cycle requires targeted strategies to rebuild skills and self-assurance in mathematics, ultimately helping individuals overcome this common yet significant barrier to success.

Causes of Mathematics Phobia

1. **Early Negative Experiences**: Math anxiety often develops in childhood. Early struggles with math, paired with limited support, can result in feelings of inadequacy and fear. Repeated failures, especially in high-pressure settings that prioritize grades over understanding, can reinforce a mental link between math and stress, shaping long-lasting negative attitudes toward the subject.

2. **Rigid Teaching Methods**: Traditional, rigid teaching methods emphasizing rote memorization, standardized testing, and inflexible problem-solving can exacerbate math anxiety. Prioritizing results over conceptual understanding creates pressure and intimidation. Furthermore, educators with math anxiety may inadvertently transmit these feelings to students, reinforcing a cycle of fear and apprehension rather than fostering a supportive, confidence-building learning environment.

3. **Cultural Beliefs and Stereotypes**: Mathematics is often regarded as a difficult subject in many societies, with stereotypes suggesting that only individuals with inherent“natural talent” can succeed. These beliefs foster a fixed mindset, where mathematical ability is perceived as static and unalterable. Consequently, students may develop self-fulfilling prophecies, abandoning efforts to improve their skills and internalizing the notion that they are inherently not “math people.”
4. **Performance Pressure and Peer Comparisons**: Mathematics is frequently perceived as a measure of intellectual capability in competitive academic environments. The fear of judgment, ridicule, or unfavourable peer comparison can make students withdraw from engaging with the subject. This performance pressure, combined with an aversion to failure, exacerbates math anxiety, impairing confidence and academic persistence.
5. **Social Effects and Parental Attitudes**: Parental math anxiety can inadvertently influence children, particularly when parents openly discuss their fears or highlight math's difficulty. Such expressions may lead children to internalize negative attitudes, perceiving mathematics as an insurmountable challenge. This intergenerational transmission of anxiety can undermine children's confidence and limit their willingness to engage in mathematical learning.

Influence of Mathematics Phobia

The impacts of math anxiety are noteworthy and can influence a wide range of personal, academic, and professional aspects of an individual’s life:

1. **Academic Performance**: Students with math anxiety often struggle with math-related tasks because anxiety impairs their concentration and cognitive processing. This can lead to a cycle of poor performance and avoidance, reinforcing negative feelings toward the subject and potentially limiting long-term engagement with mathematics.
2. **Career Opportunities**: Math anxiety deters individuals from pursuing math-intensive careers, especially in high-demand STEM fields (Science, Technology, Engineering, and Mathematics). This limits career options and reduces earning potential, as many lucrative professions require strong mathematical skills.
3. **Life Skills**: Mathematical skills are critical for daily activities such as budgeting, financial planning, time management, and problem-solving. Severe math anxiety can impair an individual's ability to perform these tasks effectively, potentially leading to challenges in financial stability and personal organization.

Solutions to Mathematics Phobia

Math anxiety must be overcome using a multifaceted strategy that includes social support, psychological approaches, and educational strategies. Here are some operative strategies to address math anxiety:

1. **Adopt Supportive Teaching Methods**: Teachers play a key role in reducing math anxiety by using teaching methods that place more emphasis on conceptual understanding than rote memory. Students are assisted in seeing math as relevant and useful by techniques including incorporating real-world applications and engaging in interactive, group activities.

Building a safe, accepting classroom atmosphere where students can ask questions and grow from their errors boosts confidence and lowers fear, which in turn improves students' interest in mathematics.

2. **Encourage a Growth Mindset**: Promoting a growth mindset, which holds that abilities may be developed via hard work and persistence, aids students in realizing that mathematical aptitudes are flexible rather than fixed characteristics. Reducing the fear of failure and promoting perseverance can be achieved by placing more emphasis on effort, resilience, and progress than just rewarding the right responses. Over time, highlighting little successes and consistent progress builds self-confidence and fosters a favourable attitude toward mathematics.

3. **Use Relaxation and Mindfulness Techniques**: Relaxation techniques, including deep breathing, progressive muscle relaxation, and visualization, can effectively help students regulate anxiety before and during math-related tasks. Additionally, mindfulness practices, which involve maintaining a non-judgmental focus on the present moment, have been shown to reduce stress and enhance concentration, enabling students to approach math with greater calm and focus.

4. **Provide Early Intervention and Extra Support**: Math anxiety doesn't have to be a major obstacle if it is detected early in the learning process. Students who get specialized support—such as tutoring, remedial courses, or special intervention programs can develop the fundamental skills

and confidence they need to succeed in arithmetic. Furthermore, schools can offer counselling services to help students develop coping mechanisms for anxiety.

5. **Encourage Parental Involvement and Positive Attitudes:** Parents can assist by involving their kids in enjoyable, low-stakes math-related activities at home. This could involve playing math-related games, baking (measured ingredients), or shopping (calculating discounts). Parents should emphasize the value of math abilities in daily life and try to convey favourable attitudes toward the subject.

6. **Use Technology and Gamification**: Interactive simulations, internet games, and educational apps can all help make arithmetic less intimidating and more interesting. Due to the instant feedback that technology can offer, students can learn at their own pace and without worrying about looking foolish. A playful component is also added by gamification, which reduces anxiety and fosters a productive learning environment.

Conclusion

Mathematics phobia is a prevalent issue that significantly impacts academic performance, career prospects, and personal development. Addressing this challenge requires strategic interventions and robust support systems. Employing inclusive teaching methods, promoting a growth mindset, and implementing early intervention strategies can help alleviate math anxiety.

Educators, parents, and communities must collaborate to foster a constructive and engaging learning environment, enabling individuals to build confidence and develop a positive relationship with mathematics. Overcoming math phobia paves the way for academic excellence, professional advancement, and practical problem-solving skills, empowering individuals to approach mathematical challenges with resilience and self-assurance.

References:

1) Hilton, P. (1980). Math anxiety: Some suggested causes and cures. *The Two-Year College Mathematics Journal*, *11*(3), 174-188.
2) Kunwar, R. (2020). Mathematics phobia: Causes, symptoms and ways to overcome. *International Journal of creative research thoughts*, *8*(8), 818-822.

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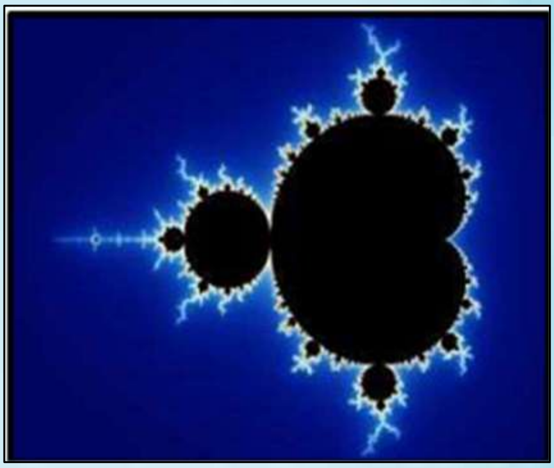
> Mathematicians are like Frenchmen: whatever you say to them they translate into their own language and forthwith it is something entirely different.
>
> GOETHE

Mathematics and Nature: The Invisible Language of the Universe

Jupitara Goswami

Dept. of Mathematics

Nature is often praised because of her sophistication, diversity, and aesthetics. But beneath its surface lies an intricate web of mathematical patterns and principles that govern its behaviour. From the spirals of galaxies to the symmetry of a snowflake, mathematics is the invisible language that shapes the natural world. This profound connection between mathematics and nature reveals a universe that is not only awe-inspiring but also deeply logical and orderly.

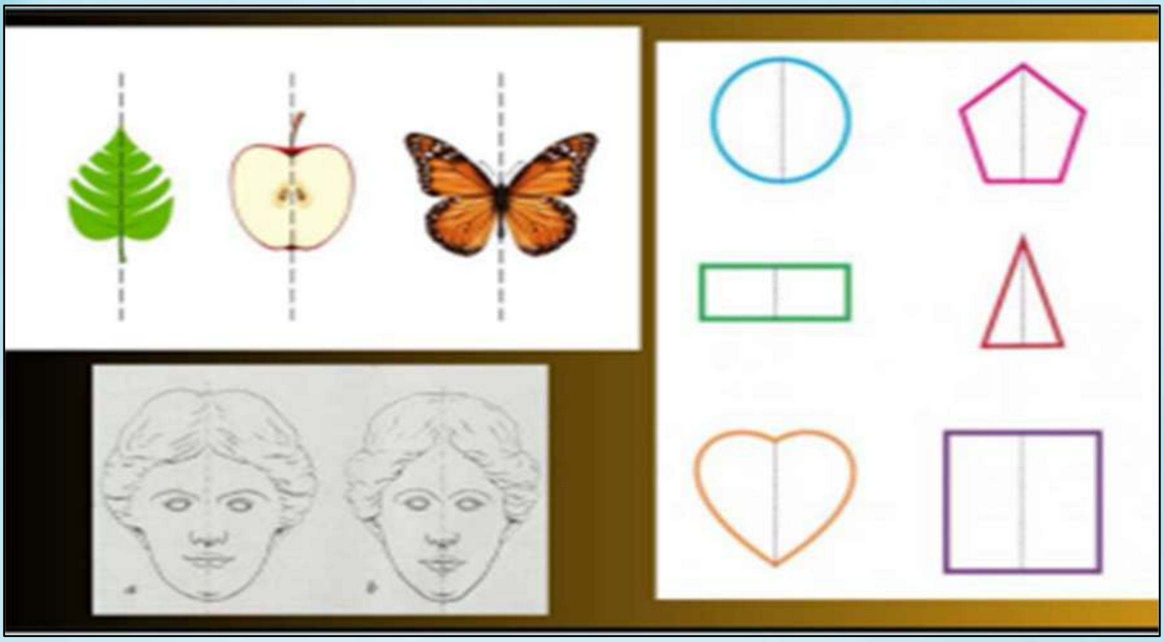


One such example is Fractals. ***Fractals*** are geometric figures that exhibit self-similarity, meaning they look the same at every level of magnification. No matter how closely you zoom in, the pattern continues to repeat. Fractals are not just mathematical oddities— they are abundant in nature. Examples include the branching structures of rivers, trees, and blood vessels. One of the most well-known fractals is the Mandelbrot set, named after mathematician Benoit Mandelbrot, who pioneered fractal geometry. These intricate patterns, featuring endless complexity and infinite boundaries, emerge from a simple mathematical equation.

Another fascinating mathematical pattern found in nature is the ***Fibonacci sequence***. This simple yet profound series begins with 0 and 1, with each subsequent number being the sum of the two preceding ones. The sequence unfolds as 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, and so on, appearing in various natural phenomena.

Surprisingly, the Fibonacci sequence manifests in countless places across nature. It governs the arrangement of sunflower seeds, the spiral patterns of pinecones, and even the curves of seashells. This natural occurrence is often attributed to efficiency—for instance, the spiral arrangement of sunflower seeds allows them to be packed in the most space-efficient manner.

The Fibonacci sequence is also closely tied to the golden ratio, an irrational number approximately equal to 1.618. This ratio is believed to be present in the proportions of plants, animals, and even the vast structure of galaxies. While the extent of its presence in the universe remains a topic of debate, the frequent appearance of this mathematical constant in nature is undeniably intriguing



Symmetry is a fundamental mathematical pattern found throughout nature. From the perfect balance of a butterfly's wings to the radial symmetry of starfish and flowers, these harmonious structures are not just visually appealing but often signify health and vitality. Beyond aesthetics, symmetry serves essential functions in the natural world. Many animals use it as a marker of genetic fitness when selecting a mate. It also plays a crucial role in survival—some species rely on symmetrical patterns for camouflage, blending into their environment, while others use them to startle or ward off predators. Whether in living organisms, natural landscapes, or even cosmic formations, symmetry remains one of nature's most captivating and whether in living organisms, natural landscapes, or even cosmic formations, symmetry remains one of nature's most captivating and purposeful designs.

A ***tessellation*** is a pattern of shapes that fit perfectly together without any gaps or overlaps. In nature, tessellations appear in honeycombs, the skin of pineapples, the packing of oranges, and even the structure of certain types of animal skin and fur. The honeybee's hexagonal honeycomb is perhaps the most famous natural tessellation. It has been proven that the hexagonal grid is the most efficient way to divide a surface into regions of equal area with the least total perimeter.

Chaos theory, a branch of mathematics, explores how small changes in initial conditions can lead to vastly different outcomes in dynamic systems—a concept famously known as the butterfly effect. This principle has far-reaching applications in fields such as weather forecasting, fluid dynamics, and population ecology. Despite its name, chaos theory does not imply pure randomness. Instead, it reveals an underlying order within seemingly unpredictable events. A well-known example illustrates how a butterfly flapping its wings in Brazil could set off a chain reaction leading to a tornado in Texas. This highlights the intricate interconnections within natural systems, where even the tiniest influences can shape large-scale events.

In conclusion, the basic principles that underpin the natural world make mathematics far more than an abstract subject found only in textbooks. Mathematics uncovers an array of patterns, harmony, and intricacy woven throughout the design of nature, from the exquisite symmetry of a butterfly's wings to the spiralling arms of galaxies. We can better comprehend the cosmos and develop a deep appreciation for the beauty and logic that underpin our very being by digging deeper this hidden language. Nature and mathematics are intricately interwoven in the vast fabric of existence, creating a narrative that is both breathtakingly accurate and breathtakingly spectacular.

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> Euler calculated without apparent effort, just as men breathe, as eagles sustain themselves in the air.
>
> ARAGO

0! (Zero Factorial)

Ashif Mirza

Batch: 2019-2022

Math's – an incredible tale of numbers full of thrilling combinations, ideas and questions. Math's is gripping because it cards when they are least expected. Let us take the story of 0!. The value of 0! Is 1, but why and how? It is not yet so simple question. So, this exclamation looking symbol is mathematical operation "factorial" which mean to multiply a series of descending natural numbers. For example, 4! = 4.3.2.1

But for 0! = 1, how canwe decrease a number till 1 which is already less than 1. So, let's calculate for some natural numbers. So,

5! = 5.4.3.2.1 = 120

4! = 4.3.2.1 = 24

3! = 3.2.1 = 6

2! = 2.1 = 2

1! = 1 = 1

If we look carefully, 4! Is nothing but 5! 5 2! = 3! 3 , 1! = 2! 2 , so, by going on this method 0!= 1! 1 0! = 1. This is how math is. Beautiful!

The Earliest Known Mathematician of India: Baudhayana

Madhusmita Kalita

Batch: 2019 - 2022

Pythagorean theorem, the well-known geometric theorem that the sum of the squares on the legs of a right triangle is equal to the square on the hypotenuse (the side opposite the right angle)—or, in familiar algebraic notation, a2+ b2 = c2. Although the theorem has long been associated with Greek mathematician-philosopher Pythagoras (c. 570–500/490 BCE), it is actually far older. Four Babylonian tablets from circa 1900–1600 BCE indicate some knowledge of the theorem, with a very accurate calculation of the square root of 2 (the length of the hypotenuse of a right triangle with the length of both legs equal to 1) and lists of special integers known as Pythagorean triples that satisfy it (e.g., 3, 4, and 5; 32 + 42 = 52, 9 + 16 = 25). The theorem is mentioned in the Baudhayana Sulba-sutra of India, which was written between 800 and 400 BCE.

The Sulbas, are sections of the Kalpa-sütras, more particularly of the Srauta-sutras, which form one of the six Vedāngas (or "The Members of the Veda") and deal specially with rituals or ceremonials . From the Sulba-sūtras, we get a glimpse of the knowledge of geometry that the Vedic hindus had. Of all the extant Sulbas, that of the Baudhayana is the biggest and is also, perhaps, the oldest. The Sulbasutras is like a guide to the Vedas which formulate rules for constructing altars. In other words, they provide techniques to solve mathematical problems effortlessly.

It is widely believed that Baudhayana was a priest and an architect of very high standards. It is possible that Baudhayana's interest in Mathematical calculations stemmed more from his work in religious matters than a keenness for mathematics as a subject itself. Undoubtedly he wrote the Sulbasutra to provide rules for religious rites, and it would appear almost certain that Baudhayana himself would be a Vedic priest.

Baudhayana was able to construct a circle almost equal in area to a square and vice versa. These procedures are described in his sutras.

To transform a square into a circle ,Baudhāyana says:

"अयमर्धः करोति समकोणमायामं चिुरश्रस्य वृत्तक्षेत्रम्।"

Which means "By drawing half (of the diagonal), one can construct a circle equal in area to the square."

Baudhayana is considered among one of the first to discover the value of 'pi'. There is a mention of this in his Sulba sutras. According to his premise, the approximate value of pi is 3.

Several values of π occur in Baudhayana's Sulbasutra, since, when giving different constructions, Baudhayana used different approximations for constructing circular shapes. Some of these values are very close to what is considered to be the value of pi today, which would not have impacted the construction of the altars.

Baudhayana gives the length of the diagonal of a square in terms of its sides, which is equivalent to a formula for the square root of 2. Baudhāyana (elaborated in Āpastamba Sulbasūtra) gives the length of the diagonal of a square in terms of its sides, which is equivalent to a formula for the square root of 2:

"द्विकरणस्य मूलम् (Dvikaranasya moolam)

तृतीयेना िर ्धयेत् (Tṛtīyena vardhayet)

तस्य तृतीयस ्य तृतीयः (Tasya tṛtīyasya tṛtīyaḥ)

सिणं चतुर ् थेन च" (Savarnam caturthena ca)

This can be translated as:

"The measure of the diagonal (square root of 2) is increased by a third, and then by its own third, less by the thirty-fourth part of that."

In modern notation, the expression approximates the value of square root of 2 as:

$$\sqrt{2} \approx 1+1/3+1/3\times4-1/3 \text{ x } 4 \text{ x } 34$$

this gives the approximation:

$$\sqrt{2} \approx 1.4142156.$$

Baudhayana listed the Pythagoras theorem in his Sulba sutra as,

"दीर्धचतुरश्रस्याक्ष्णया रज्जु : पार्श्रिधमानी ततयधग् मानी च यत् पृर्थग् भूते कुरूतस्तदुभयं करोतत ॥"

which can be translated as "The areas produced separately by the length and the breadth of a rectangle together equal the areas produced by the diagonal."

There is no evidence to suggest that Baudhayana’s formula is restricted to right-angled isosceles triangles so that it can be related to other geometrical figures as well.

Therefore, it is logical to assume that the sides he referred to, could be those of a rectangle.

We have all heard our parents and grandparents talk of the Vedas. Still, there is no denying that modern science and technology owes its origins to our ancient Indian mathematicians, scholars etc. Many modern discoveries would not have been possible but for the legacy of our forefathers who made major contributions to the fields of science and technology. Be it fields of medicine, astronomy, engineering, mathematics, the list of Indian geniuses who laid foundations of many an invention is endless.

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> The moving power of mathematical invention is not reasoning but imagination .
>
> A. DE MORGAN

Relation between Mathematics and music

Abhijit Narayan Dev

Batch: 2021-2024

Mathematics is involved in some way in every field of study known to mankind. In fact, it could be argued that mathematics is involved in some way in everything that exists everywhere, or even everything that is imagined to exist in any conceivable reality. Any possible or imagined situation that has any relationship whatsoever to space, time, or thought would also involve mathematics.

Music is a field of study that has an obvious relationship to mathematics. Music is, to many people, a nonverbal form of communication, that reaches past the human intellect directly into the soul. However, music is not really created by mankind, but only discovered, manipulated, and reorganized by mankind. Music is first and foremost a phenomenon of nature, a result of the principles of physics and mathematics.

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AMICABLE NUMBERs (মৈত্রীপূৰ্ণ সংখ্যা)

Abdul Majid Owasim Fardinand

6th Sem (B.Sc. Mathematics)

The numbers are in the form of pairs of positive integers (a,b) where the sum of the proper divisor of “a” is equal to “b” (except the number itself) and the sum of proper divisor of “b” is equal to “a” (except the b) are known as Amicable Number.

These numbers are also known as balanced numbers because they have a balanced relationship between them. The smallest pair of amicable numbers is (220,284) and the largest number is 9,363,584 and 9,437,056.

HISTORY

Amicable numbers were known to the Pythagoreans, who credited them with many mystical properties. A general formula by which some of these numbers could be derived was invented Circa 850 by the Iraqi mathematician Thabit ibn Qurra (826 - 901). Other Arab mathematicians who studied amicable numbers are al-Majriti (dide 1007) , al – Baghdadi (980 – 1037) , and al – Farisi (1260-1320) . The Iranian mathematician Muhammed Baqir Yazdi (16 th Century) discovered the pair (9363584, 9437056) . The word “amicable” comes from the Latin word “amicus” which means friend or friendly.

REPRESENTATION OF AMICABLE NUMBERS

Generally we represent amicable numbers in the form of pairs (a,b) .Let S(a) be the sum of the proper division of positive number "b" and S(b) be the sum of the proper divisor of a positive integer "a" , then

$$S(a) = b$$

$$S(b) = a$$

Therefore $$S(n) = \sigma(n) - n$$

Is equal to the sum of positive divisors of n except n itself.

PROPERTIES OF AMICABLE NUMBERS

Some properties of amicable numbers are as follows:

1.Mutual sum of divisors

2. Abundance and Deficiency

3. Unique appearance

4. Factorization

EXAMPLES

1. (220, 284)
   The proper divisors of 220 are :: 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110
   The proper divisors of 284 are :: 1, 2, 4, 71 and 142
   Sum (220) = 284
   Sum (284) = 220
   Therefore, (220, 284) is amicable number. It is the first amicable number.
2. (2620, 2924)
   The proper divisors of 2620 are:: 1, 2, 4, 5, 10,20, 131, 262, 524, 655 and 1310

The proper divisors of 2924 are:: 1, 2, 4, 17, 34, 68, 43, 86, 172, 731 and 1462

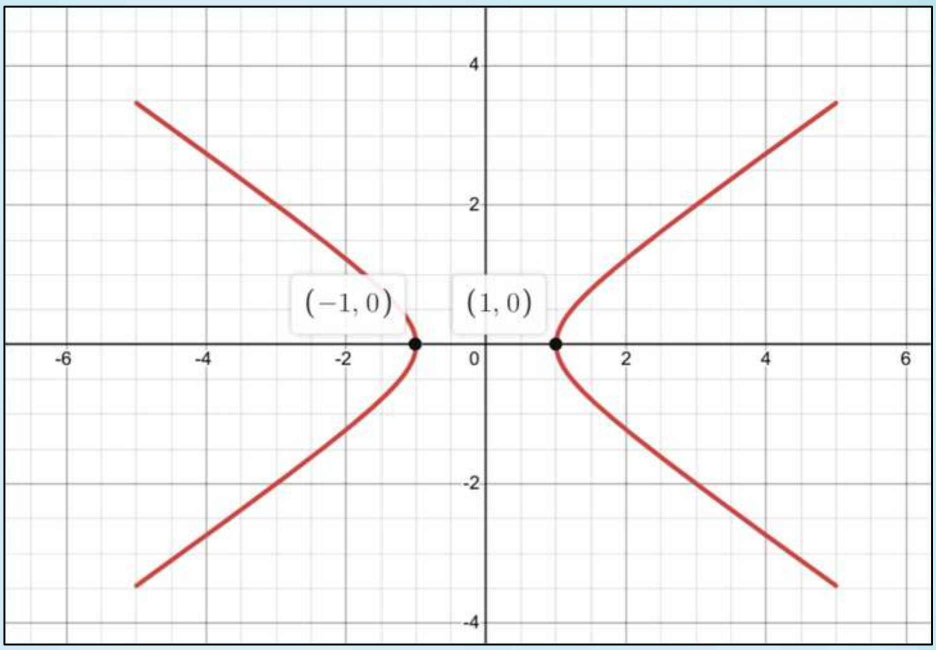
Sum (2620) = 2924

Sum (2924) = 2620

Therefore, (2620, 2924) is amicable number.

PELL's EQUATION

Pell's equation also called the Pell – Fermat equation is any Diophantine equation of the form $X^2 - nY^2 = 1$, where n is a given positive no square integer and integer solutions are so0iught for X and Y. In cartesian coordinates the equation is represented by a hyperbola; solutions occur wherever the curve passes through a point whose X and Y coordinates are both integers such as the trivial solution with X=1 and Y=0. Pell's equation has infinitely many distinct integer solutions. These solutions may be used to accurately approximate the square root of n by relation numbers of the form X/Y.



Burn's THEOREM

Burn's theorem is relatively famous result in analytic numbers theory that says the sum of reciprocals of the twin primes converges to a finite value . In other words, we have

$$\sum_{p,\, p+2 \text{ prime}} \left[\frac{1}{p} + \frac{1}{(p+2)}\right] = B$$

for some finite constant B

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Gauss once said "Mathematics is the queen of the sciences and number-theory the queen of mathematics." If this be true we may add that the Disquisitiones is the Magna Charta of number-theory.

M. CANTOR

The Fields Medal

Parag Deka

6th Sem (B.Sc. Mathematics)

The Fields Medal is one of the most prestigious awards in the field of mathematics. Often considered the equivalent of a Noble Prize in mathematics, it is awarded every four years to up to four mathematicians under the age of 40, in recognition of outstanding achievements. The medal is named after the Canadian mathematician John Charles Fields, who was instrumental in establishing the prize.

History and Background

The Fields Medal was first awarded in 1936, and after a hiatus during World War II, it became a regular part of the International Congress of Mathematicians (ICM) starting in 1950. Fields envisioned the medal as not only an award for existing accomplishments but also as an encouragement for future work, which is why the age limit of 40 was set, to recognize young mathematicians still in the midst of their research careers.

Criteria and Selection

The Fields Medal is awarded by the International Mathematical Union (IMU), and the selection process is highly rigorous. Candidates are typically nominated based on their contributions to the field, with a focus on profound results that have a significant impact on mathematics. The age limit of 40 was set to ensure that the winners are still active researchers with the potential for further contributions.

Design of the Medal

The design of the Fields Medal is itself symbolic. On one side, it features the head of Archimedes, one of the greatest mathematicians of antiquity, along with a Latin inscription that translates to: "To transcend one's limits and master the universe.'' The reverse side carries the name of the recipient and a depiction of a laurel branch, symbolizing honor and accomplishment.

Notable Recipients

Over the decades, many legendary mathematicians have been awarded the Fields Medal. Some of the most notable include:

I)Jean-Pierre Sarre (1954): Known for his work in algebraic geometry and topology.

II)Grigori Perelman (2006): Famously declined the awarded after solving the Poincare Conjecture, one of the most important problems in mathematics.

III)Maryam Mirzakhani (2014): The first and only women to have received the Fields medal, for her work in dynamics and geometry of Riemann surfaces and their moduli spaces.

iv)Terence Tao (2006): Widely regarded for his deep work in a wide range of mathematical areas, including number theory and harmonic analysis.

Importance in the Mathematical Community

The Fields Medal has become a symbol of excellence in mathematics and is highly coveted by young mathematicians because of its strict age limit and the significant impact recipients have made in their respective fields, the Fields medal often signals the beginning of a celebrated career. It also raises public awareness about mathematics, its beauty and its practical applications, further fostering interest in the field among young scholars.

Conclusion

The Fields medal remains one of the highest honors in mathematics, its role in encouraging young mathematicians to push the boundaries of human knowledge is unparalleled. By recognizing mathematicians early in their careers, the medal not only honors their past achievements but also helps pave the way for future breakthroughs in mathematics.

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> An equation for me has no meaning unless it expresses a thought of God.
>
> S.RAMANUJAN

Vedic Mathematics: The Ancient Wisdom of Rapid Calculations

Dhyanjit Medhi

6th Sem (B.Sc. Mathematics)

Mathematics has always played a central role in human civilization. From building architectural marvels to decoding the complexities of the cosmos, the need for efficient and accurate calculations has been undeniable. One of the most fascinating mathematical systems that emerged thousands of years ago is Vedic Mathematics, which offers a unique and highly effective approach to problem-solving. Based on ancient Indian scriptures known as the Vedas, Vedic Mathematics simplifies complex arithmetic operations, making them faster and more intuitive.

History of Vedic Mathematics

History whispers of an old but extraordinary approach to mathematics, born from the ancient Indian texts known as the Vedas. Rediscovered in the early 20th century by Sri Bharati Krishna Tirthaji, Vedic Math offers a refreshingly different path through the world of numbers. It simplifies the complex, making calculations feel almost like solving a clever puzzle.

Let us step into this system and uncover the secrets within the 16 Sutras, the core principles that form the heart of Vedic Math. Unlike the rigid steps often found in traditional math, Vedic methods encourage flexibility and creative thinking. It's a world where mental calculations flourish, and patterns reveal the hidden beauty behind seemingly complicated equations.

Key Principles of Vedic Mathematics

Vedic Mathematics is built on several key principles, the most important being:

1. Sutras (Aphorisms):

The 16 sutras are concise formulas that help solve various mathematical problems, such as multiplication, division, squaring, cubing, and algebraic equations. These sutras are easy to remember and apply, providing a quick solution to otherwise complicated problems.

2. Mental Arithmetic:

Vedic Mathematics encourages the use of mental calculations, reducing the dependency on calculators or written work. This enhances mental agility and sharpens cognitive skills.

3. Simplification:

Complex problems are simplified through clever tricks and shortcuts. Instead of following lengthy procedures, Vedic methods often provide a direct solution.

4. Flexibility:

Unlike conventional mathematics, which follows a rigid approach, Vedic Mathematics offers multiple methods to solve the same problem. This flexibility allows learners to choose the method that best suits them.

The Best Part?

Vedic Math is for everyone! Imagine a world where anyone, with a little playful exploration, can experience the thrill of mastering complex calculations. Online courses, workshops, and fascinating books unlock its secrets. All it takes is curiosity and a willingness to practice these age-old techniques.

Vedic Math isn't about abandoning traditional methods. Think of it as a vibrant companion to your regular math studies. It's a peek into a system where numbers hold both elegance and simplicity. Vedic Math reignites a fascination with something we often take for granted—the power and the playfulness of mathematics.

Examples of 2-digit, 3-digit and 4-digit Addition, Multiplication, Subtraction, Division:

Addition: Vedic Math uses concepts like "Ekadhikena Purvena" (one more than the previous) for fast calculations. Ex: 45 + 36 = (45 + 5) + 31 = 81

Multiplication: Techniques like "Urdhva Tiryakbhyam" (vertically and crosswise) simplify larger multiplications. Ex: 98 x 97 can be calculated in a few steps.

Subtraction Vedic Math often uses complements to simplify subtractions. Ex: 82 - 37 = (100 - 37) - (100 - 82) = 63 - 18 = 45

Division: Vedic methods break down division into simpler steps. Ex: 1234/11 can be solved easily using specific patterns.

Use of Vedic Math for School Kids

Building a Strong Foundation:

Vedic methods can make learning core math concepts (multiplication, division, fractions, etc.) more engaging and intuitive. The pattern-based approach helps kids grasp the 'why' behind arithmetic operations.

Mental Math Mastery:

Vedic Math emphasizes mental calculations, reducing reliance on calculators. This can boost overall confidence in math.

Fun Factor:

Many Vedic techniques are presented in ways that feel like puzzles or tricks, making math less intimidating and more enjoyable for young learners.

What Indian Schools Can Teach:

Schools could introduce Vedic Math alongside traditional methods, offering students alternative problem-solving tools. This could be incorporated into regular classes or through dedicated Vedic Math modules. How Learning Pedagogy Can Use Vedic Maths Teachers can gamify the learning process, introduce Vedic techniques through storytelling, and incorporate hands-on activities to make these concepts more tangible for students.

Use of Vedic Math for College Students

Speed and Accuracy in Competitive Exams: Vedic Math provides faster ways to tackle complex calculations, which can be a huge advantage in timed, competitive entrance exams.

Tackling Advanced Math: While the most known Vedic techniques focus on arithmetic, its principles can be applied to areas like algebra, trigonometry, and calculus.

Complements Traditional Methods: Vedic Math is best alongside traditional learning, offering alternative and more efficient problem-solving strategies for college-level mathematics.

Students can seek out online resources, Vedic Math workshops, or tutors for further study. Consistent practice is key to mastery of these techniques.

How It Improves Mathematical Ability

Multiple Approaches:

Vedic Math offers different ways to solve the same problem, fostering flexibility and creative thinking.

Number Sense:

Working with Vedic principles helps students develop a strong intuition for numbers, their relationships, and patterns.

Reduces Math Anxiety:

The focus on mental math and faster calculations can make math less intimidating, building confidence and reducing the anxiety often associated with the subject.

Conclusion

Vedic Mathematics offers a beautiful blend of simplicity, speed, and efficiency in mathematical calculations. Whether it's basic arithmetic or more complex operations, the methods derived from ancient Vedic texts continue to amaze mathematicians and learners alike. The application of these sutras empowers individuals to solve problems quickly and accurately, often without the need for pen and paper. As the world becomes increasingly fast-paced, the relevance of Vedic Mathematics is more evident than ever.

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AI and App Development: Math Behind it

Iftikar Hussain

6th Sem (B.Sc. Mathematics)

Mathematics is a fundamental part of both artificial intelligence and app development. AI, with its reliance on complex algorithms, and app development, which needs precision and security, both depend on various mathematical principles. Data structure and algorithm (DSA) for app development to write programs in either Java or Kotlin or in any other programming languages, mathematics is highly used.

Mathematics in Artificial Intelligence

The backbone of AI is built on a foundation of several key mathematical disciplines, including linear algebra, calculus, probability theory and optimization. These mathematical tools enable the AI models to learn, process information and make decisions according to the data they are fed.

Linear algebra is useful when representing data in the form of matrices and vectors. For AI systems to manage the enormous amounts of data they encounter, linear algebra is essential. AI models provide systems with the ability to study and comprehend data through matrix operations. For instance, the reduction of data dimensionality technique known as Principal

Component Analysis (PCA) is based on linear algebra and uses eigenvalues and eigenvectors to simplify complicated data sets.

Calculus is another key player, when training neural networks. Algorithms like gradient descent rely on derivatives to minimize prediction errors and fine-tune the model's parameters. The backpropagation algorithm, which is key to improving the accuracy of neural networks, uses calculus to calculate gradients and adjust weights during the learning process.

Probability theory, which is used to explain uncertainty and make judgments under unknown conditions, is crucial in this context because AI models need to forecast. In AI systems, Bayesian networks, which employ conditional probabilities are often employed to generate predictions from partial data. By simulating systems whose states vary over time, Markov chains also play a significant role in reinforcement learning, helping AI make the best choices possible based on prior knowledge.

Optimization plays a pivotal role in ensuring that AI systems function efficiently. Techniques like Stochastic Gradient Descent (SGD) are widely employed to improve the performance of AI models by finding the best solution with minimal computational resources.

Mathematics in App Development

Math is essential to app development in order to create effective, user-friendly, and safe applications. Several mathematical concepts are used by developers to create visually appealing and functional apps that protect user data. For instance, different mathematical formulas are applied to time and complexity to improve an application's performance.

Geometry is essential in designing user interfaces and creating animations, especially for 3D games or multimedia applications.

Whether it’s a 2D or 3D app, understanding geometry is vital for rendering objects and ensuring smooth movement. Game development, in particular, makes heavy use of vector math and transformations to simulate realistic environments and animations.

In addition, **cryptography** ensures the security of modern apps. Encryption algorithms like RSA and AES are built on advanced algebra and number theory. By encoding information in ways that can only be decoded with a key, cryptography ensures the privacy and safety of data shared within apps, protecting the data from unauthorized access.

Statistics also plays a major role in many data-driven applications, such as social media or e-commerce platforms. By using statistical models, app developers track and analyse user behaviour and improve engagement. For example, recommendation engines rely on statistics to provide personalized content or product suggestions, based on users’ previous interactions and preferences.

Where AI and App Development Intersect

The integration of artificial intelligence (AI) with app development is growing, as apps begin to integrate AI-powered functionalities such as voice assistants, recommendation engines, and augmented reality (AR). At the centre of this confluence is mathematics, which powers app development's technical implementation as well as AI's intelligence.

For instance, machine learning models in AI analyse user behaviour patterns to provide personalized suggestions. These models rely on mathematical models that detect patterns in large data sets. App developers then integrate these AI models into their products, making the user experience more tailored and engaging.

In **augmented reality (AR)** apps, mathematics is crucial for placing virtual objects in the real world. AI enhances AR by recognizing and interpreting physical environments, while mathematical algorithms ensure that virtual objects are positioned and scaled accurately. This blending of AI and geometry creates immersive, interactive experiences for users.

Conclusion

Whether in artificial intelligence or app development, mathematics is a key driver of technological advancements. The ability to solve complex problems, process vast amounts of data, and optimize systems all comes from applying mathematical principles. As AI becomes more integrated into app development, mathematics will continue to be at the core of innovation, enabling new breakthroughs in both fields.

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> I am fairly familier with all forms of secret writings and am myself the author of a trifing manuscript on the subject.
>
> SIR ARTHUR CONAN DOYLE

The Significance of Mathematics in Programming

Rituparna Sarma

6th Sem (B.Sc. Mathematics)

Mathematics is often viewed as an abstract discipline, but its importance in programming cannot be overstated. It serves as the backbone of problem solving and algorithm development, enabling programmers to approach complex challenges with clarity and precision. From analysing and optimizing algorithms for efficiency to understanding data structures that dictate how information is organized, mathematical concepts are deeply woven into the fabric of programming. Moreover, logic and Boolean algebra are fundamental in guiding decision-making processes within code. Therefore, having a strong mathematical foundation not only improves a but also gives them the tools programmer's technical abilities they need to develop creative, dependable, secure software solutions. Mathematical ideas underpin the whole field programming, from geometric computations to algebraic data structures. and Mathematics, role and significance in Programming: Mathematics plays a very crucial role in programming, and its significance can be seen in several areas such as:

DSA (Data Structure and Algorithm): In DSA it plays a vital role as it provides the fundamental techniques necessary for designing and analysing efficient algorithms and data structures with good efficiency. Mathematical concepts such as Algorithm Analysis, Graph Theory, Probability are essential in DSA to solve complex problems. Furthermore, Mathematical modelling and statistical analysis are used in Data Science and Machine learning. Overall, Math is the backbone of Data structure, enabling developers to write efficient and reliable codes.

Why is it Important?

Efficiency: Understanding the math behind algorithms helps us to choose the best method to solve a problem quickly.

Optimization: It allows us to refine processes to use fewer resources (like time and memory). Necessity of Trigonometry in Programming: In programming, especially in domains involving visuals, physics, and data manipulation, trigonometry provides essential tools for calculations and algorithms. It enables developers to create realistic simulations, animations, and more efficient navigation and analysis systems. Here is a simple breakdown: In Graphics and Game designing, it is necessary for Rendering Shapes: Trigonometric functions help calculate angles and distances when drawing shapes, such as circles and polygons. Animations: Sine and cosine functions are used to create smooth animations, like oscillating movements (ex: swinging or bouncing). Also, in Data Visualization it is used in graphing, when plotting data points on a coordinate system, trigonometry helps in understanding and representing relationships between variables.

Also, in Orientation it is necessary for calculating angles and directions is crucial for navigating in 2D or 3D spaces.

Mathematical Techniques for problem-solving:

Calculus in Optimization Problems: Calculus helps in optimization problems by allowing us to find maximum or minimum values of functions. We do this by using derivatives to identify critical points where the function's slope is zero. Linear Algebra in Data Analysis: Linear algebra is crucial in data analysis because it helps us organize and manipulate large sets of data using matrices and vectors. It allows us to perform operations like transformations, solving systems of equations, and understanding relationships between different data points. Conclusion: While not every programmer needs to be an expert in advanced mathematics, a solid understanding of these mathematical concepts can significantly enhance problem-solving skills, contribute to better algorithm design, and improve the overall quality of coding and development.

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> Mighty are numbers, joined with art resistless.
>
> EURIPIDES

THE ABEL PRIZE

Jyotismita Jogabhyasi

6th Sem (B.Sc. Mathematics)

THE ABEL PRIZE: Celebrating Excellence in Mathematics

Established in 2003 by the Norwegian government, the Abel prize is one of the most prestigious awards in the field of mathematics, named after the Norwegian mathematician Niels Henrik Abel. The award was created to honor outstanding Achievements in the field and to enhance the visibility of mathematics in society. With a monetary value of 7.5 million Norwegian Kroner (approximately$750,000), the prize recognizes individuals whose contributions have significantly advanced mathematical knowledge.

Historical Context:

Niels Henrik Abels, born in 1802 made profound contributions to various areas of mathematics, including group theory and elliptic functions. Despite his groundbreaking work, Abel struggled for recognition during his lifetime, often facing financial difficulties. The establishment of the Abel prize aims to rectify this historical oversight by celebrating the achievements of mathematicians who have made substantial contribution to the discipline.

Criteria for selection:

The Abel prize is awarded annually by the Norwegian Academy of Science and Letters. Nomination can be submitted by members of academies of science, mathematics departments, and other recognized scholars, ensuring a broad and rigorous selection process. The criteria for selection focus on the originality, depth, and influence of the nominee's work. Unlike many other prestigious awards, the Abel prize does not have specific categories, it embraces all fields of mathematics, making it inclusive of diverse mathematical pursuits.

Notable Recipients:

Since its inception, the Abel prize has honored a wide range of mathematicians, each recognized for their significant contributions. For instance, in 2003, the first recipient was Jean -Pierre Serre, noted for his work in topology and algebraic geometry. In subsequent years, mathematicians like John G. Thompson Andrew Wiles, and Maryam Mirzakhani

have been celebrated for their groundbreaking achievements. Mirzakhani, awarded in 2017, was the first woman to receive the prize, recognized for her contributions to the fields of geometry and dynamical systems .

Impact on the Mathematical Community:

The Abel prize has not only served to honor individual achievements but has also raised the profile of mathematics on a global scale. It emphasizes the importance of mathematical research and its applications, inspiring both established and emerging mathematicians. The award has fostered a culture of recognition, encouraging collaboration and innovation within the mathematical community.

Additionally, the Abel prize serves as a remainder of the challenges faced by mathematicians throughout history. It highlights the need for ongoing support and visibility for mathematical research, which is often overshadowed by other fields. The prize not only rewards past achievements but also aims to motivate future generations of mathematicians to pursue their passions.

Conclusion:

The Abel prize stands as a testament to the importance of mathematics in understanding and shaping the world. By recognizing the contributions of exceptional mathematics, it fosters appreciation for the discipline and encourages the pursuit of knowledge. As it continues to celebrate the legacies of mathematicians like Niels Henrik Abel, the prize plays a crucial role in promoting excellence and innovation in the field, ensuring that the legacy of mathematics remains vibrant and influential for years to come.

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> ...mathematical proofs, like diamonds, are hard as well as clear, and will be touched with nothing but strict reasoning.
>
> JOHN LOCKE

EVOLUTION OF CALCULAS

Ankush Biswas

6th Sem (B.Sc. Mathematics)

The evolution of calculus can be traced back to ancient times and work of mathematician in many cultures, including Greeks, Chinese, Indian and Islamic mathematicians.

I. Ancient Greeks

The Greeks developed techniques for finding area of a circle by approximating it with a polygon that had more sides they also contributed to the method of exhaustion which was later put on a scientific basis by Eudoxus around 370 BC.

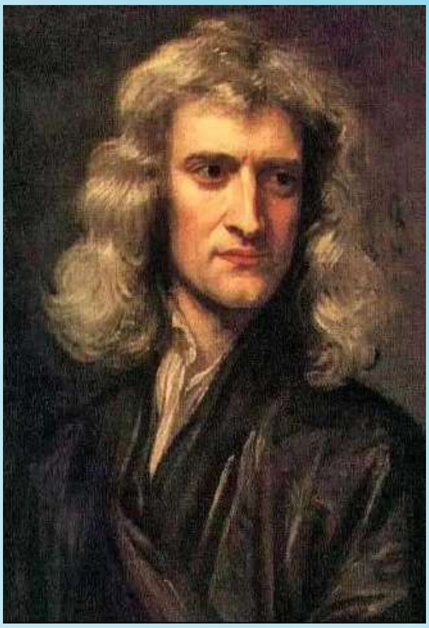
II. Indian Mathematicians

Before 1500, mathematicians in Kerala developed Taylor polynomials for functions like *sin x* and *cos x*.

III. Mathematicians in Middle East and China

During the Middle Ages, Mathematicians in these regions made discoveries that were later built upon by Newton and Leibniz.

MODERN CALCULUS



The discovery of calculus is often attributed to two men Isaac Newton and Gottfried Leibniz, who independently developed its foundations. Although they both were instrumental in its creation, they thought of the fundamental concepts in very different ways. While Newton considered variables changing with time, Leibniz thought of the variable x and y as ranging over sequences of infinitely close values. He introduced *dx* and *dy* as difference between successive values of these sequences. Leibniz knew that dy/dx gives tangent, but he did not use it as a defining property. On the other hand, Newton used quantities x' and y' which were finite velocities, to compute the tangent.

Criticism

In their development of the calculus both Newton and Leibniz used "infinitesimal" quantities that are infinitely small and yet nonzero. Of course, such infinitesimals do not really exist, but Newton Leibniz found it convenient to use these quantities in their computation and their derivation of results. although one could not argue with the success of calculus, this concept of infinitesimals bothered mathematicians Lord Bishop Berkeley made serious criticisms of the calculus referring to infinitesimals as "the ghosts of departed quantities " Bekeley's criticism were well founded and important in that they focused the attention of mathematicians on a logical clarification of the calculus .It was to be over 100 years, however, before calculus was to be made rigorous.

Ultimately, Cauchy, Weierstrass, and Riemann reformulated calculus in terms of limit rather than infinitesimals thus the need for these infinitely small quantities was removed and replace by a notation of quantities being “closed” to other.

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> In most sciences one generation tears down what another has built and what one has established another undoes. In Mathematics alone each geration builds a new story to the old structure.
>
> HERMANN HANKEL

The Riemann Hypothesis: An Overview

Bahar Ali

6th Sem (B.Sc. Mathematics)

The Riemann Hypothesis, proposed by the German mathematician Bernhard Riemann in 1859, is one of the most significant unsolved problems in mathematics. At its core, the hypothesis relates to the distribution of prime numbers, which are the building blocks of arithmetic. The conjecture posits that all non-trivial zeros of the Riemann zeta function, a complex function defined for complex numbers, lie on the critical line in the complex plane, where the real part of the input is ½.

Understanding The Zeta Function

The Riemann zeta function, denoted as ζ(s), is initially defined for complex numbers s with a real part greater than 1 by the series:

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

This function can be analytically continued to other values of s, except for s=1, where it has a simple pole. The non-trivial zeros of the zeta function are those values of s for which ζ(s) = 0 and where s is not a negative even integer.

The Critical Line

The Riemann Hypothesis that all non-trivial zeros lie on the so-called critical line, denoted as $s = 1/2 + it$, where t, is a real number. This assertion implies a deep relationship between the zeros of the zeta function and the distribution of prime numbers, which has profound implications for number theory and cryptography.

Implications Of Prime Numbers

The distribution of primes is irregular and fascinated mathematicians for centuries. The prime number theorem, which describes the asymptotic distribution of primes, shows that the number of primes less than a given number x is approximately X / log x If true, it implies that the primes are distributed in a much more regular manner than currently known, leading to tighter bounds on how far apart primes can be

Current Status of Research

Despite extensive numerical verification, millions of zeros have been computed and found to lie on the critical line – the Riemann Hypothesis remains unproven. Mathematicians have approached the problem through various branches of mathematics, and mathematical physics. Tools such as random matrix theory and quantum mechanics have been employed to provide insights, suggesting connections between the zeros of the zeta function and the eigen values of certain matrices. A complete proof or disproof remains elusive. Mathematicians are cautiously optimistic, as the hypothesis has shown remarkable resilience against attempts to refute it.

Conclusion

The Riemann Hypothesis stands as a monumental challenge in mathematics, linking the realms of analysis and number theory. Its resolution promises to unlock further understanding of prime numbers and their distribution, potentially reshaping the landscape of modern mathematics. As research continues, the quest for proof remains a testament to the enduring mystery and beauty of mathematical inquiry.

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> He who seeks for methods without having a definite problem in mind seeks for the most part in vain.
>
> D. HILBERT

THE BEAUTY OF PI

Lakshyajyoti Baishya

6^{th} Sem (B.Sc. Mathematics)

Pi (π), the mathematical constant representing the ratio of a circle's circumference to its diameter, has fascinated mathematicians and non-mathematicians alike for centuries. Its endless decimal expansion, seemingly random yet somehow harmonious, has inspired countless explorations and celebrations. In this article, we'll delve into the beauty of pi, from its historical significance to its modern-day applications.

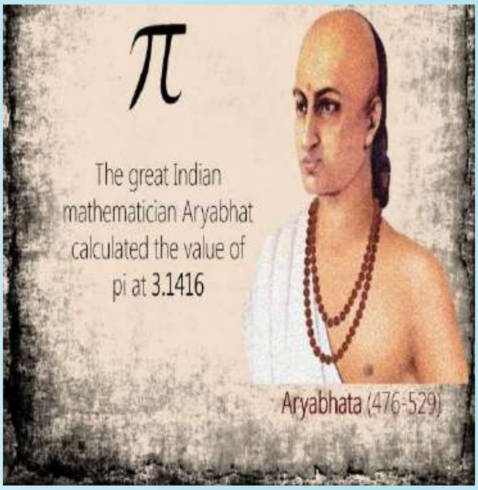
A Brief History of Pi

The concept of pi has been known since ancient civilizations. The Babylonians, Egyptians, and Indians all made approximations of its value. The Greek mathematician Archimedes is credited with calculating pi to a high degree of accuracy using inscribed and circumscribed polygons.

In the 15th century, Persian mathematician Jamshid al-Kāshī calculated pi to 16 decimal places, a record that stood for over a century. The advent of computers in the 20th century allowed for even more precise calculations, with millions of digits of pi now known.

The Endless Decimal Expansion

One of the most captivating aspects of pi is its infinite decimal expansion. Unlike rational numbers, which can be expressed as a fraction, pi is irrational, meaning its decimal representation never ends and never repeats. This endless sequence of digits has led to many fascinating mathematical properties and curiosities.



*** Normal Numbers:**

It is believed that pi is a normal number, meaning that every sequence of digits appears with equal frequency. While this has not been proven, the vast number of digits calculated so far supports this hypothesis.

* Patterns and Curiosities:

Although pi's digits appear random, there have been attempts to find patterns and hidden messages within its sequence. While some intriguing coincidences have been discovered, no significant patterns have been definitively proven.

Applications of Pi

Beyond its mathematical significance, pi has numerous practical applications in various fields:

* **Geometry:** Pi is fundamental to the calculation of the circumference, area, and volume of circles, spheres, and other circular shapes.

* **Physics:** Pi appears in many physical equations, such as those related to gravity, electromagnetism, and quantum mechanics.

* **Engineering:** Pi is essential for designing circular structures, such as bridges, tunnels, and pipelines.

Pi Day Celebrations

March 14th, or 3.14, is celebrated worldwide as Pi Day. This annual event is an opportunity for schools, universities, and math enthusiasts to celebrate the mathematical constant and its significance. Pi Day activities often include pie-eating contests, math puzzles, and educational events.

The Beauty of Pi

The beauty of pi lies not only in its mathematical properties but also in its ability to inspire wonder and curiosity. Its endless decimal expansion, its seemingly random yet harmonious nature, and its countless applications make it a truly remarkable number. Whether you're a mathematician, a scientist, or simply someone who appreciates the beauty of numbers, pi is a constant that will continue to fascinate and inspire for generations to come.

****

> The object of pure physics is the unfolding of the laws of the intelligible world; the object of pure Mathematics that of unfolding the laws of human intelligence.
>
> J.J. Sylvester

Geometry: The Shape and Space of the World

Prastuti Kalita

6th Sem (B.Sc. Mathematics)

Geometry is the branch of mathematics that deals with the properties, measurements, and relationships of shapes and spaces. It is a fundamental subject that has been studied for thousands of years, with applications ranging from architecture and engineering to physics and computer graphics.

Key Concepts in Geometry

* **Points**: The most basic element in geometry, a point has no dimension (length, width, or height).

* **Lines**: A line is a straight, one-dimensional object that extends infinitely in both directions.

* **Planes**: A plane is a flat, two-dimensional surface that extends infinitely in all directions.

* **Angles:** An angle is formed by two rays that share a common endpoint.

* **Shapes:** Shapes are two-dimensional figures with defined boundaries, such as triangles, squares, circles, and polygons.

* **Solids:** Solids are three-dimensional objects with defined boundaries, such as cubes, spheres, pyramids, and prisms.

Types of Geometry

* **Euclidean Geometry:** This is the most common type of geometry, based on Euclid's axioms and postulates. It deals with flat surfaces and straight lines.

* **Non-Euclidean Geometry**: These geometries challenge Euclid's fifth postulate and explore curved spaces, such as spherical geometry and hyperbolic geometry.

* **Analytical Geometry:** This combines algebra and geometry, using coordinates to represent points and lines.

* **Differential Geometry**: This deals with the study of curved surfaces and spaces using calculus.

Applications of Geometry

Geometry has a wide range of applications in various fields, including:

* **Architecture and Engineering**: Geometry is essential for designing buildings, bridges, and other structures.

* **Physics:** Geometry is used to describe the motion of objects, the properties of space-time, and the laws of physics.

* **Computer Graphics:** Geometry is used to create three-dimensional models and animations.

* **Art and Design:** Artists and designers use geometry to create visually appealing and balanced compositions.

* **Cartography:** Geometry is used to create maps and charts.

In conclusion, geometry is a fundamental branch of mathematics that provides the foundation for understanding the shape and space of the world around us. Its applications are vast and diverse, making it an essential subject for anyone interested in mathematics, science, engineering, or the arts.

Brjuno Number

Paranjyoti Saikia

6th Sem (B.Sc. Mathematics)

Interesting fact on Brjuno Number:

Connection to Linearization: If the rotation number λ of a holomorphic map at a fixed point is a Brjuno number, the map is analytically linearizable near the fixed point. This means that Brjuno numbers provide a key criterion in deciding whether a complex dynamical system can be simplified (linearized) through a transformation.

1.Historical Context & Origin:

In the 1960s, Russian Mathematician ***Alexander Dmitrievich Bruno*** published his seminal work focusing on the conditions under which certain holomorphic functions could be linearized. He investigated the behaviour of functions with irrational rotation numbers and introduced the concept of what would later be known as **Brjuno numbers**.

Brjuno's work specifically addressed the **linearizability** of holomorphic maps, exploring how irrational numbers related to their continued fraction expansions affected the ability to simplify these functions.

2.Defining Brjuno Numbers:

Brjuno numbers are a special class of irrational numbers characterized by their relationship to the growth of the denominators in their continued fraction expansion. Here's a precise definition and an explanation of the concept:

Definition;

An irrational number x is called a Brjuno number if the following series converges –

$$\mathbf{B}(x) = \sum_{n=1}^{\infty} \frac{\log q_{n+1}}{q_n} < \infty$$

Where ,

- $[a_0 ; a_1 , a_2 , a_3 , . . .]$ is the continued fraction expansion of x
- q_n are the denominators of the convergent of the continued fraction. Specifically , the convergents are the best rational approximations of x, and q_n is the n^{th} denominator in this sequence.

Connection to Continued Fractions:

Brjuno numbers are a special class of numbers characterized by the growth rate of the coefficients in their continued fraction expansions. Specifically, a number α is a Brjuno number if the series

$$\mathrm{B}(\alpha) = \sum_{n=1}^{\infty} \frac{1}{q_n^2}$$

converges, where q_n are the denominators of the continued fraction representation of α.

Continued Fractions

A continued fraction is an expression of the form:

$$[a_0 ; a_1 , a_2 , a_3 , . . .]= a_0 + \frac{1}{a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \cdots}}}$$

Where a_0 is an integer and a_n (for n ≥ 1) are positive integers.

Connection Between Them

■Convergence Properties: Brjuno numbers have continued fraction expansions that exhibit convergence properties. For example, their coefficients grow in a controlled manner, which affects the rate of convergence of their continued fractions. Diophantine Approximation: The study of Brjuno numbers often involves Diophantine approximation, which deals with how closely real numbers can be approximated by rational numbers. The continued fraction representation plays a crucial role in understanding these approximations.

■Rational Approximations: For Brjuno numbers, one can find rational approximations with good properties due to the convergence of the associated series.

■Applications in Dynamics: Brjuno numbers arise in the context of complex dynamics, particularly in the study of iterations of complex functions. The behavior of these iterations can be analyzed using continued fractions.

3.Relationship Between KAM Theory and Brjuno Numbers

While KAM theory primarily uses Diophantine conditions (which are stricter than the Brjuno condition), the Brjuno condition plays a role in related problems, particularly in holomorphic dynamics and the study of linearization of analytic maps near a fixed point.

In this context, the KAM-type theorem guarantees the persistence of invariant tori under perturbations, while Brjuno numbers emerge in problems of local conjugacy of circle diffeomorphisms and the linearization of holomorphic maps.

Specifically, Brjuno numbers provide conditions under which a dynamical system near a fixed point can be linearized (i.e., conjugated to a simpler form like a rotation).

In summary:

KAM theory deals with the persistence of invariant tori in Hamiltonian systems under perturbation, requiring conditions like Diophantine for stability.

Brjuno numbers are tied to conditions for the convergence of series that control small divisors, often in the context of holomorphic dynamics and local behaviour near fixed points.

4.Distinction Between Diophantine and Brjuno Numbers:

■Diophantine numbers and Brjuno numbers are related to how irrational numbers are approximated by rationals, but they apply to different mathematical contexts.

■Diophantine numbers are about being "badly approximable" by rationals, which means they avoid being too close to any rational number, satisfying a lower bound on how well they can be approximated by rationals. This condition is critical in areas like number theory and the stability of dynamical systems.

■Brjuno numbers, on the other hand, satisfy a more refined condition based on the convergence of the Brjuno series, which comes from the continued fraction expansion of the number. They appear in the context of small divisor problems in dynamical systems, particularly in determining whether a system can be analytically linearized near a fixed point.

■Key Differences:

Diophantine numbers impose a global condition on how well a number can be approximated by rational numbers, ensuring that certain irrational numbers are "not too well approximated."

■Brjuno numbers satisfy a more delicate condition that better approximations by rational, but in a controlled way that still permits linearization in dynamical systems.

■All Diophantine numbers are Brjuno numbers because the Diophantine condition implies that the Brjuno series converges. However, not all Brjuno numbers are Diophantine; some Brjuno numbers are well-approximated by rationals but still satisfy the weaker Brjuno condition.

■In summary:

The distinction from Diophantine numbers when discussing Brjuno numbers lies in the nature of the approximation conditions they satisfy and their relevance to different areas of mathematics, particularly dynamical systems in the case of Brjuno numbers.

5.Examples and notable Brjuno numbers:

I. The Golden Ratio ϕ:

■The golden ratio, defined as

$\Phi=\frac{1+\sqrt{5}}{2}$, is a Diophantine number and hence also a Brjuno number.

■Continued fraction expansion of ϕ is

$$\phi=[1;1,1,1,\ldots]$$

■Since the continued fraction of ϕ has small coefficients, and the partial quotients q_n grow exponentially, the Brjuno sum converges rapidly. Therefore, the golden ratio satisfies the Brjuno condition.

II. Quadratic Irrational Numbers:

■Quadratic irrationals, like $\sqrt{2}$ *and* $\sqrt{3}$, are Diophantine and therefore Brjuno numbers.

■For example, the continued fraction expansion of $\sqrt{2}$ is

$$\sqrt{2} = [1;2,2,2,2,\ldots]$$

■Similarly, √3 has a periodic continued fraction:

$$\sqrt{3} = [1;1,2,1,2,1,2,\ldots]$$

■Since these numbers have periodic continued fractions, they also satisfy the Brjuno condition.

III. Liouville Numbers (Non-Brjuno Numbers):

■Liouville numbers are examples of numbers that are not Brjuno numbers. These numbers are extremely well-approximated by rational numbers and do not satisfy the Brjuno condition.

■A typical Liouville number is:

$$L = \sum_{n=1}^{\infty} \frac{1}{10^{n!}}$$

■Liouville numbers have a divergent Brjuno sum because their continued fraction coefficients grow too quickly. These numbers also fail to be Diophantine since they are very well approximated by rationales.

IV. Brjuno Numbers That Are Not Diophantine:

■There exist Brjuno numbers that are not Diophantine. These numbers are not as well-known by simple closed forms, but they can be constructed using continued fraction expansions with partial quotients that grow in such a way that the Brjuno sum converges, yet the numbers can be approximated "too well" by rationals to satisfy the Diophantine condition.

■An example is a number whose continued fraction expansion has a large, but carefully controlled, growth rate. For instance:

$$\alpha=[0;1,1,2,3,5,8,13,\ldots]$$

where the partial quotients are Fibonacci numbers. This sequence leads to a Brjuno sum that converges, meaning α is a Brjuno number, but the approximation by rationales might be too good to satisfy the Diophantine condition.

V. Roth's Theorem and Brjuno Numbers:

■According to Roth's theorem, almost all real numbers are not well-approximated by rationals, and thus, almost all real are Diophantine. Since all Diophantine numbers are Brjuno, it follows that almost all real numbers are Brjuno numbers.

Summary of Important Properties:

■Golden ratio ϕ, quadratic irrationals like $\sqrt{2}$ and many other well-known irrationals are Brjnu numbers.

■Liouville numbers and numbers with rapidly growing continued fraction coefficients are not **Brjuno numbers.**

■There exist Brjuno numbers that are not Diophantine, although they are harder to describe explicitly and require specific growth conditions in their continued fraction expansions.

The Brjuno condition provides a useful classification of numbers in dynamical systems, allowing mathematicians to understand which irrational numbers permit certain types of linearization and stability in systems with small divisors.

Conclusion: The Legacy of Brjuno Numbers

The chapter concludes by reflecting on the ongoing relevance of Brjuno numbers in contemporary mathematics. As research continues to evolve, the role of Brjuno numbers in understanding complex dynamics and stability remains a vibrant area of exploration. This closing section invites readers to appreciate the beauty and intricacy of these numbers, emphasizing their importance in the broader tapestry of mathematical knowledge.

The Multifaceted Uses of Mathematics in Various Fields

Anupam Nath

6th Sem (B.Sc. Mathematics)

Mathematics is often described as the universal language of science and technology. Its principles are foundational in a myriad of fields, from the natural sciences to social sciences and even the arts. Here, we explore how mathematics plays a critical role in various domains.

1. Engineering

Mathematics is integral to all branches of engineering. It is used for:

Design and Analysis: Engineers utilize calculus and differential equations to model physical systems, such as the behaviour of structures under load.

Control Systems: Linear algebra is essential in designing control systems that maintain desired outputs in various engineering applications, from robotics to aerospace.

2. Physics

In physics, mathematics provides the framework for understanding natural phenomena:

Theoretical Physics: Equations, such as Einstein's ($E=mc^2$), describe relationships between energy, mass, and speed of light, illustrating fundamental concepts of relativity.

Quantum Mechanics: Complex mathematical constructs, including wave functions and probability amplitudes, are essential for predicting particle behaviour at quantum levels.

3. Computer Science

Mathematics underpins computer science, influencing algorithms, data structures, and programming:

Algorithms: Mathematical logic and combinatorics are critical in developing efficient algorithms for sorting, searching, and optimizing processes.

Cryptography: Number theory and abstract algebra are foundational in creating secure communication methods through encryption.

4. Economics

In economics, mathematics is used to model economic phenomena and make predictions:

Statistical Analysis: Econometrics employs statistical methods to analyse economic data and test hypotheses, guiding policy decisions.

Game Theory: This branch of mathematics models strategic interactions among rational decision-makers, helping to understand competitive behaviours in markets.

5. Medicine

Mathematics plays a pivotal role in various aspects of medicine and health:

Biostatistics: Statistical methods are used in clinical trials to evaluate the effectiveness of treatments and drugs.

Medical Imaging: Techniques like MRI and CT scans rely on advanced mathematical algorithms to reconstruct images from raw data.

6. Environmental Science

Mathematics is essential for modelling environmental systems and addressing ecological issues:

Climate Modelling: Mathematical models simulate climate change, helping scientists predict future scenarios and inform policy.

Population Dynamics: Differential equations are used to model species populations, aiding in conservation efforts.

7. Social Sciences

In social sciences, mathematics helps quantify and analyse human behaviour:

Sociology: Statistical methods are employed to analyse survey data and understand social trends and behaviours.

Psychology: Quantitative research methods use statistics to assess psychological experiments and treatments.

8. Finance

Mathematics is fundamental in finance for managing risk and making investment decisions:

Risk Assessment: Probability theory helps in assessing the likelihood of financial events, guiding insurance and investment strategies.

Portfolio Optimization: Linear programming and statistics are used to create investment portfolios that maximize returns minimizing risk.

9. Arts and Music

Even in fields like art and music, mathematics finds its place:

Music Theory: Concepts such as rhythm, harmony, and scales are deeply rooted in mathematical ratios and patterns.

Art: Artists utilize geometric principles and symmetry in their work, as seen in the use of the Golden Ratio for composition and balance.

Conclusion

The applications of mathematics span across disciplines, providing essential tools for analysis, modelling, and problem-solving. As technology and research advance, the importance of mathematics continues to grow, proving that it is not just a subject to be studied, but a powerful instrument for understanding and navigating the complexities of the world. Whether in engineering, economics, medicine, or even the arts, mathematics remains an invaluable asset, shaping our understanding and enhancing our capabilities in diverse fields.

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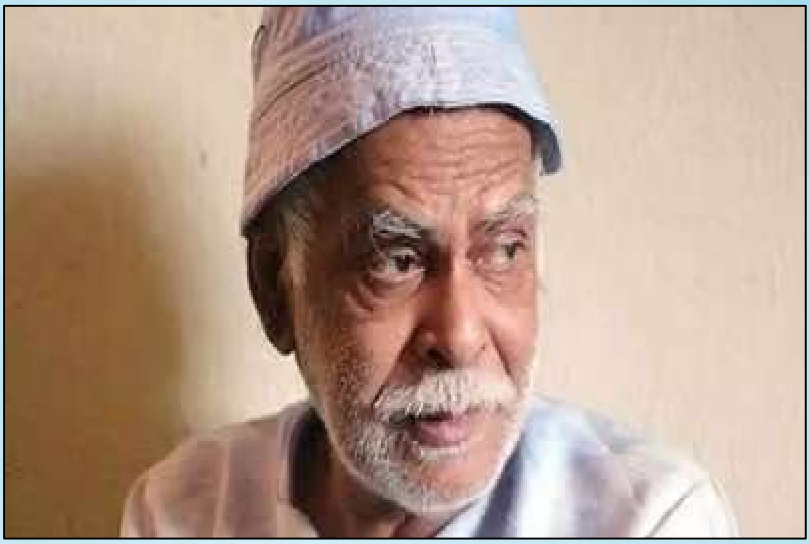
> As with everything else, so with a mathematical theory: beauty can be perceived, but not explained.
>
> ARTHUR CAYLEY

Vashishtha Narayan Singh: The Mathematics Genius Who Challenged Einstein's Theory

Priyaranjan Sarmah

6th Sem (B.Sc. Mathematics)

The story of Vashishtha Narayan Singh is a poignant tale of immense talent and unrealised potential. Born in a village in Bihar, mathematical genius Vashishtha showed his undying talent at an early age, at twenty-one he had already earned the position of a visiting fellow at the prestigious NASA, IIT, and Berkeley. The story of Singh is of a man whose fate hit the heights of human intellect and had drastic impacts of mental health on one's destiny. He belonged to the family of a police constable and completed his school education at Netarhat School, Jharkhand, and later at Patna Science College. Singh was the topper in both his BSc and MSc exams successively before topping UGC's unified JRF in 1964. Despite such a promising career, mental illness cast a dark shadow over his life, preventing him from reaching the summit to which he was destined, and so left him out as a 'could-have-been' in mathematical history. Singh's intellect was recognized internationally. Some even claim that he challenged not only Einstein's theory, $E = mc^2$, but also the Theory of Gauss.



Berkeley University awarded Singh the status of 'Genius of Genius'

One legend about him relates that he was called in by NASA to do some calculations for the space agency when the computers at its headquarters were taken down. Another legend suggests he worked on a project during the Apollo missions as part of the actual effort by NASA to send a man to the moon. Prof. John L. Kelly saw his genius and sent an invitation for him to come to the US at the University of California, Berkeley. Almost 9 years were to pass in the US before Vashishtha Narayan returned to India. He taught at some of the top institutions: IIT, Kanpur, Tata Institute of Fundamental Research, Mumbai, and Indian Statistical Institute, Kolkata. Then he got married, but mental illness struck shortly thereafter. In 1967, he became the director of the Columbia University of Mathematics, and in 1969, he wrote 'The Peace of Space Theory', where he challenged Einstein's 'Theory of Relativity'. He bagged his PhD degree on this theory. Berkeley University awarded him the status of 'Genius of Genius'. Singh returned to India in 1971 and 1972 he joined IIT Kanpur as a mathematics professor. Schizophrenia turned his life very tragic. It got him divorced and further reduced his academic recognition status. Eventually, he was institutionalised to get proper treatment. In these years, Singh somehow disappeared during the train journey and started to reappear later living in misery in his home village. As per reports in one of the train journeys undertaken by him, Singh vanished for a long time, only to come back years later.

Singh was also admitted in Bengaluru at the treatment NIMHANS and later he took care in Delhi at IHBAS with the support of actor Shatrughan Sinha. Despite the serious troubles his disease had thrown in his path, Singh made a remarkable comeback in the world of academics; he became a lecturer at BNMU Madhepura.

He breathed his last at 72 on November 14, 2019. In recognition of his contribution to the field of mathematics, he was conferred with Padma Shri posthumously. The life story of Singh is a melancholic reminder of how thin it is between brilliance and tragedy and the impact mental health can leave on even the brightest minds.

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> Pure Mathematics is, in its way, the poetry of logical ideas.
>
> ALBERT EINSTEIN

Carl Friedrich Gauss

Daithun Baglary

4th Sem (B.Sc. Mathematics)

The prince of Mathematics Carl Friedrich Gauss (1777-1855) was a German mathematician, physicist, and astronomer whose work significantly advanced numerous fields, earning him the title "Prince of Mathematics ". His contributions to both pure and applied mathematics laid the groundwork for much of modern science. Barn in Brunswick, Germany, Gauss demonstrated his extraordinary abilities at an early age. One famous anecdote recalls him as a child solving the problem of summing integers from 1 to 100 by devising a formula that quickly arrived at the correct answer, displaying the prodigious talent that would define his career.

Gauss most celebrated early work is disquisitions arithmetic, published in 1801 when he was only 24 years old. This book became a cornerstone of number theory, introducing concepts such as modular arithmetic, which are still fundamental to the discipline today. Gauss's exploration of quadratic forms and the theory of congruences in this work had far-reaching implications. Among his most important achievements was proving the fundamental theorem of algebra, which established that every non-constant polynomial equation has at least one complex root. This result deepened the understanding of algebraic structures and solidified Gauss's reputation as a mathematical prodigy.

Beyond pure mathematics, Gauss made significant contributions to applied mathematics and various scientific fields. One of these most recognizable contributions is the Gaussian distribution, also known as the normal distribution, a crucial concept in probability and statistics. The bell-shaped curve that describes the distribution of values around a mean is widely used in fields such as economics, biology, psychology, and physics. Gauss's work in this area led to the development of modern statistics methods. His introduction of the method of least squares, used for minimizing errors in data fitting, became foundational in regression analysis and data science.

In addition to mathematics, Gauss had a profound impact on astronomy. In 1801, Italian astronomer Giuseppe Piazzi discovered the asteroid cores but lost sight of it before determining its orbit. Using his own mathematical method astronomers to locate it again. This achievement revolutionized eristical mechanics, and his work in orbital mechanics could influence generation of astronomers.

Gauss's contribution to geophysics and geodesy were equally pioneering. He developed techniques for measuring the earths shape and gravity field, contributing to the accuracy of large-scale surveys. Collaboration with the physicist Wilhelm Weber in the study of electromagnetism resulted in the Gauss-

Weber law, which helped pave the way for advance in telegraphy and electromagnetics. Gauss also contributed to the theory of magnetism, laying down mathematical principles that later became part of Maxwell's equation.

A hallmark of Gauss's career was his selective approach to publishing. His personal motto, pauea sed matwra ("few but ripe"), reflected his desire to only release thoroughly polished, mature work. This, in part, may have limited the dissemination of some of his ideas during his lifetime, but the quality and depth of his published works secured his place in the annals of scientific history.

Gauss's influence continues to be felt across a wide array of disciplines. His contributions to number theory are foundational to modern cryptography, while his work on Gaussian data analysis and statistics. The impact of his work extends into physics, where his discoveries in electromagnetism and mechanics inform modern technologies. Today, Gauss's legacy endures not only through theorems, laws and equations bearing his name, but also in the fundamental ways we understand and interact with the natural world.

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...what is physical is subject to the blaws of mathematics, and what is spritual to the laws of God, and the laws of mathematics are but the expression of the thoughts of God.

THOMAS HILL

কাগজ

জ্যোতিমা ডেকা
ষষ্ঠ ষান্মাসিক

মই বৰষুণত উটি যোৱা নাওঁ হ'লো
বতাহত উৰি যোৱা জাহাজ হ'লো

কেতিয়াবা ৰঙা নীলা চিলা হ'লো

কিন্তু অৱশেষত!
মই মাথোঁ এখন কাগজ হ'লো।

প্ৰেমিকে মোক চুমা খালে
যেতিয়া মই প্ৰেমৰ চিঠি হ'লো

আৰু যেতিয়া প্ৰেমৰ মৃত্যু হ'ল
প্ৰেমিকে দুখেৰে কয়,

'তোমাক মই আজি জ্বলাই দিলোঁ'

অৱশেষত মই এখন কাগজ হ'লো।

যেতিয়া দেশত জুই লাগিল
ময়েই বাতৰি কাকত হ'লো

আৰু যেতিয়া মোক জুইয়ে পুৰে
মই মাথোঁ ধোঁৱা হ'লো!

মই কাৰোবাৰ ভাগ্য পত্ৰিকাও হ'লো
কিন্তু মোৰ ভাগ্য এয়েই আছিল যে-

মই এখন কাগজ হ'লো
এনেকৈয়ে অৱশেষত এখন কিতাপ হ'লো।

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MATHEMATICS

Gayatri Deka
B.Sc. 4th semester

What to say about math now…
Without math there is nothing…
A number can count millions of thoughts
Only 10 digits makes a whole mathematics

What to say about math now…
Without math there is nothing…
Without math we can't measure a distance…
Without math we can't calculate weight…
Without math we can't count for years…

What to say about math now…
Without math there is nothing…
Math is for trigonometry
Math is for differentiation…
Math is for integral…
Math is for everything…

What to say about math now…
Without math there is nothing…
It will never end…
Overall without a digit math is not defined…

****

POEM

Sekhar Jyoti Kalita
B.Sc. 2nd Semester

Let's go ahead and take a look
At my mathematics book
Where I wonder with confusion
How they come up with such solutions

A world of numbers and equations
To prove and solve, verifications
Of algebra and arithmetic
The beauty of mathematic.

Coordinates upon a graph
Add, subtract, divide by half
To find positions on a plane
Are just some things it can explain.

Then come trigonometric angles
That twist my thoughts into a tangle
To study tangents and their course
With theta, sine, secant and cos.

Some numbers are irrational
Infinite after decimal
Behind an under root, they hide
With uncertainty they collide.

But sometimes mathematics can
Really help you to expand
Variables trapped under a square
To make it lengthy, just and fair.

We add, subtract and multiply
With constants like log, A and π
Sometimes raise limits to the sky
And find a way to simplify.

We can enjoy the shapes and size
Only after we realize
Geometry is not as hard
As its other counterparts.

******

স্বীকাৰোক্তি

সাগৰ বৰুৱা

বাৰ্ষিক: ২০২১-২০২৪

মোৰ সন্দিগ্ধ ধূসৰতাত
        সমাধিস্থ হয় সপোনৰ সমীকৰণৰ,
 শূণ্যতাৰ স্পৰ্শত কুকুহা লাগে
        জীৱনৰ নিমিলা অংকবোৰৰ ।।
শয়ন ঘাটি দুচকুত
        অসমাপ্ত বিষাদৰ সাঁতোৰ,
নিৰ্বিষ বাস্তৱত তজবজীয়া হয়
        উতসাৱন্ত ধুমুহাৰ সোঁত ।।
গুপুতে হিয়াত সুলভ বিনিয়োজন হয় ,
        এটি ত্ৰস্ত ৰাতিয়ে।
হেজাৰ নিশাৰ ৰূপ লয় ,
        ক্ষন্তেকতে জ্বলি উঠে অসম্ভৱ ভৱিষ্যতৰ ভয় ।।
 ক্ৰমান্বয়ে বৈ যায়
        স্বপ্নৰ উদ্যান ভাঙি, নিদ্বিগ্ন যাত্ৰা।
 পাহৰণিৰ গৰ্ভত লীন হয়।
        কিম্বদন্তিৰ কৰুণতা ।।

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FACULTY

Debajit Nath

Dimbeswar Kalita

Dr. Jintu Mani Nath

Jupitara Goswami

Under-Graduate 6th Semester

Under-Graduate 4th Semester

Under-Graduate 2nd Semester


SUTRAS


SUTRAS


FAREWELL
PARTY


realme
2023.02.28 11:44


realme Shot by SMD
2023.02.28 11:19


We are MANGALDAI COLLEGIAN.


কাৰ্বি

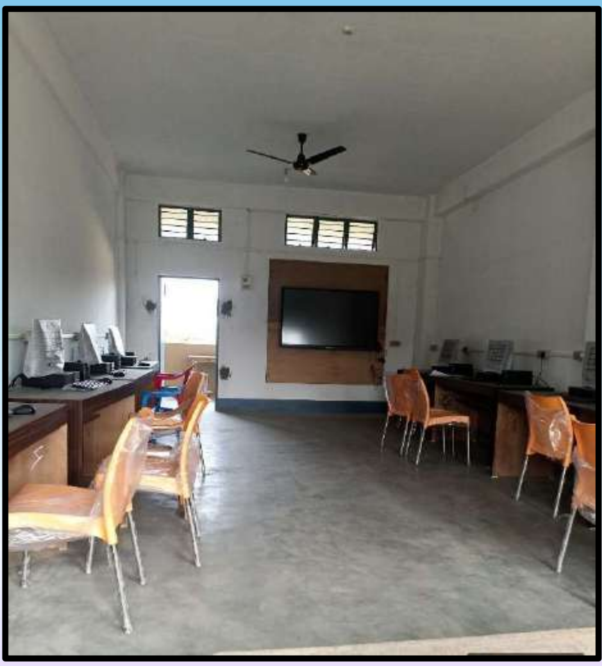

গণিত বিভাগ
DEPARTMENT OF MATHEMATICS


সাংস্কৃতিক শোভাযাত্ৰা
গণিত বিভাগ
হুঁচৰি


সাংস্কৃতিক শোভাযাত্ৰা
গণিত বিভাগ
হুঁচৰি


সাংস্কৃতিক শোভাযাত্ৰা
গণিত বিভাগ
হুঁচৰি
মঙলদৈ মহাবিদ্যালয়
তাৰিখ ০৩/০২/২০২৩


Guidance for various
Entrance Exams




Guidance for various
Entrance Exams
Numerical Analysis
LA, GT, ODE,
Seq & Series
Function of one variable
Function of two variable
Time: 12 pm onwards
Venue: Dept
GPS Map Camera
Mangaldoi, Assam, India
C2H7+8HV, NH 15, College Nagar, Mangaldoi, Pakabangipara, Assam
784125, India
Lat 26.428233°
Long 92.01378°
02/08/23 12:27 PM GMT +05:30
Google


Alumni Meet
MANGALDAI
COLLEGE
Mangaldoi, Assam, India
C2H7+8HV, NH 15, College Nagar, Mangaldoi, Assam 78
Lat 26.428112°
Long 92.013806°
29/04/23 12:08 PM


PAWANPUTRA


CHANDRARUP

MATHOLIC

1st Edition

2024-2025