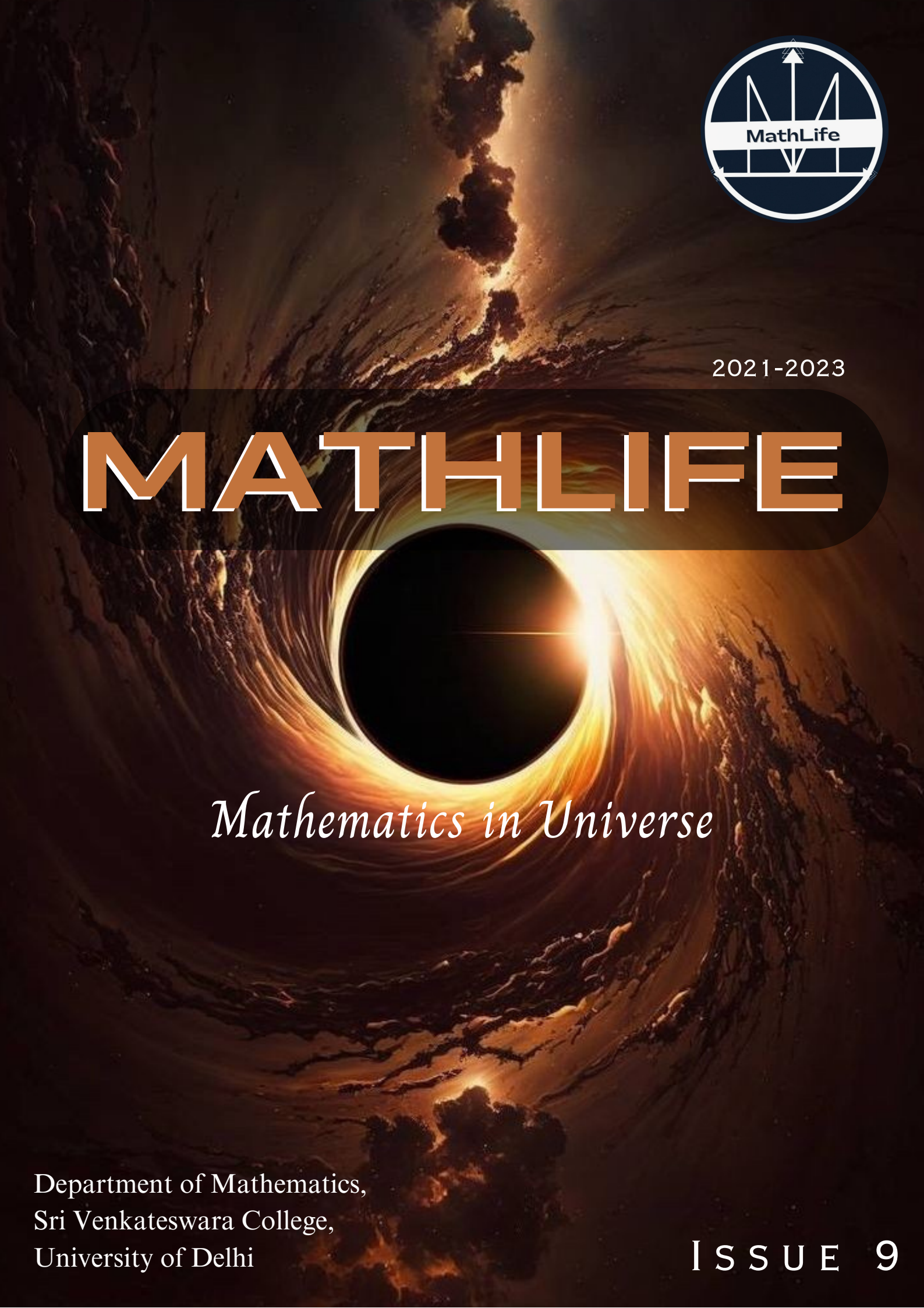


2021-2023

MATHLIFE

Mathematics in Universe

Department of Mathematics,
Sri Venkateswara College,
University of Delhi

ISSUE 9

INTRODUCING OUR NEW LOGO



The logo of the magazine "MathLife" is designed to represent the essence of mathematics and geometry in our lives. The logo incorporates the letters 'M' and 'L' in a creative and geometric manner.

At the heart of the logo lies the letter "M," positioned in such a way that its center coincides with the origin of the Cartesian plane. This placement signifies the importance of mathematics as the foundation and starting point for understanding the world. The 'M' is formed by two straight lines that intersect at the origin, creating two right angles on either side.

The letter 'L' is represented by the upper half of the Cartesian plane. The Cartesian plane is a fundamental tool in mathematics, allowing us to graphically represent mathematical functions and relationships.

The overall shape formed by the 'M' and the upper half of the Cartesian plane resembles a triangle, which is the simplest polygon. This choice reinforces the notion that mathematics builds upon basic principles to create more complex and intricate concepts. It highlights the idea that the understanding of foundational mathematical principles opens doors to exploring and comprehending larger and more sophisticated ideas.

Designed by
Kaarimah | Second Year

TABLE OF CONTENTS

01. Message from Principal's Desk 01

02. Message from Magazine in-Charge's Desk 02

03. Message from Editor-In-Chiefs 03

04. About the College 04

05. Department of Mathematics 06

06. Trisectrix The Mathematics Association 08

07. Magazine Committee 10

08. Reports 13
- 2021-22
- 2022-23

09. Mathematics in Universe 21
- Mathematics in Everyday Life 22
- Mathematics and Physics 24
- Mathematics and Art 26
- Role of Mathematics in Development of New Elements 28
- Mathematics and Technology 30
- The intersection of Mathematics, Biology and Nature 31

10. Achievements 34

11. Career Prospects 37

12. Editorial Section

1. Banach Tarski Paradox 40

2. How to count past Infinity? 43

3. The Raven Paradox 46

4. How Newton Speed Ran Pi 47

5. Devil's Trill 50

6. Aaj ka sachh 52

7. Theory of Life 53

8. The Poor Man's Justice 54

9. The Saga of Epsilon 55

10. Thinking Outside the Box 56

11. Zero to infinity 58

12. tout le temps à venir 60

13. Golden Ratio 61

14. Pi Day 64

15. Convergence 66

67 Vincent 13.

71 Still Memories 14.

75 About Sri Vipra 15.

80 Riddles 16.

84 Maths in the Movies 17.

86 Batch of 18.
- 2022
- 2023

87 Alumni Speak 19.



From the Principal's Desk

It gives me immense pleasure to welcome the 9th edition of '*MathLife*', the Annual Magazine of the Department of Mathematics. The grit and dedication displayed by the students and the faculty members in bringing out this magazine is commendable.

This edition showcases the best of the students' talents and manifests their creativity in a variety of ways. Besides, this magazine stands as a testament to the inquisitive spirit of young minds in exploring the concepts of mathematics and their application in day-to-day life.

I am glad that the Department continues to uphold the high standards of quality and excellence that have been set in previous editions. The innovative approach of the magazine engages the readers, providing theoretical and practical insights.

I compliment the efforts of all the contributors, editors, and designers who have worked tirelessly to make this magazine possible, which is novel and aesthetic in design. My best wishes to all!

C. Sheela Reddy

PRINCIPAL
Prof. C. Sheela Reddy

Message

From Magazine In-charge's Desk

Dear Esteemed Readers,

Welcome to The Mathlife, Issue 9, the annual magazine of the Department of Mathematics. It brings me great joy to present to you the culmination of creativity and hard work that embodies the essence of our esteemed departmental community.

We take immense pride in introducing this unique magazine, which serves as a platform for our students to showcase their exceptional talents through innovative writing, art, and photography. Additionally, the magazine showcases the various activities and achievements of the Department held throughout the year, both academic and extra-curricular.

Throughout the past year, we have been dedicated to capturing the kaleidoscope of talents, ideas, and accomplishments within our department at Sri Venkateswara College, University of Delhi. As the convenor of the Departmental Magazine Committee, I am honored to present our students' remarkable talents, our faculty's unwavering dedication, and the groundbreaking research and exciting events that have shaped our academic journey.

Within the pages of this magazine, you will find a harmonious blend of art and knowledge, captivating stories, insightful articles, and thought-provoking essays that beautifully highlight the diversity of perspectives and expertise within our department. From groundbreaking research achievements to breathtaking artistic expressions, each contribution in this magazine is a testament to the passion and brilliance that define our academic community.

I extend my heartfelt gratitude to the talented writers, artists, and contributors whose dedication has made this magazine possible. I would also like to express my sincere appreciation to the editorial team for their meticulous efforts in bringing these pages to life.

As you immerse yourself in The Mathlife, it may serve as a source of inspiration and a celebration of the incredible talents surrounding us. Let it ignite your curiosity, stimulate your imagination, and instill a profound sense of pride in being part of this dynamic academic community.

I extend my sincere gratitude to the Principal, and I would also like to express my thanks to all the readers. I sincerely hope that each of you thoroughly enjoys the enriching journey through our world of knowledge, expression, and creativity!



With warm regards
Ms. Monika Meena
Magazine-in-Charge

Message

From Editor In-chiefs Desk

Dear reader,

We feel extremely delighted to present to you the 9th edition of the annual department magazine 'MathLife'. This edition of MathLife explores the universality of Mathematics and delves deeper into the realm of mathematics intersecting with the vital component of the Universe where it creates the magical alchemy that we call life.

This issue portrays a plethora of talents of the students of the Department of Mathematics ranging from photography, art, poetry, etc. We thank the incredible artists, authors, writers and photographers for their valuable contributions.

We would like to express our deepest gratitude to the Magazine-in-Charge, Ms. Monika Meena who guided us throughout the making of this magazine. We also congratulate the entire Magazine Committee who have worked together towards curating this issue. The team has worked extremely hard arranging word, art and emotions into each page and weaving them together into a magnolious magazine. We hope you enjoy reading it as much as we enjoyed curating it.

We welcome you, the reader, on this journey.

Kind regards
Prerna Dumka & Uditi Bajaj
Editor-in-Chief



Tirumala Tirupati Devasthanams

శ్రీ వేంకటేశ్వర కళాశాల

Sri Venkateswara College

(University of Delhi)

NAAC Grade A+



“सत्यान्न प्रमदितव्यम्”

DO NOT DEVIATE FROM THE TRUTH.

The power of truth reigns supreme, and Sri Venkateswara College (SVC) is dedicated to upholding this value. Our institution's vision is centred around "Self-realisation through knowledge", emphasizing a holistic, inclusive, and futuristic approach to education that aligns with our college motto. As we celebrate our 62nd year since inception in 2023, we are proud to continue the legacy laid by the eminent Indian philosopher and statesman, Dr. Sarvepalli Radhakrishnan.

Since our inception in 1961, SVC has earned a venerable reputation for its commitment to the highest academic standards, diverse educational programmes, distinguished faculty, illustrious alumni, varied co-curricular activities, and highly acclaimed sports facilities. Our institution has remained steadfast in its mission to grow and improve in all aspects, staying true to our guiding principle of "Truth through self-education."

Sri Venkateswara College has earned well-deserved recognition, having been ranked amongst India Today's top 10 colleges for science. The lush green 15-acre campus is located beside the South Campus of DU. SVC is accredited by NAAC with an “A+” grade and a CGPA of 3.44. Sri Venkateswara College's ranking by the NIRF is 14 along with a score of 67.38. Our college offers over 20 undergraduate degrees in Humanities, Commerce, and Science, along with nine post-graduate courses, ensuring that every student can find a program that aligns with their interests and career aspirations.

Our college community comprises over 4600 students and 211 dedicated teaching staff, attracting students from all corners of the country. This diversity enriches the learning environment, offering opportunities for social contact and interaction that enhance overall development. At SVC, we strive to provide an inclusive and supportive environment that fosters intellectual curiosity, critical thinking, and personal growth.

SVC stands as a shining beacon of academic excellence, innovation, and commitment to truth. As we continue to grow and evolve, we remain dedicated to providing a transformative educational experience that empowers our students to realize their full potential and make a positive impact on the world.



DEPARTMENT OF MATHEMATICS

Sri VenkateswaraCollege

"Math is the only place where Truth and Beauty are equivalent."

The Department of Mathematics, Sri Venkateswara College, believes that mathematics holds an important place in the history of humanity and will always be valuable to the future of all human beings. It was initially set up by Dr Rao in 1961 with a belief to inspire and nurture the students that numbers can be fun.

Mathematics was then offered as a subject in B.A. Program. The baton was passed by Dr Nageshwar Rao in the hands of Mr L.R. Gaur and Dr Purnima Gupta in 1972. With their meticulous work and efforts, the department introduced B.S/B.Sc. (Hons.) Course in the year 1977. The department has always believed in the mission to prepare, inspire and empower the students to accomplish and succeed in the ever-changing world. Each member of the faculty believes towards the holistic growth of the students whether in academic or co-curricular activities.

This amazing foundation along with the tremendous and successful efforts of the faculty members over the years has propelled the Department of Mathematics to lay a strong foundation for the students and to achieve greater heights ever since.






Smt. DURGABAI DESHMUKH BLOCK

THE MATHEMATICS ASSOCIATION
SRI VENKATESWARA COLLEGE
UNIVERSITY OF DELHI

Every sail needs a skillful Captain, however, an astute and happy sail requires more than that. It needs a crew, a crew that understands the captain to the core, accurately assesses the situation and turns it into the ultimate advantage of its passengers. In the voyage across the vast mathematical ocean. Trisectrix is the crew of our ship. The Mathematics Association- Trisectrix works to bridge the gap between mathematics and fun making the journey lively for all of us.

In geometry, a trisectrix is a curve which can be used to trisect an arbitrary angle with a ruler and compass and this curve is an additional tool. The logo is inspired by The trisectrix of Maclaurin' which is a cubic plane curve notable for its trisectrix property. It can be defined as the locus of the point of intersection of two lines, each rotating at a uniform rate about separate points so that the ratio of the rates of rotation is 1:3 and the lines initially coincide with the line between the two points. Impacting students' lives in a threefold way- Academics, extracurricular and sociability, Trisectrix stands true to its name!

Education is so much more than just academics and hence the association, guided by dedicated professors, wants the students to head out of college equipped with academic, social and emotional learning. To achieve this the association organizes various events throughout the academic year, like the kite flying festival, teacher's day, fresher's party, etc., so that by participating in such activities students can develop their talents.

The most anticipated event of the department is its annual department fest- Exponent which epitomizes the creativity and inquisitiveness of the students. An amalgamation of fun and learning is required in life and through healthy interactions in such group-oriented activities, Trisectrix strives to enhance the students' interpersonal, communication and management skills and be the best version of themselves.



The Mathematics Association

bisectrix

THE MATHEMATICS ASSOCIATION
SRI VENKATESWARA COLLEGE
UNIVERSITY OF DELHI





Magazine Committee

"Teamwork is the fuel that allows common people to attain uncommon results."

A team is not just a group of individuals, but a collective force that brings diverse perspectives, skills, and experiences to the table. It is through collaboration, communication, and mutual support that teams can overcome challenges, generate innovative ideas, and achieve remarkable results.

Teamwork is the fuel that ignites the engine of success. It fosters a sense of unity, trust, and shared responsibility, allowing each member to contribute their unique talents while working towards a common goal. It encourages open dialogue, encourages constructive feedback, and promotes a culture of continuous learning.

In an era where complexity and interconnectedness define our professional landscape, no individual can excel alone. It is by harnessing collective intelligence, leveraging the strengths of each team member, and embracing diversity that teams can thrive and accomplish feats that would be impossible otherwise.

So, let us celebrate the power of teamwork and recognize its transformative impact. Together, we can accomplish extraordinary things, break barriers, and shape a better future.

Editor in-Chief



PRERNA DUMKA



UDITI BAJAJ

Editor



KAARIMAH

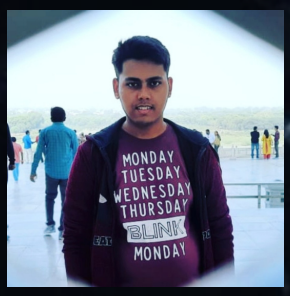


RAHUL DAS

Content Head



MAYANK BHARTI



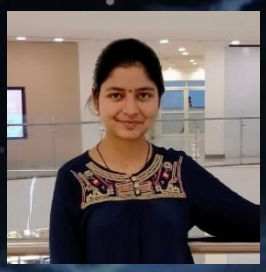
MOHAMMAD NUMAIR

Design Head



AKANKSHA SINGH

Magazine Team



POONAM SHARMA



MALVIKA GOSWAMI



MEDHA PANDEY



PRADYUMNA BORPHOKON



SHREYASI JHAMB



ISHMEET SINGH

MathLife

ANNUAL REPORT

2021-23



SRI VENKATESWARA COLLEGE

MATHLIFE

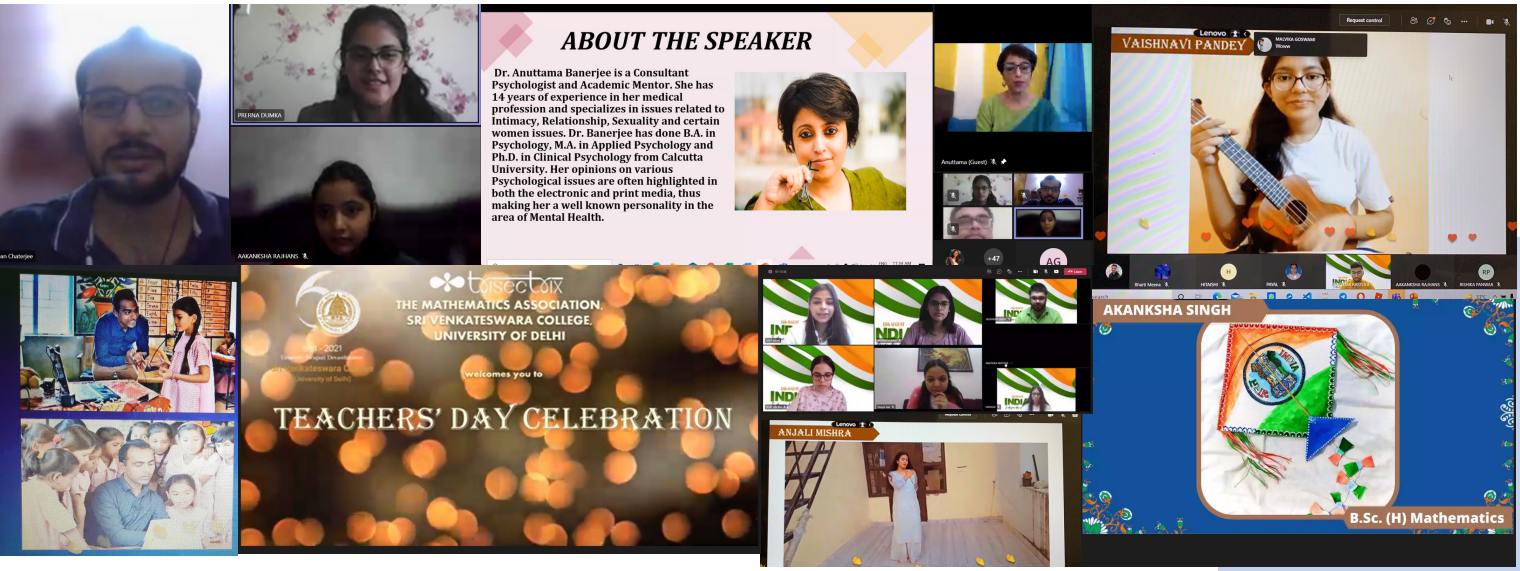












ANNUAL REPORT 2021-22

Independence Day

On India's 75th Independence Day, Trisectrix organized a virtual celebration, uniting attendees in patriotic fervor. A kite-making competition showcased participants' creativity, painting the skies with vibrant colors. A poetry-writing contest allowed heartfelt expressions of love for the country. Speeches and performances marked the event's pinnacle, highlighting India's progress and cultural richness. Trisectrix's celebration affirmed unity and the significance of honoring our shared heritage. Regardless of origin, we stand united in love for our country and pride in its accomplishments. This resounding success demonstrated the power of unity and celebration.

Teacher's Day Celebration

It is never enough to appreciate our teachers for all that they do! As a token of gratitude, on the digital platform, Teacher's Day was celebrated on September 3, 2021. Various titles were given to the teachers, and quizzes and fun games took place. Two students even conducted a lecture on mathematical topics to reverse the roles of teachers and students. The feeling of joy was what our dear teachers felt, making the student-teacher bond even stronger.

Webinar ~ Coping with Anxiety

Amid the pandemic, online platforms became the norm, presenting challenges for students' mental health. To tackle this, a webinar was organized on November 10, 2021. Led by Dr. Banerjee, an expert in mental health, the session aimed to provide strategies and support. Dr. Banerjee emphasized the importance of mental well-being and offered practical tips. After the seminar, a Q&A session was held which allowed students to express concerns, and Dr. Banerjee addressed them with empathy and actionable advice. The session left attendees hopeful and empowered, showcasing the webinar's success in addressing mental health challenges.

Orientation Program

On November 23, 2021, the department of mathematics welcomed the batch 2020-2023. They were briefed about the online mode of conduct along with the other extra-curricular opportunities available to them within the department as well as outside. The students felt motivated to embark on this new journey and by the end of the session, they felt fully informed, and their doubts were clarified as well.

Fresher's Party

Fresher's party was organized to interact with the batch of students who took admission in session 2021-2022. The main aim was to make this meeting an ice-breaking session between the juniors and their seniors and teachers. The freshers managed to gain a good understanding of what Trisectrix's interactive events are like, which was further reflected by their interest in the session's recruitment for the Association.

Mathematical Symposium

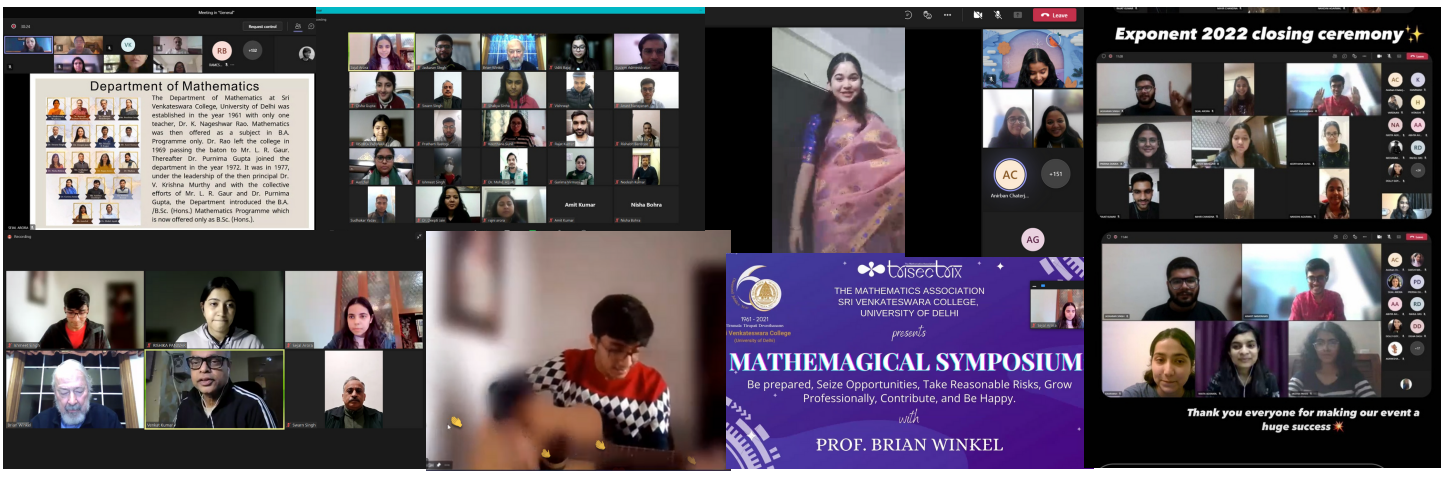
On January 11, 2022, Trisectrix orchestrated a mesmerizing event, The Mathematical Symposium, headlined by the esteemed Professor Brian Winkel. The virtual seminar captivated attendees, who hung on his every word as he shared the captivating tale of his life's journey, emphasizing perseverance and determination. The ensuing Q&A session proved equally enchanting, as participants sought wisdom and guidance from Professor Winkel. Trisectrix's masterpiece of knowledge left a lasting impression, exemplifying the transformative power of knowledge and the indomitable human spirit.

DS Course Workshop

On February 28, 2022, the Department of Mathematics organized a groundbreaking workshop on AI and Machine Learning. The workshop was graced by Prof. N. V. Ramana Rao (Director, NIT Warangal), Mr. B Prasad (Industrialist at Infotech), Dr. Damodar Reddy (NIT Goa), Mr. Santosh Amilpur, Dr. Sathya (IIIT Kurnool), and Dr. Sai Kumar Dandla (DRDO). Attendees were captivated as they explored cutting-edge tools and techniques. The objective was clear: equip participants with practical problem-solving skills using advanced technologies like Deep Learning. Through interactive sessions and hands-on experience, participants learned about TensorFlow, Keras and PyTorch, and their application in solving complex problems. Real-world case studies, including fraud detection and image recognition, vividly demonstrated the potential of AI and Machine Learning. The workshop's success exemplified the Department's commitment to empowering students in this rapidly evolving field.

Exponent'22

The air buzzed with excitement as students gathered for Exponent'22, the annual fest that brought mathematics to life. It aimed to change perceptions and showcase math's practicality. Immersive experiences engaged attendees who celebrated its relevance. Participants, including those from non-mathematics backgrounds, excelled and embraced math's presence in our lives. Nature's patterns and technological algorithms exemplified its importance. Exponent'22 celebrated math's beauty and practicality, reminding us it's more than a textbook subject. It successfully shifted perceptions, inspiring exploration of its relevance and leaving attendees with a renewed appreciation for this captivating discipline.





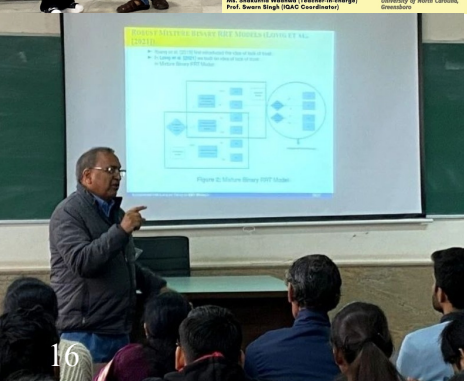












ANNUAL REPORT 2022-23

Kite flying

The Mathematics department of our college organized a kite-flying event that saw enthusiastic participation from students and faculty members. The event was a fun-filled affair, with colorful kites dotting the sky and participants vying for the highest-flying kite and the most creatively designed kite. The atmosphere was lively, with students cheering each other on and enjoying the festive ambiance. Students particularly enjoyed and participated in the competition titled "Kite-making competition". After careful evaluation of the decorated kites, winners were also declared for the same and acknowledged with prizes. The event was a great success, promoting a sense of community and bonding among the students and faculty members of the Mathematics department.

Teacher's day

The Department of Mathematics celebrated Teacher's Day with great enthusiasm and warmth. The event was organized by the students, who paid tribute to their teachers with speeches, poems, songs and provided tokens of appreciation to the beloved mentors. The teachers were overwhelmed by the heartfelt messages and expressions of gratitude from the students. The event was a wonderful way to acknowledge the hard work and dedication of the teachers, who have been instrumental in shaping the lives and careers of countless students. It was a joyous occasion that brought together the students and faculty members of the Maths department to celebrate the invaluable contributions of the teachers.

Seminar on research by undergraduate students in the US

To help students with their research and to set them on the right path to pursue their academic interests, a seminar to promote Undergraduate Research under NEP 2020 on the topic “Research by Undergraduate Students in the US” was held for their benefit. Highly esteemed Prof. Sat Gupta, the Head of department of Mathematics and Statistics at the University of North Carolina, Greensboro, enlightened the participants as he talked about his

projects, research methods, colleagues, and students. It was a great learning experience for the audience and motivated the students to pursue research, be analytical thinkers and grow professionally. Students greatly enjoyed the concept of the event and took away key points to be used on their research journey. The seminar was very well received and proved to be a great learning opportunity for all students and piqued their interest in research.

Donation drive

A donation drive is a great and noble way to support the community, help the needy and extend a helping hand to a cause that we believe in. On the 25th and the 27th, The Department of Mathematics held its own donation drive, as our way of giving back to the community.
The word was spread with the help of posters, social media platforms and circulated messages on class groups and the support of professors and association members. A donation desk was set up in the foyer and other areas of the college, and students both within and outside the department could donate their stationery items there. Faculty members also donated packed food items for the children.
After having collected a generous amount, a group of trusted students delivered everything to the awaiting children at the NGO. The students interacted with the children and learned the importance of volunteering, doing charity work and giving back to the community. The donation drive was deemed a success.at Trisectrix's interactive events are like, which further was reflected by their interest in the session's recruitment in the Association.

Freshers' party

Freshers' party is a fun-filled event that is meant to entertain the new students. It is a way to make them feel comfortable in the new environment. The event was designed to officially welcome the freshers of the mathematics department in the college. The event started out with hosts welcoming the students and teachers, followed by some special performances by the seniors. Interested students from the first year were called upon the stage to showcase their talents as a part of Mr. and Miss Freshers Competition. The event also included a narration of an original poem dedicated to juniors, a song performance, and finally, results of the competition were announced followed by a cake-cutting ceremony. The new students got to know their seniors and teachers. They also gained a good experience of what Trisectrix's interactive events are like and got a chance to showcase their talents in front of the whole mathematics department.

















Exponent'23

Unleashing the Beauty of Mathematics Beyond Textbooks

The department of mathematics at SVC recently hosted an annual departmental fest, Exponent 2023, with a noble objective of unleashing the beauty of mathematics beyond textbooks and encouraging students to explore its practical applications in their day-to-day lives. The fest was a true testament to the power of mathematics and its profound impact on our lives.

The fest's purpose was eloquently elucidated in a webinar following the inauguration ceremony, where participants were treated to a range of exciting events. The fest's events included seminars, question & answer sessions, and interactive mathematical and non-mathematical games that engaged participants from various backgrounds.

SEMINAR

The department organized a seminar on the topic of Operational Research, inviting Dr. C.K. Jaggi from DU North Campus, Operational Research Department, as the speaker. As a Fellow Member of the prestigious Operational Research Society of India and the International Science Community Association, he has published over 151 papers in International and National Journals. Dr. Jaggi has numerous accolades to his name, including the Distinguished Service Award by the Society for Applications of Mathematics, the Distinguished Professor by the International Council of Social Reforms & Research, and the Amity Academic Excellence Award, amongst others. Dr. Jaggi's remarkable contributions to the field of mathematics and operational research are a source of inspiration for researchers worldwide.
The informative session was followed by a fruitful question-answer session, where participants gained valuable insights into the practical applications of mathematics.

PAPER PRESENTATION

The mathematical association proudly presented 'Paper Presentation' at its annual fest, EXPONENT'23!, where students from all colleges showcased their research skills and mathematical expertise. The competition was a true celebration of the diverse talent and skills of the participants.

MATH E CHARADES

In addition, the association organized an exciting event, 'Math-E-Charades,' where participants used gestures and clues to solve the math mystery, adding an element of fun and excitement to the fest. The participants not only learned new skills like coordination and sportsmanship, but also appreciated the pervasive existence of mathematics in our surroundings.

2022-2023

NUMBER MELA

The Number Mela, an extravaganza of numerical prowess, was a sight to behold for all those who love to play with numbers. The event, held on April 5, 2023, presented a range of thrilling activities including Chess, Lemon-Spoon Race, Trapedalism, Brick Lifting, and Paper Fold Dance. Each competition was designed to test the limits of the participants' numerical skills and strategic thinking. From the cerebral game of Chess to the physical prowess required for Brick Lifting, the Number Mela had something for everyone.

"Crack the Code, Unleash the Genius Within: **THE CODED-DECODED EVENT**"

The Coded-Decoded event was an extravaganza of numerical brilliance, designed to challenge the participants' ability to crack mathematical codes and patterns. From deciphering complex algorithms to connecting intricate patterns, the Coded-Decoded event was a true test of numerical prowess. With every code cracked, the participants discovered a new level of confidence and unleashed their inner mathematical genius.

MATHEMATICAL TAMBOLA

On April 6, 2023, the association presented a unique and engaging event - the Mathematical Tambola. The game was played with a ticket designed with 25 numbers, each waiting to be struck with a mathematical sign or symbol. The objective was to connect the numbers in a way that would allow the player to claim their dividends or prizes. It was a BINGO-style game that required participants to flex their mathematical muscles and exhibit their creative problem-solving skills.

ANALYTICS ARCADE

On April 6, 2023, the association organized two exhilarating events that left the participants on the edge of their seats. The Analytics Arcade is a competition that tested the knowledge of Mathematics, Statistics, and Python skills, was open to all college students. The competition was designed to challenge and push the limits of the participants' analytical abilities and problem-solving skills. The event was a grand success, with participants showcasing their proficiency in analytics and programming.

TREASURE HUNT

In the Audy Lobby, the association organized a thrilling Treasure Hunt event. The game was designed to test the participants' observation skills and attention to detail. The organizers prepared a list defining specific items that the participants had to gather or complete. The hunt was full of twists and turns, and the participants had to put on their thinking caps to decipher the clues and discover the hidden gems.

Amidst cheers and applause, our department fest concluded with immense success. Students actively participated in a range of events, including treasure hunt, paper presentation, tambola etc.The energy was contagious, and the enthusiasm of the participants and the audience was palpable. The organizing committee worked tirelessly to ensure the smooth execution of the fest, and their hard work paid off. We look forward to next year's fest with great anticipation.

















Football Match

The football match between the Maths and Stats departments of our college was a thrilling affair, with both teams displaying great skill and sportsmanship. In a closely contested match between the departments, the maths department emerged victorious with a scoreline of 4-2. The match got off to an even start, with both teams creating several chances. However, it was the players of our own department who broke the deadlock with a well-placed shot from their star striker. The stats department fought back and managed to equalize, but the latter regained the lead with a thunderous strike from outside the box that left the goalkeeper with no chance. The maths department held on to their lead until the final whistle, securing a hard-fought victory over their rivals.

Farewell

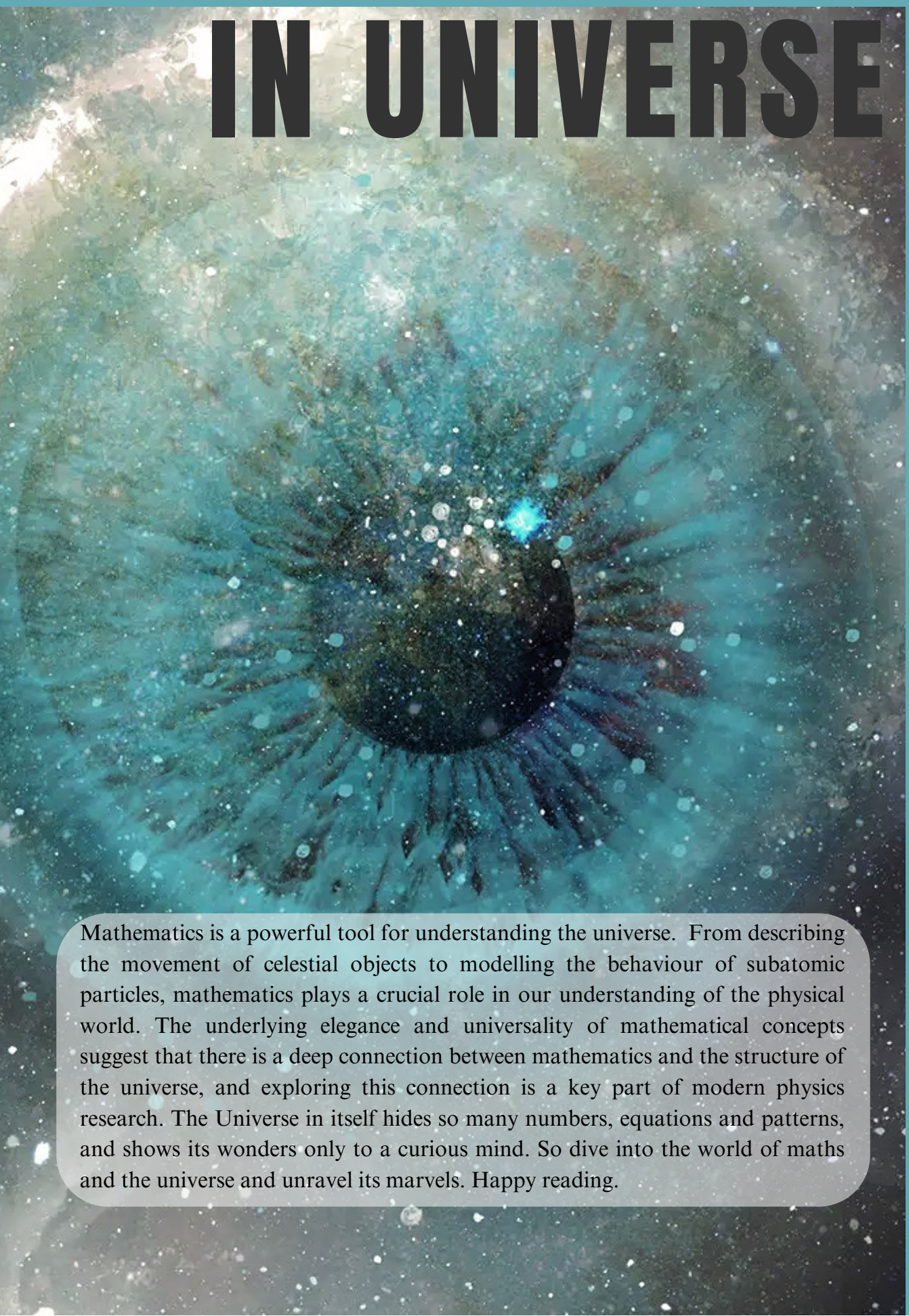
Finally, on Friday, June 16th, 2023, seniors were made to feel at the top with a farewell they shall never forget.

They were presented with a series of awards, recognizing their talents and contributions to the department. This, coupled with dance and other performances made the event successful and memorable.

The event concluded with the convocation ceremony, where the seniors tossed their caps in the air and cheered. The teachers then bid farewell to the seniors with a heartfelt message, wishing them all the best for their future endeavors.

The farewell event was a grand success and a fitting tribute to the seniors, who left with fond memories and warm wishes from their juniors and teachers.

MATHEMATICS IN UNIVERSE



Mathematics is a powerful tool for understanding the universe. From describing the movement of celestial objects to modelling the behaviour of subatomic particles, mathematics plays a crucial role in our understanding of the physical world. The underlying elegance and universality of mathematical concepts suggest that there is a deep connection between mathematics and the structure of the universe, and exploring this connection is a key part of modern physics research. The Universe in itself hides so many numbers, equations and patterns, and shows its wonders only to a curious mind. So dive into the world of maths and the universe and unravel its marvels. Happy reading.

MATHEMATICS IN everyday LIFE

Mayank Bharti & Poonam Sharma
Second Year

As we go about our daily lives, we use mathematics at every moment, from the time we wake up in the morning until we go to bed at night. Whether you're a cook, farmer, carpenter, mechanic, shopkeeper, doctor, engineer, scientist, musician, magician, artist, or tailor, everyone relies on mathematics in their daily life.

Even simple tasks like waking up, walking, brushing our teeth, washing ourselves, eating, traveling by vehicle, writing, learning, and sleeping involve mathematics. Mathematics plays a crucial role in our daily routines.

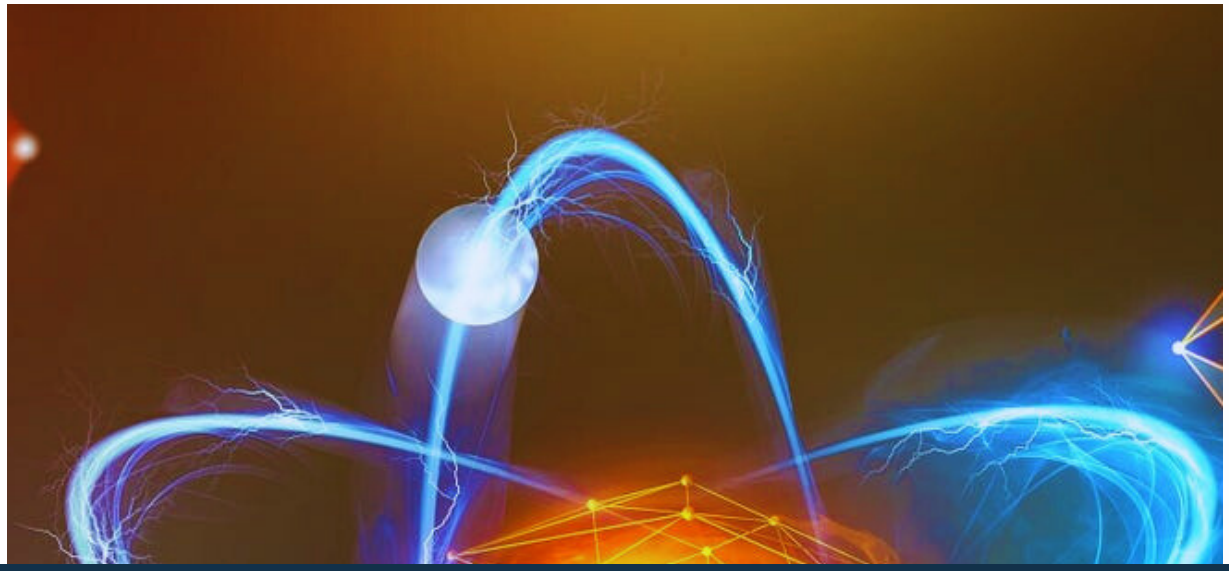
Mathematics serves as a valuable tool in everyday life. We apply mathematical concepts and the problem-solving skills we acquire through daily practice. Mathematics allows us to comprehend patterns, establish relationships, and make predictions, facilitating many essential aspects of our daily existence.

Mathematics brings order to our lives and prevents chaos. It nurtures qualities such as reasoning, creativity, abstract and spatial thinking, critical thinking, problem-solving abilities, and effective communication skills.

Even birds and insects utilize mathematics when constructing their shelters. While some may perceive mathematics as a challenging subject, with proper guidance, anyone can excel in it. Teaching through quizzes and games can enhance understanding, as it encourages learners to maximize their mental abilities.

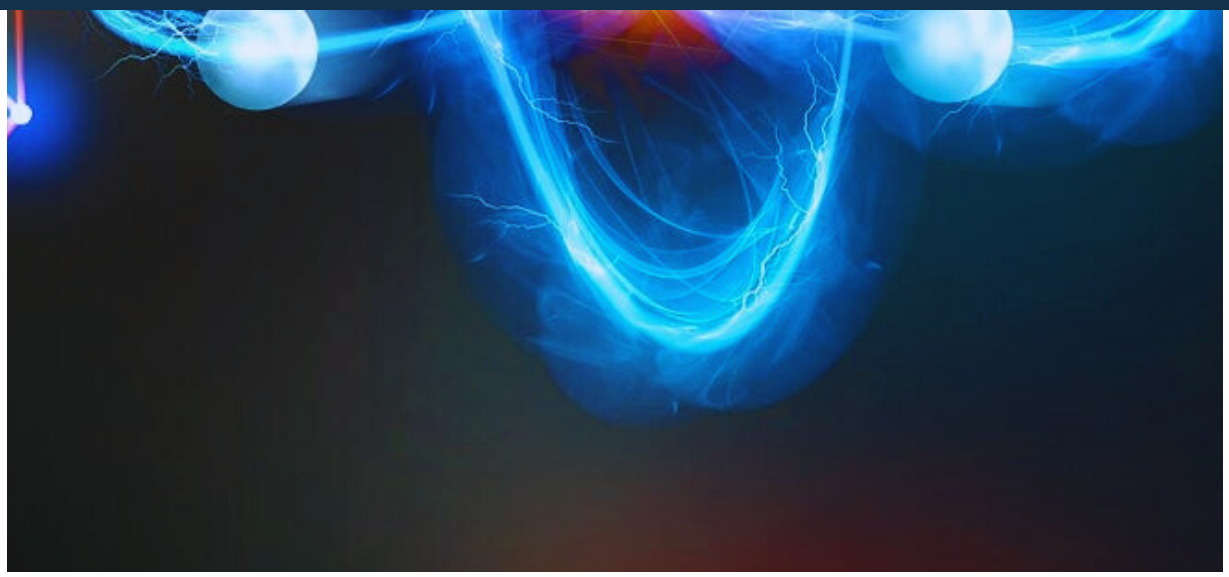
Mathematics is also unconsciously used by homemakers in their daily routines. When preparing food, precise measurements of ingredients are necessary. Without a grasp of mathematics, we cannot fully appreciate delicious meals or make necessary adjustments.

Whether you're at work or a friend's house, mathematics is a constant presence in our lives. We are surrounded by mathematics, and the more we explore, the more mathematical concepts we discover in our world. Let's embrace and enjoy the mathematical richness that surrounds us.



MATHEMATICS AND PHYSICS

Pradyumna Borphukon & Gagan Deep Singh
Second Year



Mathematics and physics are two fields of study that are closely intertwined. Mathematics provides a framework for understanding the physical world, and many physical theories and laws can be expressed mathematically. Conversely, physics uses mathematical models to describe the behavior of matter and energy in the universe.

One of the earliest examples of the relationship between mathematics and physics is the work of Isaac Newton. In the 17th century, Newton developed his laws of motion, which describe how objects move and how forces affect their motion. These laws are expressed mathematically, using algebra and calculus. Newton's laws of motion are still used today to predict the motion of objects in the solar system, and they form the basis for many branches of physics.

Another example of the relationship between mathematics and physics is the theory of general relativity, developed by Albert Einstein in the early 20th century. This theory describes how gravity works, and it is based on the principles of non-Euclidean geometry and differential equations. General relativity has been extremely successful in explaining a wide range of phenomena, from the orbits of planets to the behavior of black holes .
Many other branches of physics also rely heavily on advanced mathematical concepts and techniques.

For example, quantum mechanics, the branch of physics that deals with the behavior of subatomic particles, uses complex mathematical functions to describe the behavior of matter at the atomic and subatomic level. Similarly, thermodynamics, the branch of physics that deals with heat and energy, uses statistical mechanics, which is a branch of mathematics, to explain the behavior of large numbers of particles.

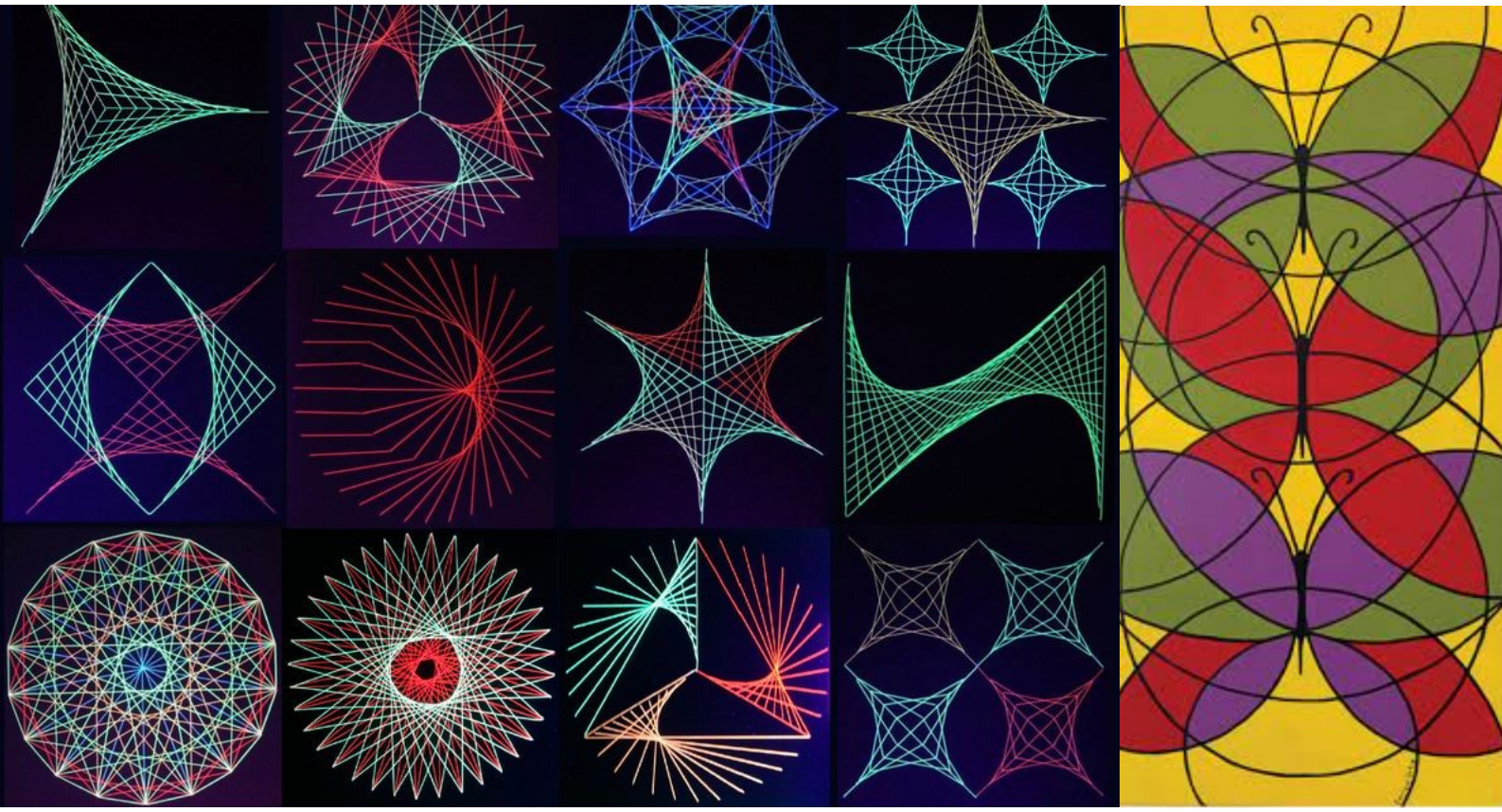
In addition to these examples, mathematics and physics have a long history of collaboration, with many physicists and mathematicians working together to solve problems and make new discoveries. This collaboration has been beneficial for both fields, with physics providing new problems for mathematics to solve, and mathematics providing new tools for physics to use.

In summary, mathematics and physics are closely related fields of study that are essential for understanding the physical world. From Newton's laws of motion to Einstein's theory of general relativity, physics relies on mathematical models to explain the behavior of matter and energy. Additionally, many branches of physics rely heavily on advanced mathematical concepts and techniques. The collaboration between mathematics and physics has been beneficial for both fields and has led to many important.

MATHEMATICS AND ART:

Where numbers meet creativity

Kaarimah | Second Year



Imagine a world where numbers danced to the rhythm of colors and shapes, where artists wielded the magical wand of mathematics to create mesmerizing masterpieces. Welcome to the enchanting realm of "Mathematics in Art."

Mathematics and art may seem like two separate and distinct disciplines, but upon closer examination, a deep connection emerges between the two. The interplay between mathematics and art has been present throughout history, from the precise proportions of ancient Greek sculptures to the intricate geometric patterns of Islamic art. Mathematics provides a framework for understanding and creating aesthetic beauty in art. Artists become sorcerers of symmetry, conjuring mesmerizing patterns with the flick of their brushes. The Golden Ratio, a legendary secret passed down through the ages, unveils its hidden charm, weaving its way into paintings and sculptures, leaving audiences spellbound.

architects who embark epic quests, armed with the knowledge of mathematical proportions, to construct majestic structures that seem to defy gravity itself. Cathedrals reach towards the heavens, their intricate spires forming awe-inspiring geometric patterns, while bridges span great chasms with the precision of mathematical equations.

We see colors blending like melodies on a canvas, harmonizing in mathematical symphonies.

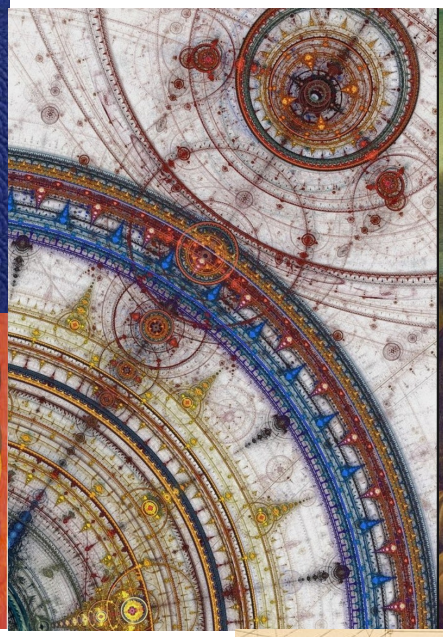
The Golden Ratio in Art

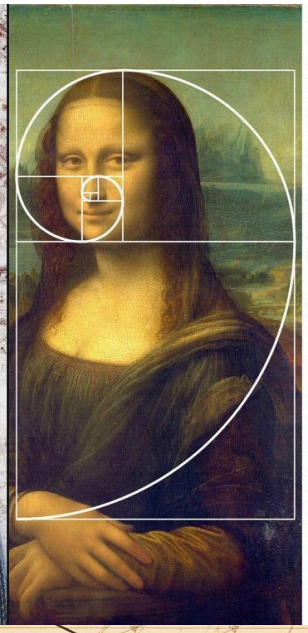
Artists reveal the secrets of color theory, using mathematical equations to create breathtaking palettes that evoke emotions and stir the soul.

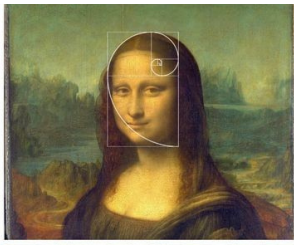


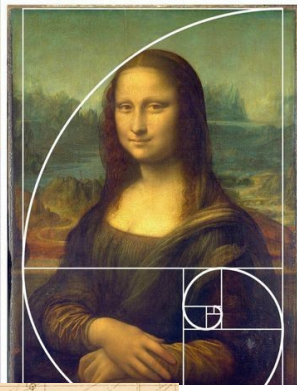


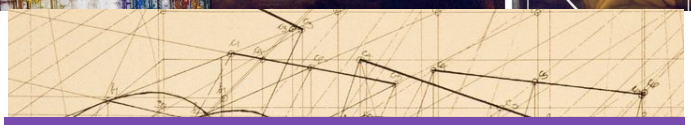










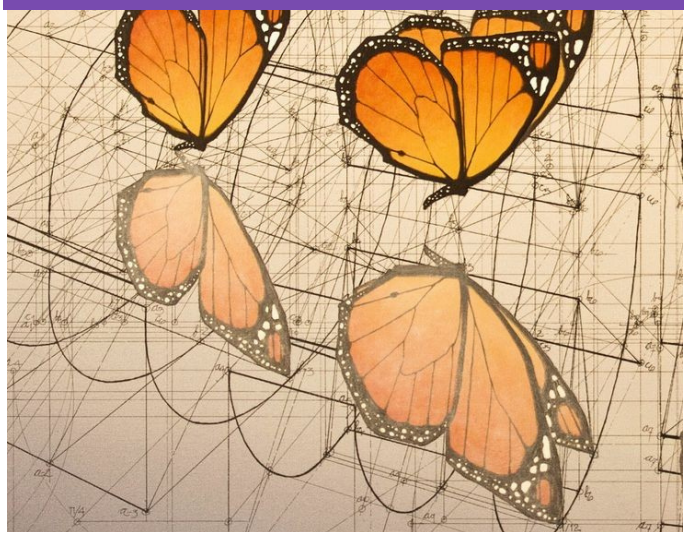


Behold the artists who find inspiration in the very fabric of nature's design. Fractals, the intricate patterns that repeat infinitely, become the muse of painters and sculptors, resulting in art that captures the essence of the cosmos itself.

As you traverse this wondrous realm, you'll witness how mathematics sparks creativity and fuels the imagination. Artists embrace geometric puzzles as delightful challenges, transforming them into brilliant puzzles on the canvas.

In the hands of these visionary artists, mathematics is no longer cold and abstract but alive, vibrant, and dancing with life. The boundaries between mathematics and art blur, revealing a vibrant tapestry where creativity and logic embrace in a joyous dance.

So, the next time you gaze upon a masterpiece, look beyond the surface. Peek into the hidden realm of "Mathematics in Art," where the wonders of numbers and the magic of creativity intertwine, inviting you to explore the beauty of both worlds.



THE ROLE OF MATHEMATICS IN DEVELOPMENT OF NEW ELEMENTS

Mohammad Numair
Second Year

The periodic table currently has 118 elements. But does this imply that this is it? Certainly, we are far from seeing the last of elements on Earth. A recent discovery in Congo displayed the existence of electrically charged rocks, which, when touched against each other, spark. These were reportedly the result of the fusion of magnetite and quartz. Similarly, each day arrives with some or other new discovery. But what role does mathematics play in this 'circle of progress'?

Math is a versatile science and so are applications in the real world. According to science, new elements can be found naturally, or by fusion of 2 elements through bombarding each other's atoms. Now, without mathematics, it would be practically impossible to make the discovery both ways. This is because firstly, heavy technology is required to estimate and excavate the naturally occurring elements.

Moreover, mathematics is the core of all calculations relating to the running of the machines, the optimal extraction as well as environmental constraints. Regarding new element discovery, math plays a major role in predicting where to drill and where to search. This is because, math uses previous data like the topology of an area, etc. and incorporates previous results into the final answer so that we do not start drilling anywhere! Furthermore, math is the essence of all scientific processes through means of differential equations, modelling, etc.

Now, the other way involves the collusion of atoms of 2 elements at high speeds to form something new. This way also has a sizeable amount of math to it. Firstly, there is a need to estimate the conditions under which these experiments need to happen to remain safe. This is because many such fusions are nuclear and dangerous. Designing and executing an experiment as such requires complex mathematical calculations and planning. Lastly, the visualization of the process is also an important part done through three-dimensional mathematics.

Hence, we see that math finds numerous ways of being incorporated into the process of discovering new elements. Without math, perhaps, it would be impossible to plan and execute such delicate processes. Hence, math is a powerful tool, whose power lies with the wielder.

MATHEMATICS AND TECHNOLOGY

Rahul Das | Second year

Imagine a world which is out of proportion! No numbers, no calculations, everything will be an unbalanced mess, right?

Since the evolution of mankind, we humans have always looked for ways which make our lives convenient. For instance: numbers- mathematics & the weapon without which the world right now is unfathomable i.e.technology. These two phenomena go hand in hand, one carries the other and vice versa. Through mathematics, we perform various operations which are eventually applied in constructing various beautiful geometrical pieces like buildings, bridges, monuments, a simple staircase, a road, even a ship, trains, cars whatever you can think of. What technology does is that it helps and enhances mathematical operations through various tools which makes the whole process come to life and eventually creating wonders and making our day-to-day lives convenient as well...

We need this power duo in navigation, communication, creation and whatnot. Not just on earth, we are also solving mysteries beyond space which seemed like an impenetrable area is now somewhat known to mankind. Slowly and steadily we are making advancements, it is thanks to this power duo that we are making progress.

Without this power duo, the small tasks which are performed in minutes, would have been cumbersome. Remember the first computer which took up the size of an entire room? Numerous hits and trials, various algorithms and efforts paved the way for further advancement. In brief, this power duo, incorporated together, can do wonders for the world. This duo can now be seen in almost every sphere of our life, which makes it much much easier.

Hence, in conclusion, the world we imagine ahead would rely on this power duo of mathematics and technology and if done consciously we will head towards a better future.


THE ∩ OF
mathematics
BIOLOGY,
& NATURE

Mathematics & Biology

As students of mathematics, we're all too familiar with finding it difficult to visualize or even fathom certain concepts. Mathematics seems to pick up, come together, and solve problems, by taking concepts from the vast no. of fields and subjects that come under it. You can almost never single a concept out, when working on a research problem. Your mind needs to be open, to look into a seemingly unrelated field to solve your dilemma. It comes as no surprise then, even though it may feel utterly ridiculous, how connected math and biology are. Yes, the subject you left behind in 10th grade, the very same one you chose math over, just to get away from memorizing the 10 million types of blood, and complex cycles. Believe it or not, more than any medicine, Mathematics has helped cure cancer! Mathematics is the core of all calculations relating to the running of the machines, the optimal extraction as well as for environmental constraints. It is a highly analytical subject. Besides current applications, Alan Turing, the great mathematician, and inventor of the Turing machine, wrote about the Turing patterns. They explain the geometry of the various designs and patterns found in nature, such as the stripes found on Zebras. Mathematical biology focuses on the use of mathematical tools to study biological systems, it is through geometry and mathematical modelling, (such as Turing patterns) that we are able to tell why cells of the brain develop differently than cells on any other part of the body. This way, math finds its use in synthetic biology. We are able to encrypt and control the geometry of cell formation, by studying the amount of protein they need/use, using mathematical models. It is through a sort of predator and prey model, that we are able to control the amount of sustenance required to help immune cells fight against cancer cells. There are of course other connections between math and biology such as abstract relational biology, mathematical biophysics, algebraic biology, evolutionary biology and so much more. All of this is testament to the fact, that mathematics is literally everywhere, even in the subject you used to memorize and mug up notes for, in 10th grade.

-Medha Pandey
Second Year

Mathematics & Nature

Mathematics is not something that could only be found in textbooks. We may not recognise its presence around us but the truth is that it is present everywhere, even in the nature that we admire. We can see several forms of symmetry in nature. The reflection of an image in a lake is an example of bilateral symmetry which means that the image can be divided into two identical parts. A yellow dandelion is a perfect example of radial symmetry. Not only symmetry, but we can also see various geometrical shapes occurring naturally around us. For thousands of years, humans have marvelled at the perfect hexagonal shapes in the honeycomb. It is truly a wonder how bees naturally create such shapes without the use of any ruler or compass. Other animals like nautilus exhibit mathematical patterns. The shell of the nautilus is said to have a Fibonacci spiral that is each ring is a golden ratio away from another ring. However, there are some exceptions as all the shells are not Fibonacci spirals, and some of them exhibit logarithmic spirals. Spiders also have a knack for geometry as they all create nearly perfect circular webs with almost equidistant radial support coming out of the middle. Symmetry and mathematical patterns exist almost everywhere in nature but they aren't limited to our own planet. Scientists have discovered that in addition to having mirror symmetry, the milky way galaxy also has a logarithmic spiral design similar to the nautilus shell. The planets orbit the sun on paths that are concentric. We also see concentric circles in the rings of Saturn.

Another intriguing shape that occurs in nature is the fractal which is a repeating shape. The same shape is seen again and again inside the shape itself. Such patterns can be seen in ferns, tree branches, coastlines etc.

Maths and nature together endow our lives with more beauty and grace. Nature in itself hides so many numbers, equations and patterns, and shows its marvels only to a curious mind.

-Prerna Dumka
Third Year

COMPETITIONS

- **Sonia Yadav** from 2nd year won first prize in Poetry Competition held in Sri Venkateswara College.
- **Dipesh Kumar** from 1st year got 3rd Position in Youth Delhi Talent Show.
- **Shubh Bhaskar** from 1st year won the "Trading Tycoons" competition at Sri Venkateswara College.
- **Rohan Bakhshi** from 1st year won the Valorant Showdown organized by the Statistics Department of Sri Venkateswara College.
- **Ayush Samber** from 2nd year won first prize in " Acess Denied" held at Sri Venkateswara College.

DEBATING

- **Vishrwa Tiwari** from 3rd year won two Parliamentary Debate competitions held at ARSD College and Ramjas College. He was also the runner-up in the Parliamentary debate competition held at Gargi College.
- **Varun Mishra** from 2nd Year got 2nd position in two debating competitions held at UPSC Guidance Cell and Maitreyi College.
- **Nikita Agrawal** of 2nd year secured 3rd position in two Conventional Debate competitions, held at Ram Lal Anand College and SFI respectively.
- **Utsav Raj** from 2nd year became Quarter Finalist in Parliamentary Debate Competition held at Miranda House, and become a Quarter finalist as an Adjudicator in Aryabhatt PD, and was named the Best Speaker in Aaroh Theatre and Dyal Singh College.

ACHIEVEMENTS

EXTRA CURRICULARS

- **Anoushka Dhar** from 2nd year got 3rd position in "Through Your Lens, short film-making competition" held at Maitreyi college. She also won Mela Quiz held at Miranda House.
- **Varun Mishra** From 2nd year won bronze medal in Table Tennis Men's Individual, IBS Inter College, Umang Sports Fest.
- **Kritika Saluja** from 3rd year won 2nd prize in Nukkad Natak Competition held at IIT-Roorkee
- **Ayush Sambher** from 2nd year won 3rd price in "Shri Ram Case Cognition" held at Shri Ram College of Commerce.
- **Kaarimah** from 2nd year got selected at OFCM by MTTS Trust.
- **Utsav Raj** from 2nd year won 3 open mic competitions held at NCC (SVC), Pol Science Department (SVC), Rajdhani College, and 2 Quiz Competitions held at NCC(SVC) and College of Vocational Studies

CLUBS & SOCIETIES

- **Kritika Saluja,** an artistic individual in our dept, carried the role of President in Anubuti, The Dramatic Society, where she undoubtedly dazzled the stage with her creative vision, artistic flair and unparalleled leadership, making her tenure an unforgettable one.
- **Vishrwa Tiwari**, a 3rd-year student, has been promoted to the distinguished position of Vice President in Vimarsh, The Hindi Debating Society, where his exceptional oratory skills and critical thinking have shone through, earning him this well-deserved promotion.
- **Yashaswi Kafola**, currently in 3rd year student joined the ICC (Internal Complaints Committee) of The English Debating Society where they worked towards ensuring holistic functioning within the society.
- **Shreyasi Jhamb,** a 3rd-year student at SVC, has been bestowed with a remarkable honour, having been promoted to the esteemed position of Vice President in Conquiztadors, The Quiz Society of SVC. Her exceptional intellect and profound knowledge shall undoubtedly fortify society's endeavours, as she leads the way towards new heights of quizzing glory, showcasing her unmatched passion and dedication to the art of quizzing.

ACHIEVEMENTS

2022-2023

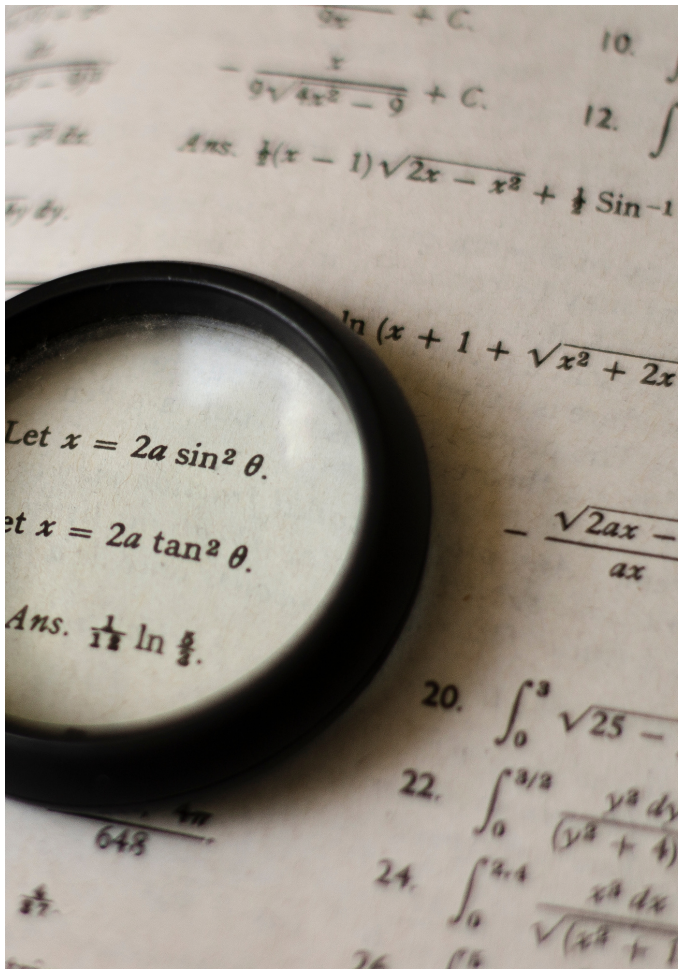
- **Gautam Joshi**, a 3rd-year student at SVC, has been an exceptional leader, having served as the President of Nerds of Comedy, where his unparalleled wit and humour have left the audience in stitches. His remarkable talent and contagious energy have undoubtedly made him a force to be reckoned with in the comedic world.
- **Prerna Dumka**, also a 3rd-year student at SVC, has been promoted to the coveted position of Co-Curator in Petricor, The Creative Writing Society, where her exceptional creativity and literary prowess shall undoubtedly shine through. Her exceptional contributions shall undoubtedly pave the way for a new wave of literary excellence, as she leads society towards new heights of creative expression.
- **Arushi Jurgan**, a distinguished 3rd student at SVC, has been an essential pillar of support in Cushy, The Book Club, having served as the Logistic and Sponsorship Head with exceptional skill and dedication. Her meticulous planning and financial acumen have undoubtedly paved the way for the club's success, as she has expertly navigated the logistical and financial challenges with ease.
- In a remarkable achievement, **Ravi Sharma**, a 2nd-year student, has ascended to the position of Vice President in the Purvanchal Club, showcasing his exceptional leadership skills and dedication to the organization promoting the heritage and culture of colourful Purvanchal.
- **Soham Sharma**, currently in 2nd year became the project head for project Gulzar at Enactus. The project aims to tackle the rising issue of floral and paper waste in India by making innovative products, in his tenure, the project generated a revenue of 38k, uplifting the beneficiaries' income by 18% by selling bookmarks. The project also launched a new product - hand-rolled floral incense sticks in three different fragrances.
- In a magnificent display of artistic prowess and creativity, **Kaarimah**, a 2nd-year student, has been elevated to the extended core of the illustrious Leonci Art Society. In her new role, she shall grace society with her unparalleled skills, working in tandem with the social media team to craft captivating content and posters, all while leaving a lasting impact on society's artistic endeavours.
- Amidst her 2nd year at SVC, **Nikita Agrawal** has been appointed as the esteemed General Secretary of Vimarsh, The Hindi Debating Society, in recognition of her unwavering passion for the art of debate and her outstanding contributions to society.
- **Rahul Das**, a 2nd-year student, has been a beacon of excellence, having served as the Treasurer in the English Debating Society, showcasing his financial acumen and unwavering commitment to the society's success. Furthermore, he has achieved another milestone in his journey by being promoted to the coveted position of Research Content Head in the esteemed Book Club, where his passion for literature and unmatched research skills helped in soc success.
- **Vansh Arora**, a 2nd-year student, with remarkable talent and unwavering dedication, has earned him the prestigious position of Logistics Head and Consultant at his branch at 180DC, where he has worked on three pro-bono consulting projects for clients ranging from fledgling startups to reputable international non-profits. Furthermore, his contributions to Enactus SVC as the PR Head have not gone unnoticed, as he has shown exceptional finesse in crafting and executing PR strategies, all while showcasing his unmatched skills

CAREER PROSPECTS

AFTER B.SC. (HONS.) MATHEMATICS

Mathematics is one of the most studied and diversified subjects in and around the world. This subject opens up doors leading to a plethora of career options in the future for the students.

In both private as well as government sectors, there are a plethora of career options after B.Sc. (Hons) Mathematics. The degree is an extensive course taught over a period of three years at an undergraduate level. Here is a career roadmap that can help students choose and pursue their careers after completing B.Sc. (Hons) Mathematics.



1

GOVERNMENT JOBS

Students willing to establish their careers in the government sector can sit for various government entrance examinations after completing B.Sc. (Hons) Mathematics. There are many competitive examinations at the state as well as National levels (UPSC, Indian Defense, SSC, etc.). Many students sit for the UPSC examination after completing this degree every year. Other established government career options are:

- Village Officer
- Government Teacher
- Central Government Jobs
- Public Sector Banking Jobs
- Jobs in Indian Railways
- Defense Research and Development Organization (DRDO)
- Indian Space Research Organization (ISRO)
- IFS officer



2

MBA (MASTERS OF BUSINESS ADMINISTRATION)

Students who are willing to pursue and make their careers in the fields of management and business prepare for an MBA. MBA courses have huge demand in the world. Students can start preparing for entrance examinations like CAT and GMAT for MBA. To apply for the CAT or GMAT entrance test, they must have completed their graduation from a recognized university with 50% of marks and if they are belonging to SC and ST, then 45% of marks are enough. There is no age limit. CAT is a common entrance test conducted by IIMs for admissions into their management programs. This is an online test and it is a nationwide entrance test, where they write the entrance test online. Almost all the business schools in India accept CAT scores.



3

TEACHING

Teaching as a career has limitless opportunities in the field of mathematics. Students after completing bachelors in mathematics can pursue teaching. The various opportunities in this field are:

- Lecturer
- Professor
- Associate Professor
- Assistant Professor

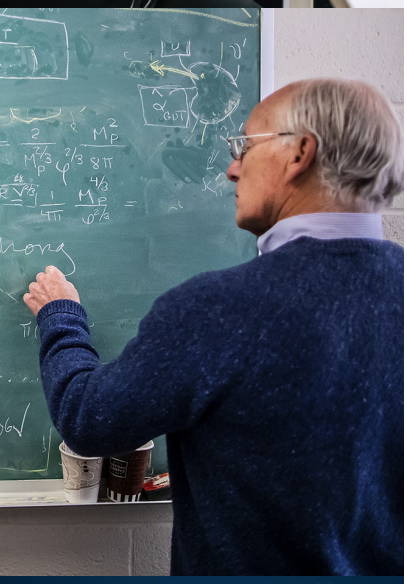




4 ACTUARIAL SCIENCE

This discipline is interdisciplinary and incorporates mathematics, computer science, finance, economics, and statistics. This makes it one of the lucrative career options after B.Sc. (Hons.) Mathematics. These professionals assess financial risks (anticipating the future scenarios) in the corporate world. The field also handles the production of life tables, mortality analysis, and the application of compound interest. The various opportunities in this field are:

- Financial Analyst
- Financial Consultant
- Actuary



5 OPERATION RESEARCH

It deals with the application of various methods in order to make better decisions. Also, it is a method of solving various problems of a business firm and organization.
The main motive is to achieve the best performance and protect firms from an uncertain future. Hence, they play a huge role in a firm by providing their services to solve multiplex problems which will help them to improve efficiency. It is a great opportunity and helps an individual to act as an asset for the organization and is a really good career option.



6 DATA SCIENCE

From small startups to MNCs, each organisation nowadays generates, on a regular basis, vast amounts of data. The professionals working in the field of data science make sense of this data and this in turn helps the companies make their future plans. The services include data mining, data modelling, interpretation, developing prototypes, predictive models and custom analytics, etc.
According to studies by LinkedIn, since 2012, Data science jobs have increased by 650%. The U.S. Bureau of Labor Statistics estimates that there will be about 11.5 million new jobs by 2026.



7 ECONOMICS

There is a broad scope of economics as it not only studies its subject matter. But it also studies various other things such as its scientific nature, ability to pass value judgments, and suggest solutions to real-world issues. The study of economics opens up a broad range of opportunities to gain an edge in today's globalised world. Since the growth of any business relies on economic policies, a career in this field can be very rewarding. After gaining proper skills and training, you can not only find employment opportunities at the national, but also at the international level. Economics is the foundation for every industry and organisation, hence it has incredible scope and prospects.



The Banach-Tarski paradox states that if you have solid ball in 3-D space, and you decompose it into finitely many pieces, which can be moved around through rotations and translations (without any stretching or change in shape) and assembled to yield two identical copies of the original one.

PROOF OF BANACH-TARSKI PARADOX

Given: A solid ball in 3-D space.
To prove: 1=1+1

Proof: The solid ball (sphere) is made up of infinitely many points. So before starting with the process of making of two spheres, the first thing we need to do is to give every single point on the sphere a unique name, this can be done by naming a point on the sphere as starting point and then naming the other points based on how they can be reached from this starting point. If we move this starting point across the surface of the sphere or rotate it in any direction, then we can cover all the points on the sphere. As long as we never backtrack, the sphere will never wind up in the same place twice. In order to prove this paradox, we only need to rotate in four directions, i.e., up, down, left and right, around two perpendicular axes. Infinitely many sequences can be made from just these four rotations, (write the rotations in order right to left, so the final rotation is the leftmost letter).

L, R, U, D, LL, UL, DL, RR, RU, RD, UU …
But we'll not include 'RL' since going left and then right is same as returning to the same point as before. Therefore, we'll not incorporate any left right (RL), right left (LR), up down (DU) or down up (UD) rotations.

Now we know that the set of all possible sequences (of allowed rotations) are countably infinite, and these countably infinite set of points can be determined by having a starting point and then naming the points we land on after by following the previous sequence.

In order to distinguish between the points, we color-code them. Suppose we color-code the starting point green, then follow the given sequences and color-code all the other points based on the final rotation. Let's use purple for left, red for right, blue for down and orange for up.

E.g., sequences {(U), (DLU), (RUR), (ULD)…}, corresponds to {orange, blue, red, purple}, for the sequence say, DLU, we start by determining the starting point and rotate down, then rotate left and finally rotate up, this is our point. In this case, up is our final rotation, so this point will be colored orange, and this is how we'll plot every point in the sequence and color-code them. Now after doing this process for every single sequence, we will have countably infinite number of points, named and color-coded but there are still uncountably infinite number of points on a spheres surface and just to make sure that we named every..

..point on the sphere, we take another starting point, color-code it green, and then run every sequence from this new starting point, after this we repeat same process and by this, we get uncountably infinite number of starting points. For now, we have almost named and color-coded every single point on the sphere just once, with the exception of poles. Poles are locations on the sphere that come back to exactly where they started. For every sequence we have two poles of rotation, e.g., for any sequence of right or left rotations the poles are there in the North and the South, similarly for up and down, they are the East and the West, which implies more than one sequence can lead us to the same set of poles, i.e., they can be named more than once and be colored in more than one color. To deal with this, we color-code them separately, say yellow. Since every sequence has two poles and we have countably infinite sequences, therefore we have a countably infinite number of poles of rotation.

Now, every point on the sphere is given just one name and just one of six colors, also they correspond to a unique line of points below it, all the way to the center point of the sphere and while decomposing the sphere, we will be dragging every point's line along. Finally, we are ready to take the entire sphere apart.

First, we keep the center point aside, now we cut out and extract all the pieces, yellow poles of rotation, the green starting point, orange up points, blue down points, purple left points, and red right points. Now we have the entire sphere disintegrated. And with just these pieces we can build the whole sphere twice.
We start the process by working on the left piece, it is composed of points that can be excessed via a sequence ending with a left rotation (L).
L, LL LLL, LLLL, …
LU, LUU, LUUU, …
LD, LDD, LDDD, …
LUL, LULL, LULL, …
LDL, LDLL, LDLLL, …
…. }

Now, if we rotate this left piece right, that's the same as adding an 'R' to every sequence. But we already know going left and then right is backtracking, so they cancel each other out.

{RL, RLL, RLLL, RLLLL, …
RLU, RLUU, RLUUU, …
RLD, RLDD, RLDDD, …
RLUL, RLULL, RLULL, …
RLDL, RLDLL, RLDLLL, …… . }

{O, L, LL, LLL, …
U, UU, UUU, …
D, DD, DDD, …
UL, ULL, ULL, …
DL, DLL, DLLL, …, …. }

As we reduce them away, the left piece now becomes equivalent to the set of all points with names that end with not only 'L' but also 'U', 'D' and every point in the set is reached with no rotation since left and the right rotation equals no rotation at all, therefore, we even a have full set of starting points(O).

We have turned less than a quarter of the sphere into nearly 3-quarters just by rotating it once. Now if we add the right piece, poles of rotation and center point to the upgraded left piece, we will have the entire sphere again.

Now we are left with the up piece, down piece, and the starting points piece, to make the second sphere, let's take the up piece and rotate it down.
{U, UU, UUU, …
UL, ULL, ULLL, …
UR, URR, URRR, …
ULU, ULUU, ULUUU, …

Now this is where the problem lies, we already have a set of starting points unused. To rectify this, let us start over, and take everything from the up piece that turns into a starting point when rotated down and every point whose final rotation is up and separate them by placing them with the down pieces.

Also, we know that, after a down rotation, the points named "UU" will just turn into points named "U" and that would give us a copy of same i.e., the set of string of (U) in both, this set and down one. So, we move all points with any name that is just a string of (U)s and put them in the down piece and now we can finally rotate the up piece down, which makes it congruent to the up, right and left pieces, now if we add in the down piece (along with some up, which does not matter since the points will simply overlap) and the starting point piece to this piece, we're almost done with making the second sphere, now we only need the poles of rotation and the center point.

These missing points (poles of rotation) can be considered as countably infinite number of holes, thus if we think of the sphere as a spring, then in every piece of the spring there is a hole. Now we know that there is some pole for this sphere, around which we can rotate this sphere such that every pole hole orbits around, without hitting another. These can be considered a series of circles with one point missing, and we have infinite points on the surface of the sphere so we can fill these missing points from infinity by rotating around that pole, same can be done for center point and we are finally done with our second sphere.

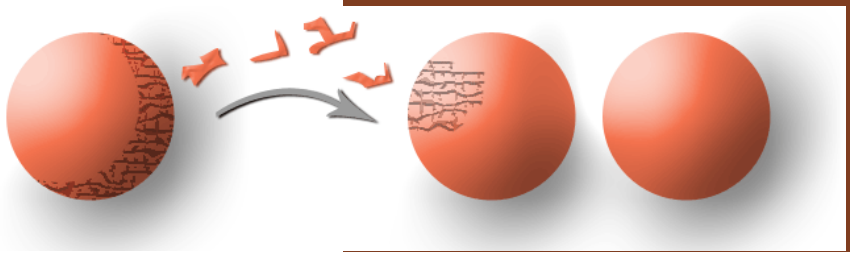
1=1+1, hence proved.

Banach Tarski in Real Life:

The Banach-Tarski paradox seems paradoxical in real life because of the following argument, surely the volume of a ball is the same as the sum of the volumes of any finite number of possible decompositions of that ball, which is in turn not the same as the volume of two balls separately. More precisely, the total volume ought to remain constant.

Further, the Banach–Tarski paradox does not apply to physical world, simply because it is more about the theory of sets, which being an abstract, is not very much related to physical world.

In Banach-Tarski paradox, we split the sphere into a finite number of immeasurable sets of points and then by putting these points together and we create the entire original sphere twice. Though this is impossible to do in real life (because we are bounded by atoms). Every object in real life is measurable, because it is made up of a finite number of atoms taking up a finite amount of space. On the contrary, in mathematics, the sphere has infinite density and when you cut an infinite density in half, the new density is still infinity (infinity/2=infinity)

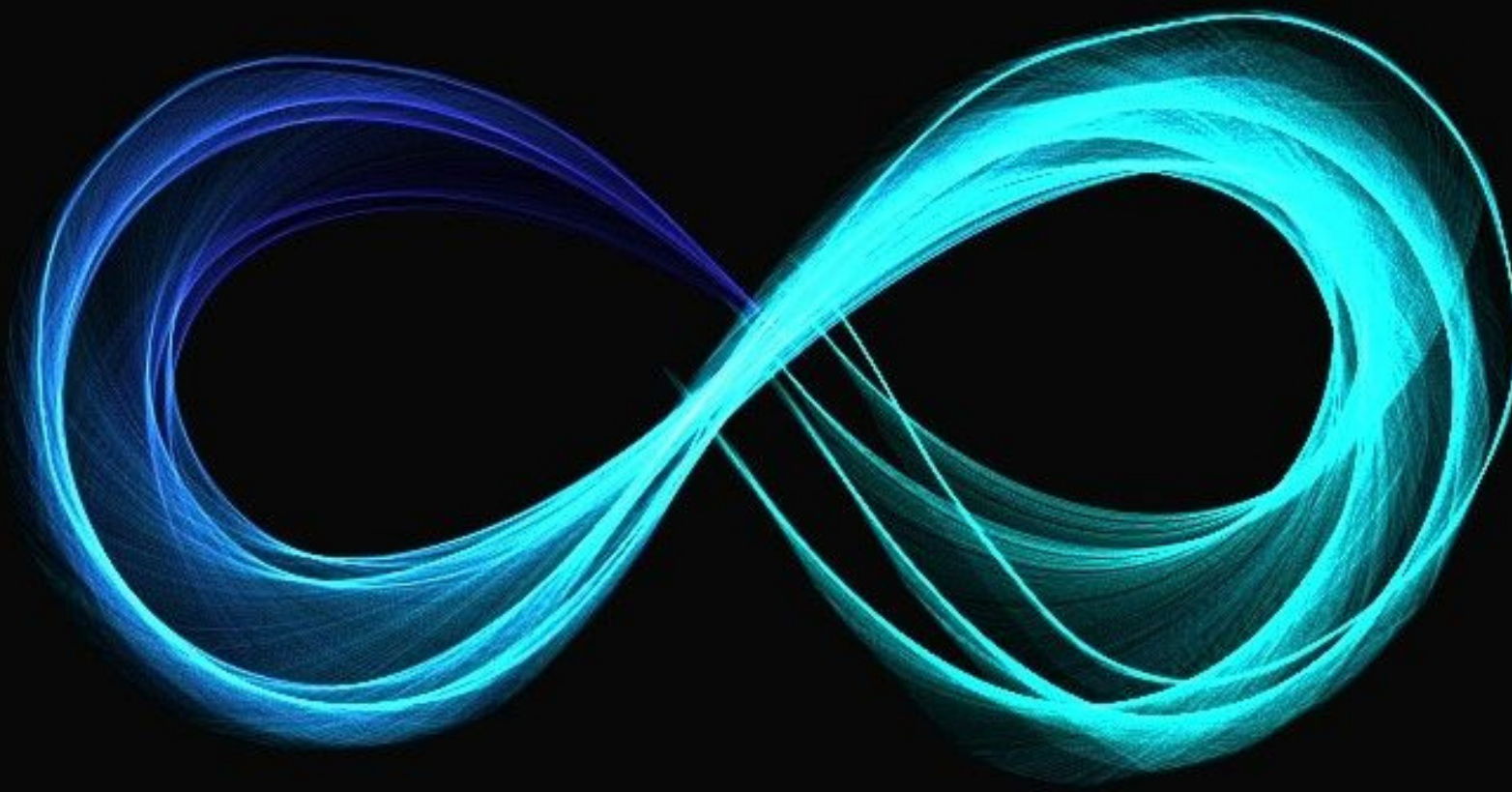


"Unraveling the Mysteries of Banach-Tarski Paradox: When One Plus One Equals Two, and Also One!"

- Kaarimah
Second Year

Reference:
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HOW TO COUNT PAST INFINITY ?



— Aneesh Chatterjee
Second Year

1.1: ORDERS OF INFINITY

We very often hear or read about infinity in popular culture and media, but these references rarely get across the nuance of the concept, and never show how we can deal with infinite values. This section of the paper aims to familiarize the reader with the concept of infinity, providing some intuitive ways of thinking about it, and delving into some of the mathematics related to different types of infinity.

To start off, it is obviously not sufficient to define infinity as simply "a number bigger than any number", there are far too many ways to poke holes in this statement. Instead, we shall relate infinity to the cardinality of various familiar sets.
The cardinality of a set is simply the number of elements in the set, for example, the set
A = {1, 2, 3, 4, 5, 6}
Has a cardinality of 6. We shall denote the cardinality of any set 'A' by '[A]'.
Now, consider the set of all natural numbers (denoted by 'N')
N = {1, 2, 3, 4, ….}
It is the set of all counting numbers, and it goes on forever. Therefore, it seems sensible to write [N]= ∞

The reader might think that all infinities are the same size, so we should be able to use this fact to prove that the cardinality of any infinite set is equal to that of the natural numbers. However, this is not the case, there are many higher orders of infinity that are much larger than that of the natural numbers. We shall consider this in more technical terms later, but first, we put forward an intuitive proof, using another familiar set.

Consider the set of all real numbers (denoted by 'R'). The real numbers are simply all rational and irrational numbers put together; they contain every number which does not involve the square root of something negative. The set R is obviously infinite, but it turns out the cardinality of R is much larger than the cardinality of N, we can prove this as follows.

Two sets have the same cardinality if we can associate each element of one set with another element of the other set, such that no elements are left over in either. For example, say we have 2 sets
A = {1, 2, 3, 4, 5, 7}
B = {99, 100, 101, 102, 103, 104}
These sets both have the same cardinality, and we can pair up the elements as follows:
1 -> 99
2 -> 100
3 -> 101
4 -> 102
5 -> 103
7 -> 104

Now let us try to do the same thing for the sets N and R. R contains all decimals, so suppose we can write down all the real numbers between 0 and 1, we then associate each one of these numbers with an element of N. It would look something like this:
1 -> 0.134562……
2 -> 0.342516……
3 -> 0.421785……
4 -> 0.768954……
5 -> 0.543286……

And so on. Our assumption here is that we have written down all possible real numbers between 0 and 1, then associated each one with a unique natural number. Now imagine constructing a new number as follows. Take the first digit after the decimal from our first number, the second digit from our second number, the third from the third number, on and on. Then add 1 to each of these digits if it is from 0 to 8 and subtract 1 if it is 9. For the series above, we would obtain a number that looks like this (call it X):
X = 0.25289……

Because of the way we defined X, it must differ from every number in the original list by at least one digit, yet it lies between 0 and 1. Furthermore, we have run out of natural numbers to pair up with already, so we cannot pair X with anything. Therefore, the set of all real numbers between 0 and 1 is an infinite set which is larger than the set N. This set is a subset of the overall set of real numbers, so R must be larger than N as well. This form of proof is called Cantor's Diagonal Argument.

Now, we can say that the cardinality of R is a higher order infinity than the cardinality of N.
Let us also put forward a more technical definition of equivalence of sets.

For 2 sets A and B, A is equivalent to B if we can form a one to one mapping between the elements of A and B. Therefore, the natural numbers, the whole numbers, the even numbers and the odd numbers are all equivalent sets, and hence their cardinality is the same, lowest order of infinity. This first order of infinity is called countable infinity and denoted by aleph-null. The cardinality of the real numbers is a higher order of infinity (uncountable infinity), which may or may not be equal to aleph-one (whether it is equal or not is the basis of the continuum hypothesis, one of the largest unanswered questions in mathematics).

1.2: CARDINAL AND ORDINAL NUMBERS

Before moving on, it is important to establish what kind of number aleph-null is, since it seems to defy all previous conventions, there are 2 types of numbers to consider, cardinal numbers and ordinal numbers. Aleph-null is a cardinal number, which means that it describes the size of a set. There is another type of number, ordinal numbers, which instead describe a position or an ordering. The easiest way to appreciate the difference is with an example. Consider drawing lines spaced apart, each spacing reducing by a factor of ½ as we draw more lines, we will be able to draw infinite lines in a finite space. Now the number of lines here is equal to the cardinality of the natural numbers, aleph-null, since we can associate each line with a natural number. Suppose we draw an extra line after this infinite sequence. Interestingly, the number of lines has not changed, we can simply associate that extra line with 1 and then continue pairing with the rest of the natural numbers as before, we still obtain a one to one pairing with the natural numbers. However, if we want to label the lines in the order we drew them, we will need to count after the infinite natural numbers. The first number that appears after the natural numbers is called omega, and unlike aleph-null, it is an ordinal number.

The reader might ask where the hierarchy of infinities ends, is there one larger than the cardinality of the real numbers? The answer is yes, it is in fact possible to climb the orders of infinity infinitely. This is due to the axiom of replacement, which allows us to construct a new set by replacing the elements of any existing set with other sets according to some defined rule. Using this, we can make 'jumps' of almost any size, and define higher and higher orders of infinity, with higher and higher cardinals. These are named aleph-one, aleph-two, and so on. It is also possible to generate higher orders of infinity by taking the power set of an infinite set, this fact can be proved using Cantor's Diagonal Argument again.

1.3: INFINITY AND SHAPES

Finally, let us explain how infinity can be related to points in a 3-D shape. The Banach-Tarski paradox itself deals with infinite points in a sphere, and we can prove that the number of points is the same order of uncountable infinity as the real numbers, higher than that of the natural numbers. In fact, we can establish a one to one correspondence between any subset of the real numbers with any subset of a plane, or of an n-dimensional space, this is illustrated as follows. Firstly, we can obviously associate the real numbers with a line. For simplicity, let us once again consider the subset of the real numbers between 0 and 1
Firstly, let us associate the number line between 0 and 1 with a 2-Dimensional unit square. Consider any point A inside the square, with co-ordinates as shown in the figure, then write the alternating x and y co-ordinates. This will give us a decimal number B which must lie between 0 and 1, so it lies on our subset of the number line. In this manner, we can associate all the points in the square with unique points on the number line. Therefore, the number of points are the same order as infinity, i.e., that of the real numbers. In the same way, we can associate all the points in a unit cube with unique points on the number line by taking the x, y and z co-ordinates one after the other. This process is applicable for any 3-D shape (in fact, for any N-dimensional object).

THE RAVEN PARADOX

Ever tried to link an apple mathematically with a crow? Well, what if I say it is logically possible? In terms of probability and reasoning, we might find that our answer dwells, but in the form of a paradox.

The Raven paradox is precisely what is being referred to above. Introduced in the 1940s by logician Carl Gustav Hempel, it is one of the most interesting paradoxes in mathematical reasoning. Also known as Hempel's paradox or paradox of indoor ornithology, it questions the evidence of the truth of a statement. It also questions the likelihood of unrelated observations contributing to the hypothesis of a statement.

According to the Raven paradox, the hypothesis saying that "all ravens (crows) are black" can be tested using an apple. As intriguing as it seems, it offers confusing interpretations as well. Now, from the hypothesis, by logical reasoning, we know that if A implies B then not B implies not A.

Therefore, we get that any non-black object is a non-raven. By this definition, observing an apple that is non-black provides conclusive evidence in favor of the hypothesis. Because an apple is clearly a non-raven, any non-black object in the universe is not a raven. Startling as it is, however, it seems a bit absurd. The absurdness comes from the use of an unrelated observation, i.e., an apple, to make a conclusion regarding the color of a crow. That is precisely the paradox.

This is because, continuing the reasoning, assuming a contradictory argument, i.e., all ravens are white, the corresponding negation is that any non-white object is a non-raven. The existence of black ravens does contradict it but all non-white non-raven things in the universe seem to prove it true. Hence, the raven paradox questions these implications as well. Now, the question arises: whether there is any resolution to this paradox. Numerous mathematicians have given their theories like:

HEMPEL'S RESOLUTION

Hempel did not provide any concrete theory but laid down some base rule for the elimination of the paradox. He stated that just as all non-black things are non-raven have some exceptions, if we eliminate this additional information, we can arrive at a better result

STANDARD BAYES' SOLUTION

This is one of the most popular resolutions for the problem. Bayes and I.J. Goods presented this as a probability sum with weights of different evidences:

Suppose that there are N objects, r ravens and b black which might be seen at any moment with probability 1/N. Let H(i) be the hypothesis that there are I non-black ravens.

Let H(1), H(2), ..., H(r) be equally likely initially. Seeing a black raven gives the Bayes factor in favor of H(0) is :

(r/N)/(mean((r-1))/N, (r-2)/N, ..., 1/N))=2r/(r-1)=2 (approx)

And the Bayes factor if we see a white shoe is:

((N-b)/N)/mean((N-b-1)/N,(N-b-2)/N, ..., max(0,(N-b-r)/N))=(N-b)/max((N-b-1)/2, (N-b-r-1)/2))

Hence, it is a little amount over 1

Thus, evidence shown by a white shoe is small is number if r<N-b

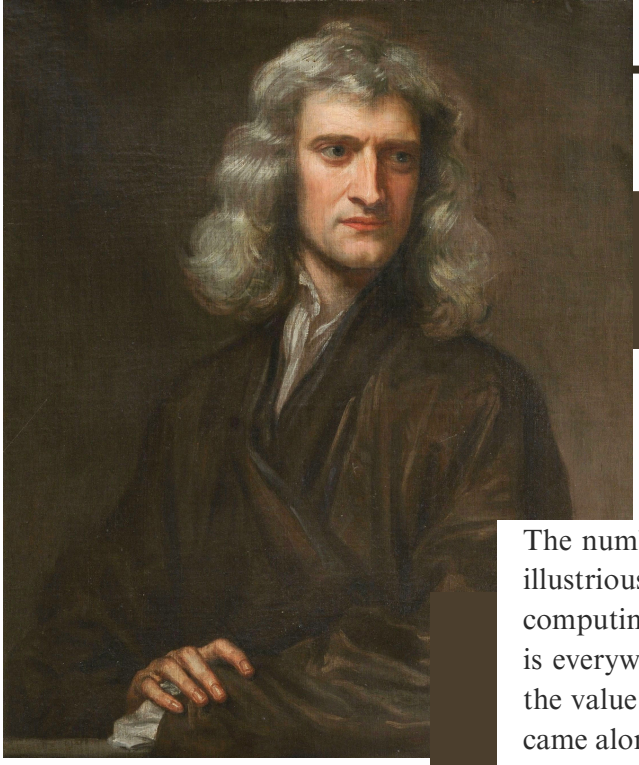
And therefore, we can say that non-black objects do not contribute significant evidence for our hypothesis.

CONCLUSION

Many more such propositions have been made, often with many contradictions. Now, what do you think about this problem and how can it be solved?



— Mohammad Numair
Second Year



How newton Speed ran π

by Ashwini Kumar Upadhyay
Second Year (B)

The number pi is the most well-known number in mathematics, due to its illustrious past and ubiquitous presence. It is used for various tasks, such as computing the areas of circles and evaluating computer processing speed. It is everywhere! For 2000 years, the most successful method for calculating the value of pi was painstakingly slow and tedious, but then Isaac Newton came along and changed the game.

As we all know, a circle's circumference is approximately 3.14 times its diameter. This is Pi, but Pi also relates to the area of a circle, which is Pi R^2. So a unit circle's area is just Pi. Remember it, because you'll need it later.

The ridiculous way we used to calculate Pi was the most obvious way. It's easy to show that Pi must be between 3 and 4. Take a circle and draw a hexagon inside it, with sides of length 1. A regular hexagon can be divided into six equilateral triangles. So the diameter of the circle is two. Now the perimeter of the hexagon is 6, and the circumference of the circle must be larger than this, so Pi must be greater than 6/2. So Pi is greater than 3. Now draw a square around the circle. The perimeter of the square is 8, which is bigger than the circle's circumference, so Pi must be less than 8/2. So Pi is less than 4.

This has actually been known for thousands of years.

And then, in 250 BC, Archimedes improved on the method. So first he starts with the hexagon, just like before, and then he bisects the hexagon into a dodecagon. So that's a regular 12-sided shape, and he calculates its perimeter. The ratio of that perimeter to the diameter will be less than Pi. He does the same thing for a circumscribed 12-gon and finds an upper bound for Pi.

The calculations now become a lot more tricky because he has to extract square roots and square roots of square roots and turn all these into fractions, but he works out the 12-gon, then the 24-gon, the 48-gon, and by the time he gets to the 96-gon, He sort of had enough, but at the end he gets Pi to be between 3.1408 and 3.1429.

So for over 2000 years ago, that's not too bad. It seems like all the precision one needs is in Pi.

This is now a matter of flexing your muscles. This shows off just how much mathematical power one has when one can work out a constant like Pi with very high precision. So, for the next 2000 years, this is how everyone carried on bisecting polygons as Pi passed through Chinese, Indian, Persian, and Arab mathematicians, each contributing to the process. By the late 16th century, Frenchman Francois Viete had doubled his previous record a dozen more times than Archimedes, computing the perimeter of a polygon with 393,216 sides, only to be outdone at the turn of the 17th century by the Dutchman Ludolph van Ceulen. He spent 25 years on the effort of computing to high accuracy the perimeter of a polygon with 2^62 sides. That is 46,11,68,60,18,42,73,87,904 sides!

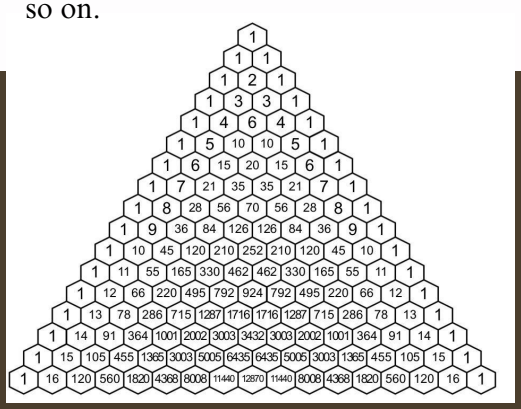


The reward for all of that hard work was just 35 correct decimal places of Pi. And these digits are inscribed on his tombstone. 20 years later, his record was surpassed by Christoph Grienberger, who got 38 correct decimal places. But he was the last to do it this way because, shortly thereafter, we got Isaac Newton, and once Newton introduced his method, nobody ever bisected polygons again.

The year was 1666, and Newton was just 23 years old. He was quarantined at home due to an outbreak of bubonic plague. Newton was playing around with simple expressions like (1+x)^2. One can multiply it out and get 1+2x+x^2. Then what about (1+x)^3? Well, again, one can multiply out all the terms and get 1+3x+3x^2+x^3. And one could do the same for (1+x)^4 or (1+x)^5 and so on.

But Newton knew there was a pattern that allowed him to skip all the tedious arithmetic and go straight to the answer. If you look at the numbers in these equations, the coefficients of x and x^2 and so on, they're actually just the numbers in Pascal's triangle.

Pascal's Triangle



The power of (1+x) is raised to correspond to the row of the triangle. Pascal's triangle is really easy to make. It's something that's been known from ancient Greeks to Indians and the Chinese. A lot of different cultures have discovered this. All one does is, whenever one has a row, just add the two neighbors, and that gives you the value of the row below it. So that's a really quick and easy thing. You can compute the coefficients for (1+x)^10 in a second instead of sitting there doing all the algebra.

One can calculate the numbers in any row without having to calculate all the rows before it for the expression.

(1+x)^n =1+nx + (n(n-1)x^2)/2!+ (n(n-1)(n-2)x^3)/3! …

And that's the binomial theorem. This is a theorem that you can rigorously prove, and this formula is exactly what you'll see as the coefficients in Pascal's triangle.

Everybody saw this formula and yet nobody thought to do with it the thing that Newton did with it, which is to break the formula. The standard binomial theorem insists that you apply it only when N is a positive integer, which makes sense. This whole thing is about working out 1+x times itself a certain number of times, but Newton just applied the theorem. Math is about finding patterns, extending them, and trying to find out where they break. So he tries (1+x)^-1

What happens if one plugs in N=-1 for the right-hand side of the formula? And what one gets is that the terms alternate back and forth. Plus one minus one, plus one minus one, and so on forever.

So that's 1-x. The next term will be a plus x^2,the next one will be a minus x^3 plus x^4 minus x^5 . So that's just an alternating series with plus and minus signs as the coefficient. So it becomes an infinite series. If one doesn't plug in a positive integer, the binomial theorem will give you an infinite sum.

But how do you understand that? Like for all positive integers, it was just a finite set of terms, and now we've got an infinite set of terms. If one has a positive integer, the coefficient looks like N times N-1 times N-2, and so on. When you get to N-N, if N is a positive integer, you will eventually get there, and N-N is zero. So that coefficient and all the coefficients after it are all zero, and that's why it's just a finite sum, But when one plugs in negative integers, you never hit N-N because N is not a positive integer, so you get this infinite series. which means there's more to Pascal's triangle

There are lots of math formulas that could break completely when you do this. That's why we have rules, but we should always know the extent to which the rules have a chance of working.

But Newton doesn't stop with the integers. Next, he tries fractional powers. Like (1+x)^1/2. So now, what does it mean to put N=½ into the binomial theorem? One gets an infinite series. So now we're going to take N to be a half, and he works this thing out, and then he can do all kinds of things. For example, he could work out the 3 very quickly and efficiently because it 3 can be written as 4-1 . And then 21-14, If you put it in the series, you'll get a very rapidly converging series expansion that will quickly give you 3 to high accuracy.

Now, Newton is particularly interested in N=½ because the equation for a unit circle Is x^2+y^2=1. And if you solve for Y, well the top part of the circle which is equal to 1-x2

This is basically the same expression he's been looking at, he just has to replace
X by -X^2, which adds in some minus signs and doubles the power of X on each term.
But now he's got an equation for a circle where each term is just a rational number
times X raised to some power.

(1-x)^½=1-(x^2)/2-(x^4)/8….
Now we have two different ways of representing the same thing. And whenever you have something like that, magic is about to happen. But how does he use this to calculate Pi? Well, luckily for us, he had just invented calculus.

He realizes that if you integrate under that curve as X goes from zero to one, you're getting the area under the curve, which is a 1/4th of the circle. And he knows that the area of a unit circle is exactly Pi R squared except that R is one, so the area is Pi. And we want just ¼ , so the area is Pi/4. On the other side, he has this nice series, and he knows how to integrate X for some power. And now you have an infinite series of terms that just involve simple arithmetic with fractions. You put an x=1 and you can calculate Pi to an arbitrarily high precision.

$$\int_0^1 \sqrt{1-x^2}\,dx = \frac{\pi}{4}$$

But Newton goes even further. A not good math paper has zero ideas, it's just pushing through things that everybody already knows but nobody bothered to do it. Then there are good math papers that have one new idea. That's really shocking. Now Newton's on new idea number four at this point, and he's about to have new idea number five. And new number five is that instead of integrating from zero to one, he's going to integrate just from zero to a half.

When you have an infinite series, you want the terms to decrease in size as fast as possible. So one doesn't have to calculate as many of them to get a pretty good answer. And Newton sees if he integrates not from zero to one, but from zero to a half, then when he substitutes in a x=1/2, each term will shrink in size by an additional factor. But if you only integrate to a half, what is the area under the curve that you're computing? Well, it is this part of a circle, which you can break into a 30 degree sector of the circle, which has an area of Pi/12 plus a right triangle with a base of
½ and a height of 3/2.

$$\int_0^{1/2} \sqrt{1-x^2}\,dx = \frac{\pi}{12} + \frac{\sqrt{3}}{8}$$

And rearranging for Pi, you get the following.

$$\pi = 12\left[\frac{1}{2} - \frac{1}{2}\frac{1}{3}\left(\frac{1}{2}\right)^3 - \frac{1}{8}\frac{1}{5}\left(\frac{1}{2}\right)^5 -\right.$$

Now, if you evaluate only the first five terms, you get Pi equals 3.14161. That's off by just two parts in a 1,00,000. And to match the computational power of Van Ceulen 2^62 sided polygons, you would only need to compute 50 terms in the Newton series. What, before it took years
It now takes only days. So no one was bisecting polygons to find Pi ever again

For me, this is a tale about how the obvious course of action is not necessarily the best course of action and how it is frequently a good idea to play around with patterns and push them outside the realms where you expect them to work because a little mathematics and understanding can go a long way.

Reference:
Video:The Discovery that Transformed Pi
https://www.youtube.com/watch?v=gMlf1ELvRzc&t=842s

DEVIL'S TRILL

The hand moveth swift, her eyes shut tight,
the bow 'gainst the strings, rubbing the melody out.
Her body, the vessel; her mind, controlled,
the fiddle sung the devil's piece, eons and eons old.
A tear once, the blood drop twice
hath fell upon the floor from the conduit's eyes.
It sunk and seeped deep inside the floor
on to the chambers of guilt and sorrow.
Quarter an hour passed, stopeth playing she,
it hath spread all over, the wave of tranquility.

In white all three, yet none were pure,
their soul solely thine and thine alone.
his hands around his neck wrapped he
the judge took life, his own for thee.
the other two judges, also dead,
took their own, no, each other's life instead.

The player, she left, for the bigger throng awaits,
the biggest performance was yet to happen
the promised star was she yet to be made.
she reached the hall, with thousands was it filled,
the fiery red eyes of the player eyed them all
and thus it hath begun, the devil's trill.
The hall echoed of the melodious piece,
the conduit's eyes shut tight, could see
the souls, slave soon to become.

Both her orbs wept,
the clean white left, the bloody red right.
Streams of blood and tears gushed down the floor to hell.
Quarter an hour passed, stoppeth playing she,
it hath again spread all over, the wave of tranquility.
The audience, none alive, themselves or each other they killed,
the devil called upon her, for it was achieved, her desire.
The hall, with dead corpses was filled,
the player's body droppeth, and her soul rejoices with
the devil's choir.

AUTHOR'S NOTES:

Confusing? Well, the story behind this violin piece might help you understand. Niccolo Paganini, a famous violinist wanted to compose the best musical piece ever written and played. But months of hard work bore no fruits. One night, the devil came to visit him and played him his 'Devil's Trill Sonata'. He gave him his music, a soul being the payment, either his or someone else's. Niccolo being a pure soul won't take other's life so he gave his and thus became the part of the devil's choir. It is believed that the music piece promises fame to anyone who plays it and lures the listeners into believing so.

Now, let me break down the poem for you. Another violinist auditioned to perform solo on the big stage. There were three judges and she performed the devil's trill. The same options and dreams of fame were given to the judges (by the devil, of course). One of them committed suicide and the other two killed each other. The tears and the red blood drops are symbolic of the souls of those greedy judges. As none survived the song, the devil himself became the judge, and thus that violinist performed on the big stage. There, just like the judges, the fate of the audience was decided, they were the devil's. In the end, as Satan promised, the player was given the promised fame and was asked to join the devil's choir.

This is my first try at blank verse (No particular rhyming scheme but a tempo). Here I preferred the usage of archaic terms, for Satan's music is very old. In the first para, the term guilt and sorrow refers to Hell. In the second para, the word 'thine' has been used for the devil himself. In the third para, the big performance takes place, where Lucifer harvest on thousands of soul, and in the fourth, as a reward, the violinist was granted a position in the devil's choir.

Now, I urge you to read the poem again. Hopefully, it will make sense now :D

-Ishmeet Singh
Second Year

आज का सच

यह कविता उन माता-पिता की मनोदशा को दर्शाती है , कि कैसे समय आने पर उनके बच्चे अपने कर्तव्य से पीछे हट जाते हैं । उन्हें यह जानने और समझने की आवश्यकता है कि केवल उनके माता-पिता ही है जो उन्हें बिना किसी शर्त के , निस्वार्थ भाव से , अपने आप की परवाह किए बिना , निश्चल प्रेम करते हैं लेकिन इस बारे में दूसरा विचार किए बिना, वे अपने माता पिता को या तो वृद्धाश्रम भेज देते हैं या किसी नौकर के सहारे घर में अकेला छोड़ देते हैं , तब उनके दिल पर क्या गुजरती है वह यह कविता दर्शाती है ।

दो फूल खिले एक अंगना में ,
जिसका माली था एक ।
जिसकी खाद भी थी कभी एक ,
जिसका पानी भी था कभी एक ।
बड़े हुए भी एक ,
लहराए हवा में एक ,
और झड़ भी गए एक ।
पर फिर गिरे , उगे , उठे और दिए फूल भी एक ,
लेकिन इस संसार की रीत बना गई उन्हें दो ।
अलग हो गए वह एक ,
समझ भी हो गई अनेक ।
भूल गए वो उस माली को ,
भूल गए वह उस पानी को ।
समझ में न आई उनकी एक ,
बदल डाला जो था कभी एक ।
जिसकी खाद भी थी कभी एक ,
जिसका पानी भी था कभी एक ।
गुजारिश है अध्ययन करो उस माली का ,
जिसके कभी मोहताज थे ,
कर दिया उसे पानी का भी मोहताज जो ।।

by Poonam Sharma
Second Year



Theory of Life

Don't run from it , it will be fun definitely.
Go with the flow and
achieve anything in your low.
Not going to make it without the basics,
So why can't we go after its mathematics?

Don't run from it, it will be fun definitely.
For all teens, I have the value to add,
It will make life smooth,
If made forever friend.
The theorem of life will be abstract,
If the key to prove exists in the head and hand.

Don't run from it, it will be fun definitely.
For every worry there exists,
a positive epsilon in the name of a solution such that,
the limit, whether positive or negative, will be worthwhile always,
So why stress the mind always.

Don't run from it, it will be fun definitely .
Follow the path of addition,
Adjoin all the execution to yield maturation.
Follow the path of subtraction,
Cut-off all the harrowing events,
and work upon your actions.

Follow the path of division,
Fractionate the load of all the past actions.
Follow the path of multiplication,
Split up your benevolence among others to gather elatedness.
Don't run from it, deal with it mathematically.

Poonam Sharma
II - Year



THE POOR MAN'S JUSTICE

Medha Pandey | Second Year

It slithered onto a bare wrist,
a shining chain of silver flow.
It wasn't a means for justice served,
just a poor man's freedom to come and go.

Knowing not the petty crime,
that holds me prisoners in these walls,
But no need to look for a roof,
I wish to stay till the fortress falls.

Maybe I've known people,
not narrowed by this filthy stench.
Maybe I've seen the world–
but found my peace at a prisoner's bench.

I try not to remember,
or maybe even I have tried?
Maybe even I have descended,
from a forgotten king who lived and died.

And so I don't lie awake,
a doubtless deep sleep at night.
I don't wonder why I'm here,
I fall asleep without a fight.

Awakened by some rude intruders,
who accused me of so and so.
They walked me up some raised stage.
They freed me from the silver flow.

With a bag over my head,
maybe not a crown to show,
but I stood there, a free man,
they signalled it was time to go.

I fit my head into the hole,
my neck was caught in silver flow.
Not justice serve, a poor man's death
But just a life to come and go.

THE SAGA OF Epsilon

The fifth Letter of Greek
is not often used but unique,
though it is not forged from iron
it is arbitrary called Epsilon.

Since Epsilon is arbitrary, let it lie between zero and infinity.
Here, Epsilon teaches morality, says, its not zero or miserly
and also not rich like unity,
it says, I am not a man of class.
I am one among the flickering middle class.

Epsilon represents a property of mankind,
says, I am two of my kind.
One of rational, other of irrational kind,
says, it depends on you what in me you find.

Now, Epsilon is sad and angry,
says them, I am also used while comparing.
In these gloomy clouds, it finds a beam of hope,
I think he found someone who would cope.

One day they were sitting together, Oh! the Epsilon & Delta,
on the next day, we found a relationship between Epsilon & Delta.
They were married and spent their life happily,
now, they can memories one thing, oh its memories.

-Akash Yadav
II - Year

THINKING OUTSIDE THE BOX

Gagan Deep Singh | Second Year

Innovation is the fundamental basis of scientific progress. Just relying on the information we already possess and merely using it in the form we already know would halt any scientific developments in the future. It is but a necessity to take something other than the conventional approach, which we often term “thinking outside the box”. The most outstanding scientists like Newton, Archimedes, Einstein, etc. thought away from the bounds of the societal approach of science, even against it, and ended up creating the biggest niche in the scientific world.

So how can mathematics, which is an integral part of science, achieve progress by just relying on the already available information and methods? There is no way for mathematicians to move forward in their field without “thinking outside the box”- proving and disproving theorems, finding out new formulae and newer methods to easily solve problems, challenging the already established hypotheses and postulates, finding out new and interesting, ways to make the calculations easy- the list of innovative ideas in the mathematical field just keeps on expanding.

Similar to the greatest scientists of history, the greatest mathematicians also had their method of unconventional thinking. For instance, one of the greatest Indian mathematicians of all time, Srinivasa Ramanujan. He made notable contributions to various areas in mathematics, such as the elliptic functions, continued fractions, and infinite series, and left a particularly significant mark in the area of the analytical theory of numbers. However, the interesting fact about him is that he did not major in mathematics even after being granted a scholarship from Trinity of College, Cambridge in the UK by the British mathematician Godfrey H. Hardy. So, all his mathematical achievements were not inspired by his knowledge of the mathematics being taught at universities during that time. Instead, he worked with his understanding of the subject, worked with his theories, all of which might not have been accurate, but did produce the desired results in the end.

Similarly, we can think about the invention of one of the most important components of past and present mathematics, zero.

Its importance in Mathematics is indeed irrefutable. Without zero, a number system can't be developed. We use zero as an identity in group theory. It can also be treated as ideal in the ring. These are parts of the abstract algebraic approach. So we find different uses for zero. Its invention cleared our explanation of the balance of the earth. Any equation is nothing but representative of balance with zero. However, if a person just normally thought about it, would he be able to come up with such a revolu-tionizing thing? Aryabhatta is known as one of the greatest mathematicians of all time just because of his mathematical approach to the world and his unconventional way of perceiving common ideas.



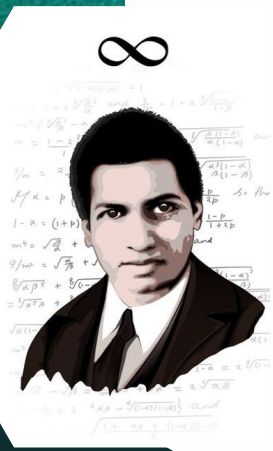
Another example would be Archimedes. Archimedes anticipated modern calculus and analysis by applying the concept of the infinitely small and the method of exhaustion to derive and rigorously prove a range of geometrical theorems, including the area of a circle, the surface, area and volume of a sphere, the area of an ellipse, the area under a parabola, the volume of a segment of a paraboloid of revolution, the volume of a segment of a hyperboloid of revolution, and the area of a spiral.

Archimedes' other mathematical achievements include deriving an approximation of pi, defining & investigating the spiral that now bears his name, and devising a system using exponentiation for expressing very large nos. He was also one of the first to apply mathematics to physical phenomena, founding hydrostatics & statics.

Archimedes' achievements in this area include proof of the principle of the lever, the widespread use of the concept of the center of gravity, and the pronunciation of the law of buoyancy. He is also credited with designing innovative machines, such as his screw pump, compound pulleys, and defensive war machines to protect his native Syracuse from invasion.

Being a mathematician of the ancient era, when not much was known about the subject in the first place, it would not be wrong to say that he laid down the foundation for the "box" that the upcoming mathematicians would use as a reference to delivering their contributions to the field of Maths, a truly fitting role for someone titled as the "Godfather of Mathematics".

ZERO TO INFINITY



Zero is the number that represents an empty quantity or Null Quantity that doesn't exist and also serves as a placeholder in numerical digits. Infinity is that which is boundless or endless or larger than any natural number. In physics, it is defined as something you can't reach or an unreachable quantity.

The zero first came out when in about 773AD a mathematician Mohammed ibn-Musa al-Khowarizmi was the first to work on the equations that were equal to zero through which he called it "sifr"

By the nineteenth century Zero was part of the Arabic numeral system. After that the earliest recorded idea of infinity in Greece may be that of Anaximander (c. 610 – c. 546 BC) a pre-Socratic Greek philosopher. He used the word apeiron, which means "unbounded", "indefinite", and perhaps can be translated as "infinite", then after this, the symbol for infinity was discovered by John Wallis an English Mathematician in 1655 whom we know as currently. Now if we go towards the theory of Zero and infinity we may find that both of these Quantities are really important for modern-day mathematics, because without zero there are no mathematical operations like addition, subtraction, multiplication and division, whereas if we look towards infinity then there is no Calculus, Real and Complex Analysis, Set Theory etc.

The relation between zero and infinity first arises from the theory that what is the value of any number divided by zero it is pretty illogical to think that because it is not possible something divided by zero leaves nothing so from here we currently state this by the term "∞".

There is another condition that we face in some of the cases what is the value of. In particular, it is currently not defined what the value of going to be. Some state that this is the same as and thus it equals to "∞" but some think that it is something else that doesn't exist in current mathematics.

Also, we can get to the following theories:

- In the real numbers, for any real number c. It is not defined how since is not defined.
- If a sequence of positive real numbers converges to ∞ (i.e., diverges), then the sequence of the reciprocals of those numbers converges to 0.

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Also: Zero is a number whereas infinity isn't a number but a concept to define the unbounded region of numbers
These two terms play a major role in every field of science like physics, chemistry, etc.

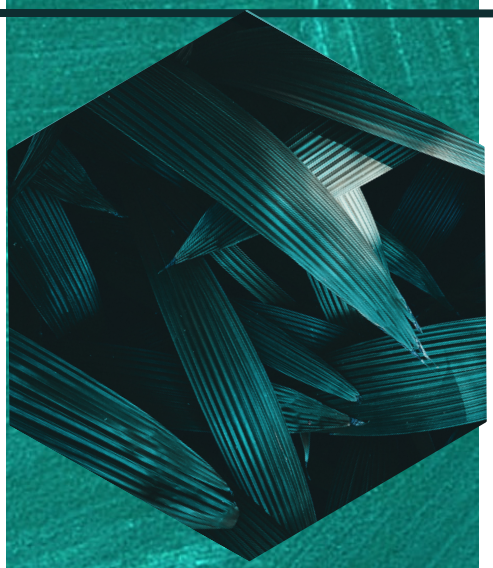
PHYSICS

The science of physical infinities is much less developed than the science of mathematical infinities. The main reason is simply that the status of physical infinities is quite undecided. In physics, we can see the term infinity in space, time, divisibility, or dimensionality.
Also in physics, we use zero as to show the initial or starting condition for any quantity like time, distance, temperature, force, energy, momentum, etc.

CHEMISTRY

In chemistry, zero has been proposed as the atomic number of theoretical element. Also, the temperature of any element will be determined above or below Zero. Temperature above zero is considered as warm whereas below zero is cold

There are many more theories related to zero and infinity but mostly some of them are unknown. Sometimes 0 is considered as a non-numerical concept that only exists to complete the number system, and infinity is only considered as a hypothetical case for something that is not in reach.





Mayank Bharti
Year – IInd

Tout le temps à venir

By Ishmeet Singh
Second year (A)

I AM SUMMER :

THE WARMTH I GIVE TO THE NEW ONES,
A SHINE FAR MORE BRIGHTER
THAN A THOUSAND SUNS.

I AM MONSOON:

I CRAMP, SHE ENDURES AND RETCH
OH WHAT NOT SHE SUFFERS FROM, THAT POOR WRETCH!
THE BARRIER BREAKS, MY HEAVEN BLEEDS
IT PAVES THE WAY TO SOW THE NEW SEEDS.

I AM AUTUMN:

PERPETUITY, A SHAM
FOR ALL, WITH TIME ENDS.
THE MORTAL'S PLIGHT TOWARDS FIXITY, A SCAM
NATURE IN ITSELF SHALL MAKE AMENDS.
WITH TRUTH I GO,
AND REPLACE THE OLD WITH NEW
LIKE THE FALL, I LET IT FLOW
AND PERHAPS, YOU SHOULD TOO!

I AM WINTER:

THE ICY FROST SHROUDS AND HIDES
THE BREATHING LIFE INSIDE,
THE DREADFUL HUSH OR SCREAMING WRATH
ATOP THE CRUST SHALL FOOL YOU NAUGHT,

THE LATENT LIFE INSIDE IT GROOMS
JUST WAIT UNTIL IT BLOSSOMS, BLOOMS.

I AM SPRING:

THE OOZING ESSE, MY BREATHING WORLD
PRANCES IN AN ENDLESS SWIRL,
A COMPLEX BEING, A VITAL PART
AND OF ALL, THE GREATEST CARRIER,
I AM THE CANVAS OF THE ART
I BLEED WITHOUT BARRIER.



GOLDEN RATIO: MATH OR MYTH ?

Prerna Dumka | Third Year

Is there truly a special number that underlies everything from sunflowers to sea shells, from pineapples to pinecones, and from the pyramids to the Parthenon? A number that can link beauty, art, music, and the human body together, i.e., the rules of mathematics to nature's law of order.

Phi is an irrational number. In 300 B.C., Euclid wrote a book called 'elements', where he first described 'phi' or 'golden ratio' using a golden triangle. In a Golden triangle, the ratio of the long side to its short side is called the golden ratio. It is also called a Sublime triangle, whose angles are 72, 72, and 36 degrees. If we divide one side according to the golden ratio, it will make another golden triangle.

What makes Phi special is that it shows up out of the blue in many places that are pretty far off from the geometry class. Or at least people claim to find phi in a bunch of unexpected places. And because we find it in so many deeper places, is it supposed to be a sign of a deeper secret?

Where does the real story of Phi end and the myth begin? Leonardo of Pisa, aka Fibonacci, wrote a book called Liber Abaci i.e., the Book of Calculation, wherein he mentioned a problem about rabbits whose answer resulted in the famous Fibonacci sequence. It was Kepler who found that as you go closer and closer to the ratio phi, in fact, any sequence of numbers following the Fibonacci rule tends to phi. Now the big question is, 'Does phi the golden ratio, the divine proportion, really show up everywhere in nature, or is it our pattern-sensing brain making us think that we see it everywhere?'



A nautilus shell. The claim is that if you trace the spiral of the shell, each ring is a golden ratio away from another ring. But people have gone out and measured loads and loads of nautilus shells, and they aren't golden spirals. Things like snail shells and sheep horns are all examples of logarithmic spirals, but they aren't golden spirals.

If phi is the fundamental building block in nature, we should be able to show that it is more than a coincidence. There are some reasons behind it being there, let's talk about some examples where phi exists. There are 8 spirals in one direction and 13 spirals in another, both of them are Fibonacci numbers, so their ratio is phi.

The ratio of the height of the navel to the height of the body is claimed to be in the golden ratio. The Great Pyramid of Giza, the Porch of Maidens, Athens, the Taj Mahal, and Chartres Cathedral are a few of the world architectures that people claim were built according to the golden ratio dimensions. The ratio of one turn of the DNA helix to its width is said to be 34A high per turn and 21A wide. Their ratio is claimed to be 34/21=1.68, which is very intriguing but is not scientifically correct because the correct measures are 34.86/21=1.743.

Here is the key thing in any examples, phi isn't approximately 1.6. It is exactly an irrational number. When people go measuring things, looking for the golden ratio, they often measure them in ways that ensure that they find the golden ratio. Our brains love patterns, and once we learn a pattern, we tend to find it in unlikely places. Once we are familiar with the human face, we tend to find such patterns in the clouds, vegetables, and even the moon.



We see the same number of spirals going in each direction in the pine cone too. Some may say that it's because both of them are 'pines', so that doesn't make any sense. The pineapple leaves also follow the Fibonacci pattern; it is the best pattern for more leaves to get sunlight without getting overlapped. The same arrangement can be seen in a sunflower.

But that doesn't mean that plants have a gene programmed to do the math and achieve the golden ratio pattern. The reason behind it is that plants have undergone a gazillion years of evolution. In the process of evolution, they have found the best way to satisfy their needs, whether it is about the leaves getting the maximum amount of sunlight or fitting a large number of seeds in a small space. Different species of plants follow different patterns, plants like corn leaves and mint leaves do not show Fibonacci patterns, and it works just fine for them. And that's the fundamental of evolution that something evolves to work 'just fine' for the species, not that everything evolves to attain golden perfection.

Our obsession with the golden ratio has more to do with beauty than with math. Fibonacci spirals are beautiful, which is the reason why we are attracted to this pattern more than other patterns. And that's the thing about beauty, it can take so many forms. Some artists like x and y purposely use the golden ratio but there is plenty of other art that makes no use of the golden ratio. So beauty or perfection does not imply the presence of a golden ratio.

Mathematics follows very particular rules, while beauty and life do not. The world around us is chaotic and jumbled, but if we look closely, we can find some order after all.

Reference-
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https://www.youtube.com/watch?v=1Jj-sJ78O6M&t=1032s
https://www.youtube.com/watch?v=4xpda7WB87w



π-DAY

Anurag Maurya | Second Year



PI Day is celebrated annually on March 14. It is celebrated in the name of the mathematical symbol pi (π) which has its own importance in mathematics. The date March 14 is selected for the celebration of Pi Day because the first three letters of the values of Pi are 3,1 and 4, and these three letters are taken as month and date, which is the 14th day of the 3 months of a year. This was founded by Larry Show in 1988, an employee of the San Francisco, California Science Museum. The first Pi Day was celebrated at the Exploratorium (Shaw's place of work), a San Francisco-based interactive science museum, which features a circular parade and the eating of fruit pie.

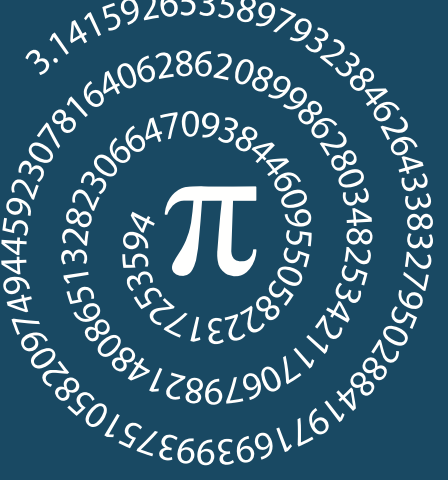
Here comes the question Why do we celebrate Pi Day?

So Pi is a very important constant that is used in mathematics. Pi has its significance. Pi was originally discovered as the constant equal to the ratio of the circumference of a circle to its diameter.

The value of Pi is calculated over one trillion digits beyond its decimal point, and the calculation will go on because Pi is an irrational number. We can say that Pi is an irrational number of digits without repetition. It is very interesting to say that pi has no pattern, but it plays a very important role in the formation of another pattern.

If we go to the history of pi, in the second half of the 16th century, a French Scientist, Francois Viete, discovered an infinite product that converged to π is known as Viete's formula.





DID YOU KNOW?

A famous scientist and physicist* Albert Einstein*'s birthday also falls on the same day.



There are many who are attempting to make a n-gon, which was used to calculate the perimeter of a circle. In 1621, Willebrord Cyclometriculus Snellius came to the result that the perimeter of an inscribed polygon converges on the circumference twice as fast as the perimeter of the corresponding circumscribed polygon. It was proved by the Christian Huygens in 1654.

On March 12, 2009, the US House of Representatives passed a non-binding resolution recognizing March 14 as National Pi Day. UNESCO's 40th general conference accepted Pi Day as the International Day of Mathematics in November 2019.

For Pi Day 2010, Google represented a Doodle laid over images of circles and Pi symbols; and for the 30th anniversary in 2018, it was a Dominique Ansel Pie with the circumference divided by its diameter. The whole month of March is celebrated as a Pi month in 2015. It had a special significance as the date is written in the form of 3/14/15 in month /day/year format. At 9:26:53, the date and time included together make the first 10 digits of Pi.

A decision was put online at 9:26 am, following that year's "pi minute", and in 2020 it was released at 1:59 pm, making the first 6 digits of Pi. Some other days were also there which are considered as an approximation of Pi Day, such as 10th November, which is the 314th day of the year, and July 22 (22/7 in the day /month format).

Two Pi Day is also known as Tau Day which is another mathematical constant Tau whose value is approximately double the value of pi is observed on June 28 (6/28 in the month/day format).



Convergence
अभिसरण

As they say, mathematics is the language of the universe. Every day, every second, we are converging. Where? You may ask. To our goals, our desires, and… to the grave. This poem is an ode to that language of convergence (abhisaran in Hindi) that is all around us, teaching us the truths of life.

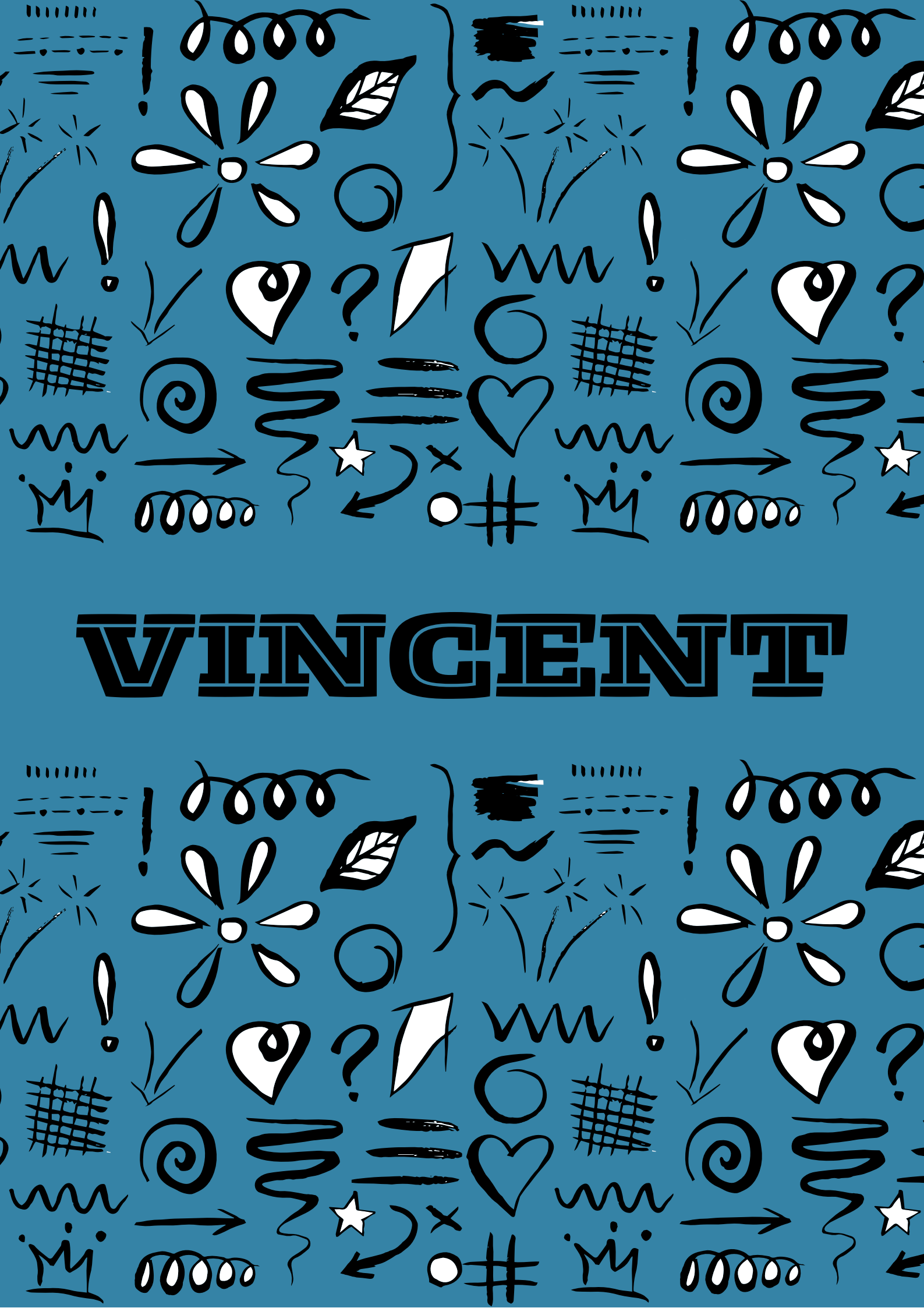
एक विशाल समुंदर है, आकाश से गहरा पानी है
शाम की धूप में चमक रहीं, ये लहरें बड़ी अभिमानी हैं
इठलाकर टकराती हैं, छूकर साहिल के रेत-चरण
मिल जाती हैं फिर पानी में, करने अनंत में अभिसरण

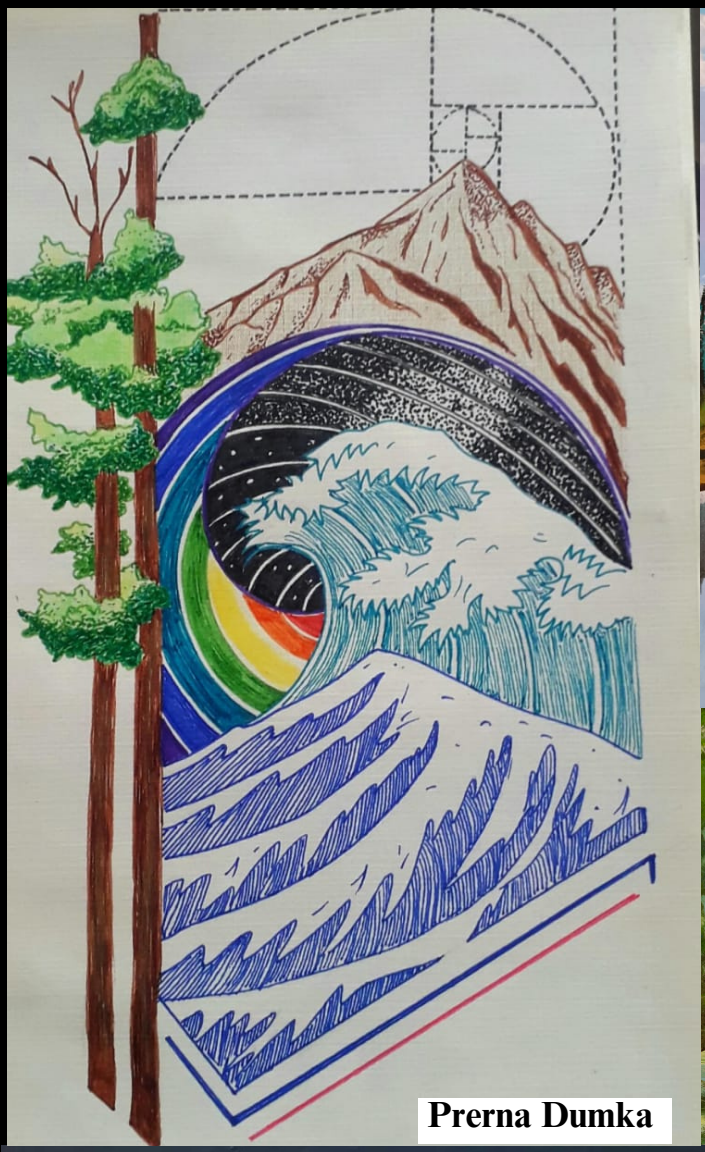
सूरज तेज प्रताप से जग को, शौर्य गाथाएँ सुनाता है
अगले ही पल बादल आकर, उन गाथाओं को ढक जाता है
फिर क्या शौर्य,कैसी गाथाएँ, क्या सूरज, क्या रही किरण?
जब परिवर्तन के नियमों में, प्रकृति का भी होता अभिसरण

जो न मिला हो हिस्से में, उसे छल-कपट से छीना है
जब दिया भी है तब भी पहले, अपना ही लाभ देखा है
मोह-बंधन में फँसकर फिर तो, क्या बाँटा, क्या किया हरण?
जब मन के तार-तार में होता हो, लालच का ही अभिसरण

ये जीवन हर खालीपन को, पूरा करने में बीत जाता है
अंत कल, यह तन-मन उसी कोरेपन में विलीन हो जाता है
शून्यता के इस व्यूह में, फिर तो क्या जीवन, क्या हुआ मरण?
जब सृष्टि के कण-कण का, भीतर ही होता अभिसरण
भीतर ही होता अभिसरण....

-KSHITIJ KUMAR
Third Year


VINCENT



Prerna Dumka



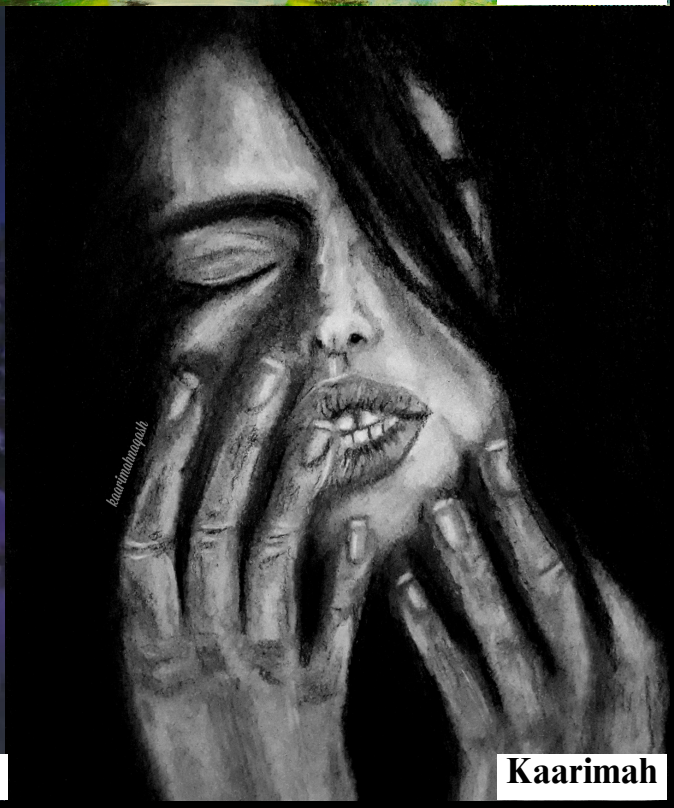
Lakshmi Kalayanraman



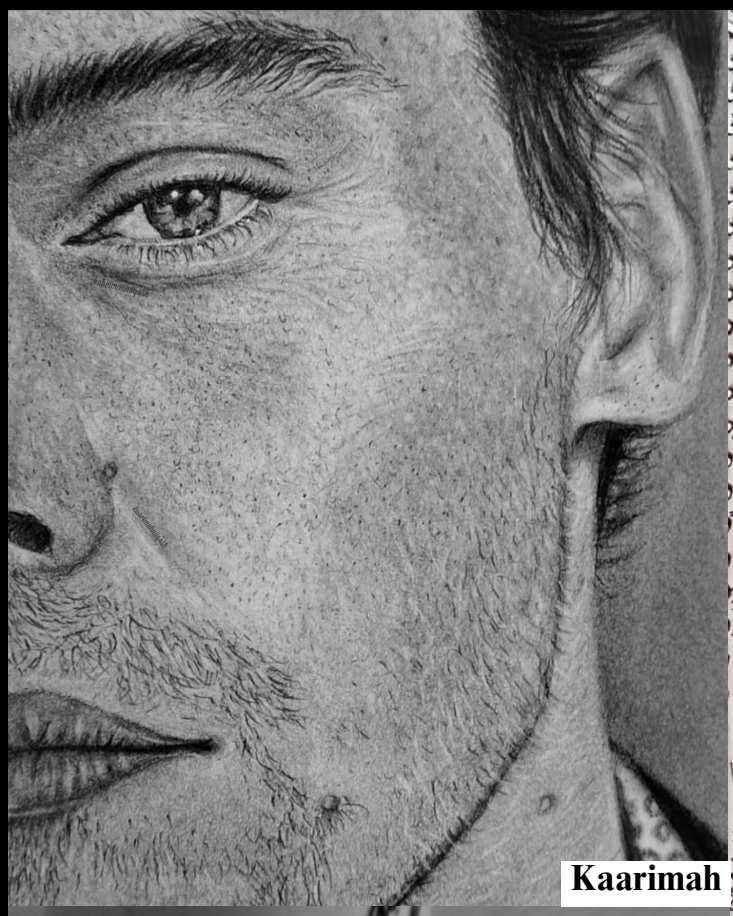
Kaarimah



Lakshmi Kalayanraman



Kaarimah



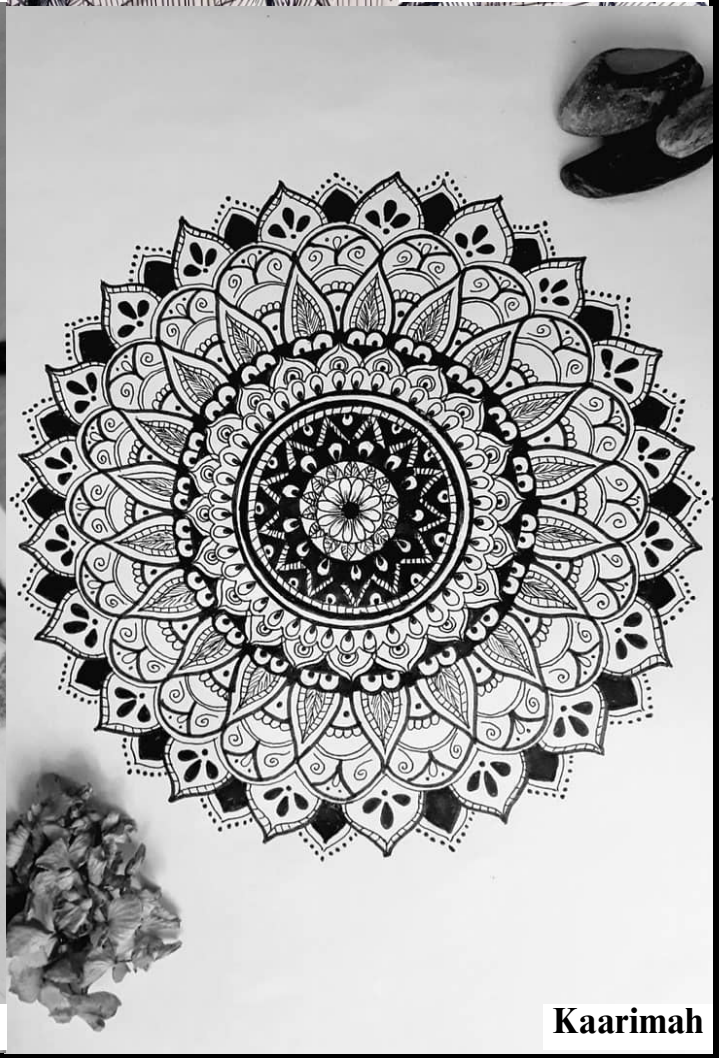
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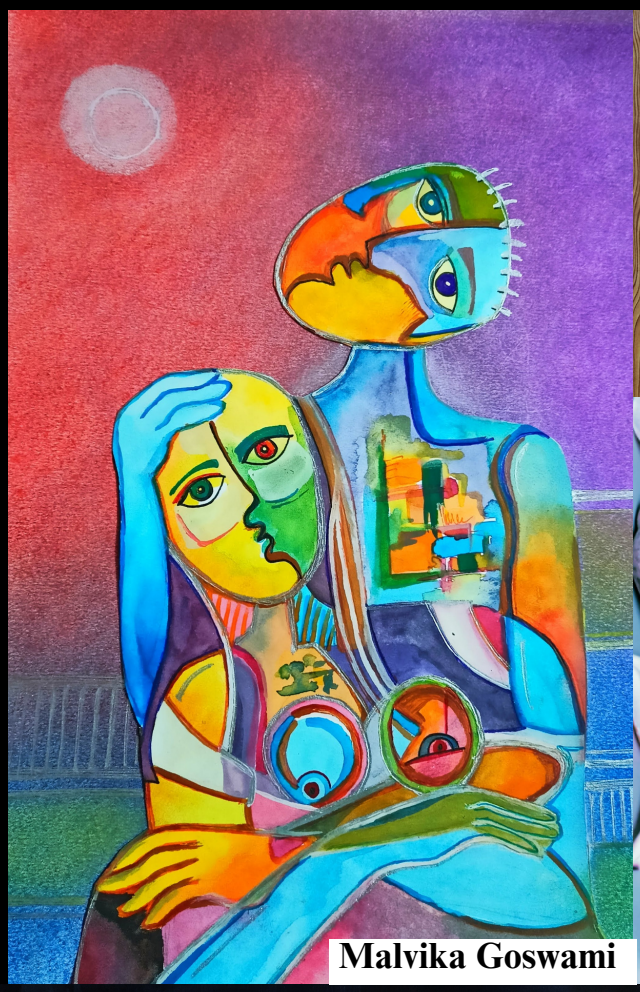
Malvika Goswami



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Malvika Goswami



Yuvraj Singh



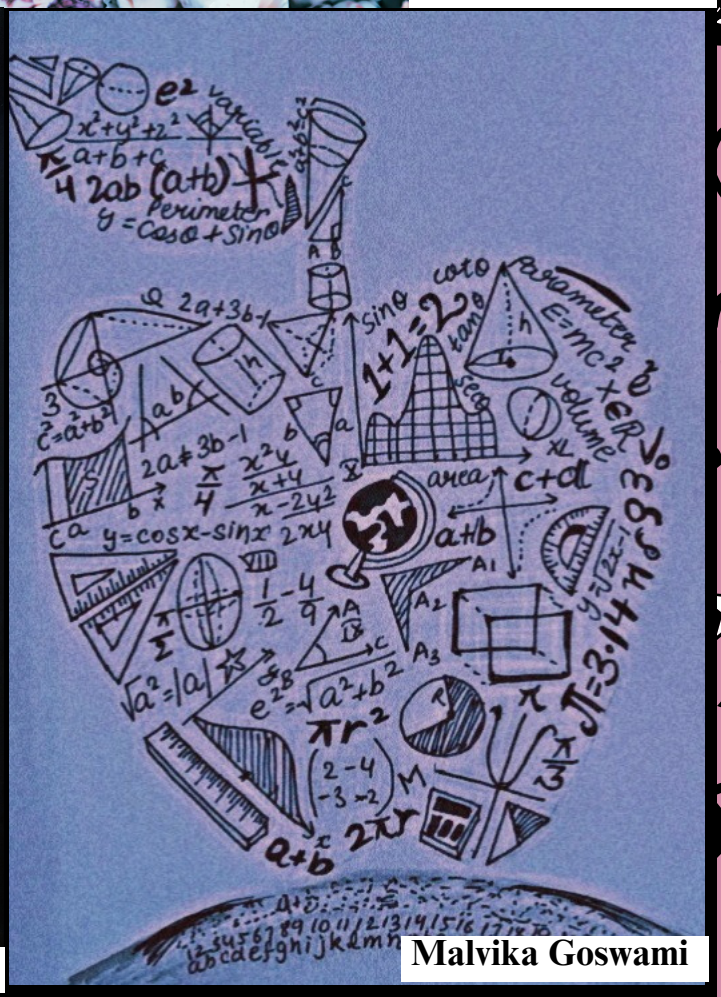
Jessica



Malvika Goswami



Jessica



Malvika Goswami


STILL
MEMORIES



Anannya



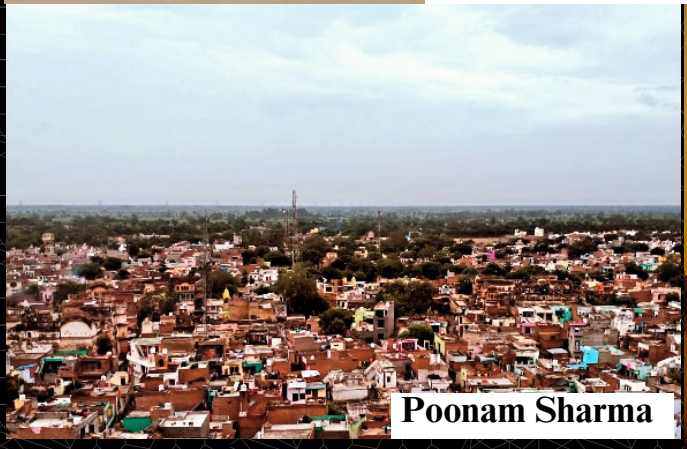
Anannya



Akanksha Singh



Anannya



Poonam Sharma



Anannya



Akshath



AkankshaSingh



Akshath



AkankshaSingh



Akshath



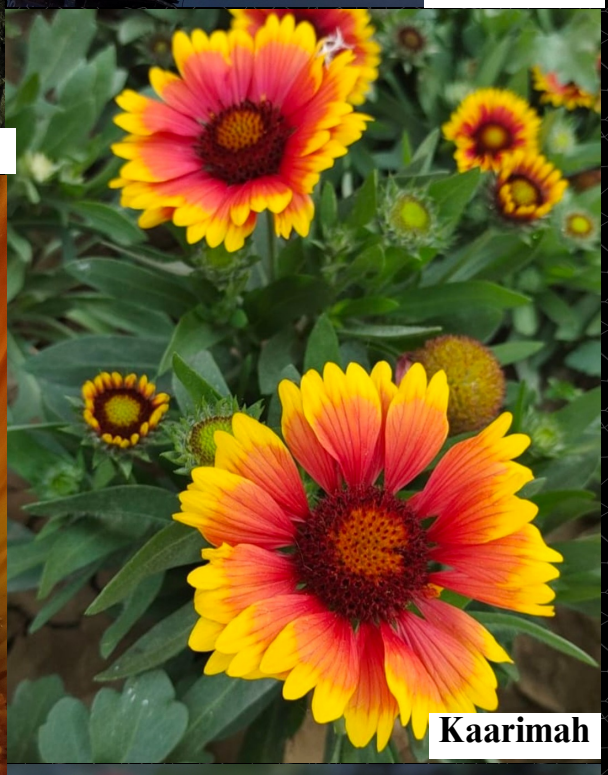
AkankshaSingh



Aneesh Chatterjee



Kaarimah



Kaarimah



Akanksha Singh



Akshath

SRI VIPRA

REPORT

2021-2022

SRI VIPRA

REPORT

Sri VIPRA (Undergraduate Research Opportunity for Sri Venkateswara College) is a prestigious program that offers undergraduate students the opportunity to engage in research projects under the guidance of faculty members. The research project runs for a period of three months, tentatively from June to September. The Department of Mathematics at Sri Venkateswara College has been actively participating in this program, providing students with valuable research experiences. This report highlights the projects undertaken by the Department of Mathematics during the years 2021 and 2022.

2021

The following projects were undertaken in the year 2021

1. Project : "Journey of Pi"

   Faculty : Dr. R K Budhraja.

S.No	Name of student	Course
1	Dolly Goyal	B.Sc Mathematics Hons IIIrd year
2	Saumya Sharma	B.Sc Mathematics Hons IIIrd year
3	Harsh Sharma	B.Sc Mathematics Hons IIIrd year
4	Kumari Kusum	B.Sc Mathematics Hons IIIrd year

2. Project : "Analysing COVID-19 Data using Statistical Software R"

   Faculty: Dr. Rajni Arora

S.No	Name of student	Course
1	Disha Gupta	B.Sc Mathematics Hons 4th sem
2	Nishank Gupta	B.Sc Mathematics Hons 4th sem
3	Priyal Chopra	B.Sc Mathematics Hons 4th sem
4	Shakya Sinha	B.Sc Mathematics Hons 4th sem

3. Project: "Construction and exploration of certain complex valued Function geometrically"

Faculty: Dr. Nisha Bohra

S.No	Name of student	Course
1	Anant Narayan	B.Sc Hons Mathematics
2	Imran Hussain	B.Sc Hons Mathematics
3	Jaskaran Singh	B.Sc Hons Mathematics
4	Jayati Sood	B.Sc Hons Mathematics
5	Prassanna Nand Jha	B.Sc Hons Mathematics
6	Vidhi Yadav	B.Sc Hons Mathematics

4. Project. "High order Discretization for the Helmholtz Equation"

Faculty: Dr. Neelesh Kumar

S.No	Name of student	Course
1	Ashish Prakash	B.Sc Mathematics(H),Sem II
2	Rishabh Banerjee	B.Sc Mathematics(H),Sem II
3	Rishabh Jhakmola	B.Sc Mathematics(H),Sem II
4	Soumya Jain	B.Sc Mathematics(H),Sem II
5	Siddhi Agarwal	B.Sc Mathematics(H),Sem II
6	Ananya Kaushik	B.Sc Mathematics(H),Sem II
7	Harsh Vardhan Kukreti	B.Sc Mathematics(H),Sem II
8	Akanksha Singh	B.Sc Mathematics(H),Sem II
9	Prerna Tuteja	B.Sc Mathematics(H),Sem II

5. Project: "Role of Mathematics in Artificial Intelligence"

Faculty: Dr. Garima V

S.No	Name of student	Course
1	Ramnaresh Dara	B.Sc(Hons) Mathematics
2	Anjali Kumari	B.Sc(Hons) Mathematics
3	Kashish	B.Sc(Hons) Mathematics
4	Surabhi Rawat	B.Sc(Hons) Mathematics
5	Vivek Kumar Mahto	B.Sc(Hons) Mathematics
6	DishanT Kaushik	B.Sc(Hons) Mathematics
7	Jahnvi Agarwal	B.Sc(Hons) Mathematics
8	Palak Chaudhary	B.Sc(Hons) Mathematics
9	Neer Kumar	B.Sc(Hons) Mathematics
10	Pranavi Kasireddy	B.Sc(Hons) Mathematics

6. Project: "Algorithms and their Complexity"

Faculty: Dr. Deepti Jain

S.No	Name of student	Course
1	Honey Jain	B.Sc(H) Physics 2nd Year
2	Pratyush Ranjan Behra	B.Sc(H) Mathematics 3rd year
3	Rishabh	B.Sc(H) Mathematics 2nd year
4	Saurav Tanwar	B.Sc(H) Mathematics 3rdyear
5	Vidhi Chauhan	B.Sc(H) Mathematics 3rd year

7. Project : "Neural Network and Deep Learning"

Faculty: Mr. Anirban Chatterjee

S.No	Name of student	Course
1	Sejal Arora	B.Sc(H)Mathematics,Semester 4
2	Tanishq Handa	B.Sc(H)Mathematics,Semester 6
3	Ankita	B.Sc(H)Mathematics,Semester 4
4	Harjeet Singh Khera	B.Sc(H)Mathematics,Semester 6
5	Mansi Garg	B.Sc(H)Mathematics,Semester 6
6	Naman Kumar Jain	B.Sc(H)Mathematics,Semester 4
7	Rita Dasuni	B.Sc(H)Mathematics,Semester 4
8	Shibani Maharana	B.Sc(H)Mathematics,Semester 4

8. Project : "The Application of Differential Equations in Biology"

Faculty : Amit Kumar and Sudhakar Yadav

S.No	Name of Student	Course
1	Aryan Kumar Prasad	B.Sc(H)Mathematics,Semester 3
2	Neha Gautam	B.Sc(H)Mathematics,Semester 3
3	Fardeen	B.Sc(H)Mathematics,Semester 3
4	Priyanka	B.Sc(H)Mathematics,Semester 3

2022

The following projects were undertaken in the year 2022

1. Project : "Black Scholes Model and its applications"

Faculty: Dr. Rajni Arora and Dr. Garima V.

S.No	Name of Student	Course
1	Palak Chaudhary	B.Sc(H)Mathematics,Semester 4
2	Sameer Gupta	B.Sc(H)Mathematics,Semester 4
3	Arushi Gandhi	B.Sc(H)Mathematics,Semester 4
4	Jahnvi Agarwal	B.Sc(H)Mathematics,Semester 4
5	Ayush Gupta	B.Sc(H)Mathematics,Semester 4

2. Project : "Mathematical Modelling and Machine learning for Biomathematics"
   Faculty : Dr. Sudhakar Yadav and Dr. Mainak Mukherjee

S.No	Name of Student	Course
1	Akshath Devaraj	B.Sc(H)Mathematics,Semester 4
2	Darius Singh	B.Sc(H)Mathematics,Semester 5
3	Arunima Goel	BA(P) Economics+Mathematics,Sem 4
4	Bhumika Taneja	B.Sc(H)Physics,Semester 6
5	Manisha Ahuja	B.Sc(H)Physics,Semester 4
6	Shruti Vohra	B.Sc(H)Statistics,Semester 5
7	Th Phalguni	B.Sc(H)Statistics,Semester 5

3. Project: "Machine Learning Techniques(hands on experience using Python)
   Faculty: Mr. Anirban Chatterjee

S.No	Name of Student	Course
1	Harsh Yadav	B.Sc(H)Statistics,Semester 5
2	Shubham Snehil	B.Sc(H)Statistics,Semester 4
3	Hitaishi	B.Sc(H)Mathematics,Semester 5
4	Rishika Panwar	B.Sc(H)Mathematics,Semester 4
5	Abhya Ahuja	B.Sc(H)Mathematics,Semester 4
6	Uditi Bajaj	B.Sc(H)Mathematics,Semester 4
7	Mohammed Musaddique	B.Sc(H)Physics,Semester 4
8	Pranavi Kasireddy	B.Sc(H)Mathematics,Semester 5
9	Aryaman Bawa	B.A (H)Economics Semester 5
10	Kunika Punia	B.Sc(H)Physics,Semester 4

4. Project : "Numerical Solution of Differential Equation"
   Faculty : Dr. Swarn Singh

S.No	Name of Student	Course
1	Sakshi Mahajan	B.Sc(H)Mathematics,Semester 5
2	Kritika Saluja	B.Sc(H)Mathematics,Semester 5

5. Project : "Finite Element Method"
   Faculty: Dr. Shahna

S.No	Name of Student	Course
1	Rishab	B.Sc(H) Mathematics,Semester 5

The Department of Mathematics at Sri Venkateswara College actively participated in the Sri VIPRA program during the years 2021 and 2022. The projects undertaken during this period covered a range of topics, including mathematical modeling, artificial intelligence, machine learning, differential equations, etc. Through these projects, students gained valuable research experiences, deepened their understanding of mathematical concepts, and developed essential skills in data analysis and modeling. These projects have contributed to fostering a culture of research and innovation among undergraduate students in the field of mathematics at Sri Venkateswara College.

RIDDLES

1

My twin lives at the reverse of my house number. The difference between our house numbers ends in two. What are the lowest possible numbers of our house numbers?

2

A group of students was standing in the blazing sun facing due west on a march past an event. The leader shouted at them: Right turn! About turn! Left turn! At the end of these commands, in which direction are the students facing now?

3

At the time of shipping, Tom can place 10 small boxes or 8 large boxes into a carton. A total of 96 boxes were sent in one shipment. The number of small boxes was less than number of large boxes. What is the total number of cartons he shipped?

4

A small number of cards have been lost from a complete pack. If I deal among four people, three cards remain. If I deal among three people, two cards remain, and if I deal among five people, two cards remain. How many cards are there?

5

Three friends, Alex, Bob, and Charlie, decide to play a mathematical game. Each of them secretly chooses a positive integer between 1 and 100 (inclusive). They then take turns revealing their numbers in ascending order. The twist is that once a number is revealed, it cannot be changed. The winner of the game is the person whose number is the median of the three numbers revealed. If there is a tie, the game is declared a draw.
Knowing that they are all intelligent individuals, they all want to win the game. They also know that the other two players are just as intelligent as they are. Given this information, what strategy should each player employ to maximize their chances of winning? And what is the probability that the game will end in a draw? Think about it for a moment and see if you can come up with a strategy for each player and the probability of a draw

.

6

You have 10 cans of peas. The cans are open. In each can, there are 100 peas. In nine of the 10 cans, each pea weighs one gram. In the tenth can, each pea weighs only 0.9 grams. You do not know which can have the smaller peas, nor is it possible to tell with the naked eye. To help you, you have an electronic scale. However, the scale is not in great shape, and can only provide one correct measurement before permanently malfunctioning. How can one, using only the one measurement afforded by the scale, determine beyond a shadow of a doubt which one has the smaller peas?

7

100 people are waiting to board a plane. The first person's ticket says Seat 1; the second person in line has a ticket that says Seat 2, and so on until the 100th person, whose ticket says Seat 100. The first person ignores the fact that his ticket says Seat 1, and randomly chooses one of the hundred seats (note: he might randomly choose to sit in Seat 1). From this point on, the next 98 people will always sit in their assigned seats if possible; if their seat is taken, they will randomly choose one of the remaining seats (after the first person, the second person takes a seat; after the second person, the third person takes a seat, and so on). What is the probability that the 100th person sits in Seat 100?

SOLUTIONS

1 The lowest possible numbers for the houses are 19 and 91. The difference is 72.

2 East.
Hint- They will turn 90 degrees in a right turn and they turn 180 degrees in an about-turn, and finally they turn 90 degrees in a left-turn

3 11 cartons (4 small boxes + 7 large boxes)

4 47 cards

5 To maximize their chances of winning, each player should choose the number 50.
If a player chooses a number less than 50, they risk the possibility of the other two players choosing numbers greater than 50, resulting in a median greater than 50. Similarly, if a player chooses a number greater than 50, they risk the possibility of the other two players choosing numbers less than 50, resulting in a median less than 50.
By choosing the number 50, each player ensures that they have an equal chance of being the median, regardless of the choices made by the other two players. This strategy guarantees that no matter what numbers the other players choose, one player will have the median.
Now, let's calculate the probability of a draw. For a draw to occur, two or more players must choose the same number.
The first player has 100 choices (any number from 1 to 100). The second player also has 100 options, but one of those choices has already been made by the first player. Therefore, the second player has 99 choices. The third player has 98 options since two numbers have already been chosen.
The total number of possibilities is the product of the choices for each player: 100 * 99 * 98.
The probability of a draw is the number of ways two or more players can choose the same number (excluding the possibility of all three players choosing the same number, which would result in a win) divided by the total number of possibilities:
(100 + 99 + 98 - 3) / (100 * 99 * 98) = 195 / (100 * 99 * 98) ≈ 0.0198
Therefore, the probability of the game ending in a draw is approximately 0.0198 or 1.98%.

6

Take 1 pea from Can 1, 2 from Can 2, 3 from Can3, ... 10 from Can 10, and put the (1+2+3+...+10=55) 55 peas on the scale.
If they were all 1-gram peas, they would weigh 55 ounces.
See how much the total weight is under 55 ounces? Specifically, how many 0.1 ounces are under it. For example, if the total weight is 54.7 grams, that's 3 grams shy of 55. So we know there are three 0.9-gram peas. So they are in Can 3.

7

Probability is always ½ or 50%.
The first person sits in Seat 1: In this case, everyone will sit in their assigned seats, and the 100th person will indeed sit in Seat 100.
The first person sits in Seat 100: In this scenario, the second person will take their assigned seat (Seat 2) since it is available. From this point on, everyone will continue to sit in their assigned seats, and the 100th person will sit in their assigned seat, Seat 100.
The first person sits in a seat other than Seat 1 or Seat 100: Let's consider Seat X. Now, the second person will sit in their assigned seat, Seat 2 since it is unoccupied. The third person will sit in their assigned seat if it is available, which has a 1/98 chance of happening. Otherwise, they will choose a seat randomly. From this point on, the seating situation becomes a cascading effect. Each person has a 1/98 chance of sitting in their assigned seat and a 97/98 chance of choosing a random seat. Ultimately, the 100th person will have a 1/98 chance of sitting in Seat 100.
The probabilities of scenarios 1 and 2 are straightforward and add up to a total probability of 1/2 (50%) since both are equally likely to occur.
The probability of scenario 3 can be calculated using recursive reasoning. Let P(n) represent the probability that the nth person sits in their assigned seat, Seat n. We already established that P(1) = 0 (since the first person doesn't sit in their assigned seat) and P(100) = 1/98. For any other value of n, we can express P(n) recursively as:
P(n) = 1/98 * P(n+1) + 97/98 * P(n)
Using this recursive formula, we can calculate the probability of the 99th person sitting in their assigned seat (P(99)) and then plug it into the formula for P(98), and so on, until we reach P(2). Finally, we can substitute P(2) into the equation for P(1) to calculate P(1). However, it is unnecessary to perform these calculations because we already know P(1) = 0.
In conclusion, the probability that the 100th person sits in Seat 100 is 50%.

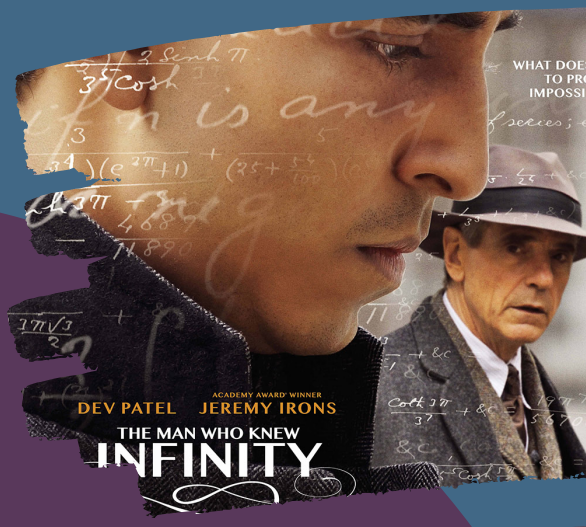
MATHS IN THE MOVIES

AN INDELIBLE ASSOCIATION

Ever thought about mathematics in movies? How are they related? How are they depicted? Well, the association of math in movies is like an indelible bond. Every year, lots of movies and books based on mathematics come out, not in the genre of research, but fiction, and non-fiction as well.
Some of the best movies and books ever made on mathematics are:

1. The Man Who Knew Infinity:

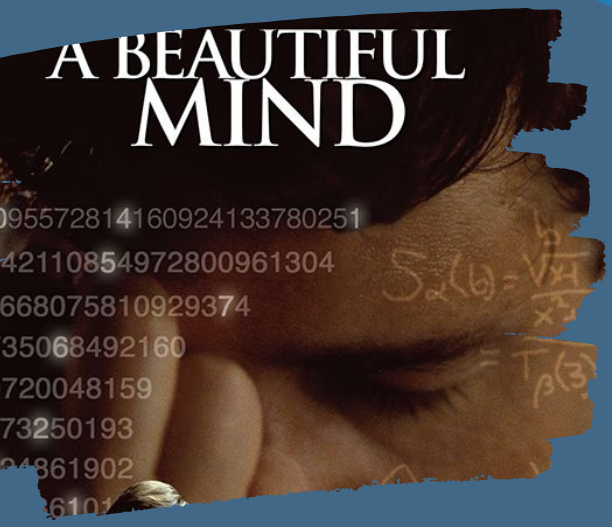
An exotic book is written about the life of the great mathematician Srinivasa Ramanujan by Robert Kanigel. This book shows the beautiful journey of Ramanujan from a simple village prodigy to one of the best mathematicians of all time.
This book has also been converted into a movie which was released in 2015 starring Dev Patel.
If you love mathematics, especially what it can do, then this movie precisely shows how Ramanujan developed partitions, and theories that were used to study the behavior of black holes.



2. The Imitation Game:

This 2014 movie is a war drama based on the life of the mathematician Alan Turing, the developer of the Turing Machine. This movie beautifully depicts how math and some wordplay were used to decipher the war communication of the Germans which later led to their defeat.





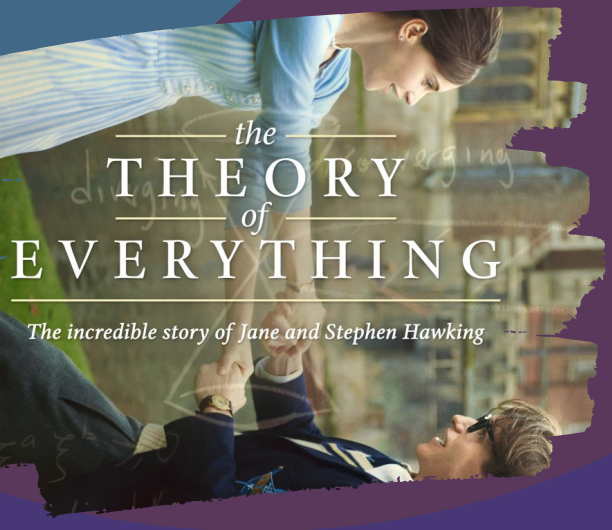
3. A Beautiful Mind:

This is also a brilliant movie released in 2001 based on the life of the mathematician John Nash. This movie depicts his struggles through life and how he finally won the Nobel Prize in economics for his contributions to game theory.



4. Super 30:

A Bollywood film based on the life of mathematician Anand Kumar, this movie beautifully depicts the struggles one goes through while teaching as well as preparing for one of the toughest exams in India- JEE. The story is based on his success in running a program for educating 30 students and helping them crack the exam.



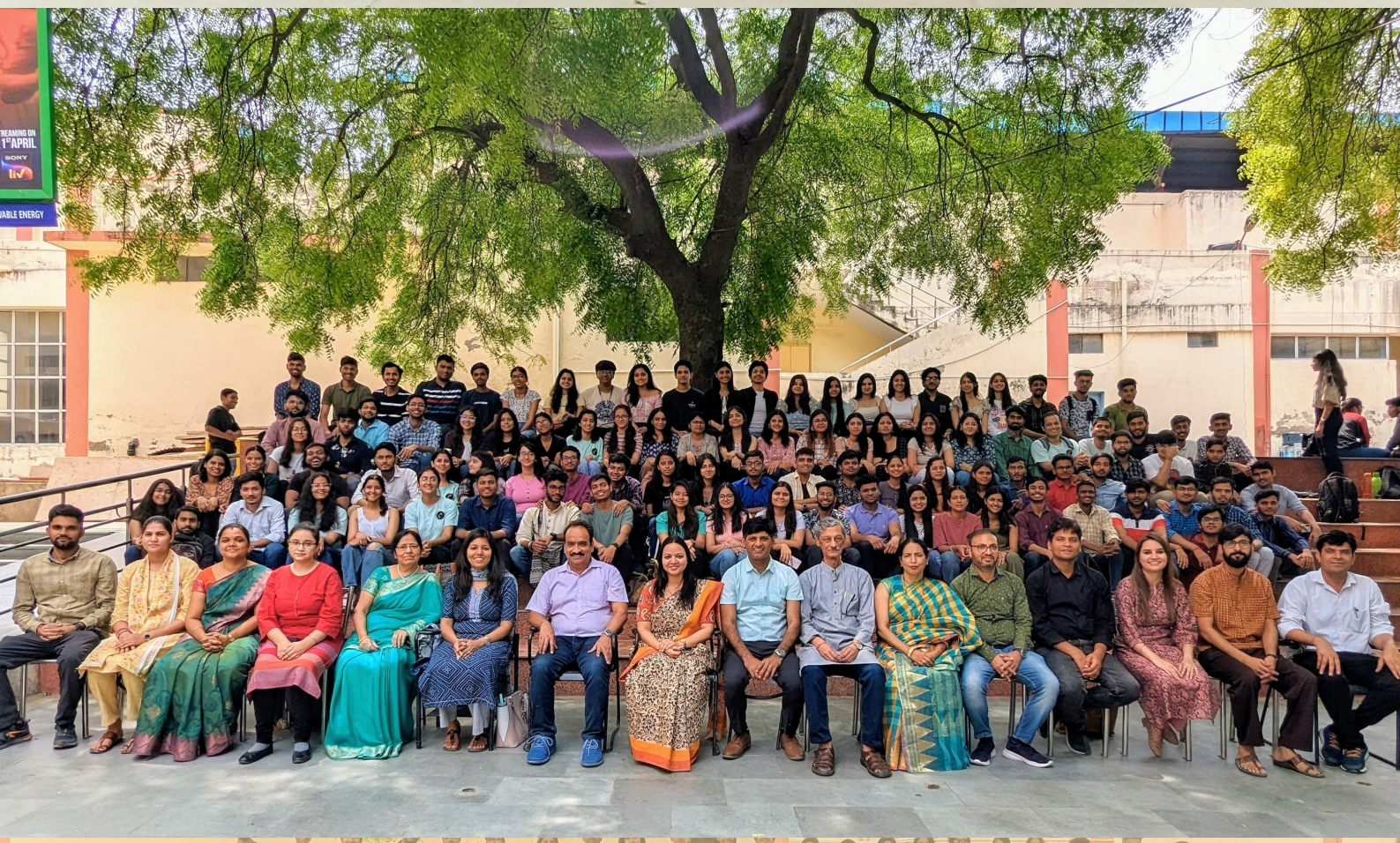
5. The Theory Of Everything:

A beautiful drama based on the life of Stephen Hawking. This acclaimed movie explores Stephen Hawking's ex-wife, Jane Wilde. The movie depicts the love story of Stephen Hawking and his subsequent development of motor neuron disease. A binge-worthy movie for all math lovers.

MOHAMMAD NUMAIR | 2ND YEAR

BATCH OF 2022





BATCH OF 2023

ALUMNI SPEAK



In conversation with Ayushi



Ayushi Gupta (Batch'20):
creativeayushigupta@gmail.com
Working in MNC as a Statistical Programmer. Also, running a YouTube Channel:
Ayushi Gupta Live

How was your experience in college?

I had a wholesome experience in college, filled with lots of ups and downs. It was a roller coaster ride for me in the true sense that I experienced multiple low & high moments in a short span, and the main reason for that could have been my attitude to try everything available. I tried upon multiple things during those 3 years of my stay at Venky. At some, I failed, others I succeeded, but at the end I realised it's all about putting your hands in multiple activities and finding that 1 thing which is a combination of something you are good at & something you are interested in following for a long time.And even if you are unable to settle on 1 just make it 2 , consider 1 as your main job & keep the other as a side hustle. Now I realize that these 3-4 years are given to transition from a comfortable school life to a competitive working life, and hence it becomes important for us to work hard during these days, and the more important thing is to enjoy that work as trust me these are one of those very few years of life that are a blend of beauty, free time, exploration, excitement, unlimited opportunities & energy.

What were your accomplishments during college life?

Well, I won't say accomplished, but I did put my hands on multiple things during those 3 years, some of which turned out to be fruitful and exciting for me , some of which didn't. To document a few :

- I built an income stream in the 1st year itself, through which I was able to generate almost 5-10k per month in college itself.
- I auditioned for multiple societies & clubs and got into 6 of them namely, Nrityangana, NSS, Parivartan, Effulgence, EOC, and Trisectrix -TheMathematics Association.
- I served the Mathematics Association as a Cultural Secretary in my 2nd year and successfully organized multiple events.
- As far my academics is concerned I managed to maintain a 9+ CGPA score throughout & secured the 3rd position in my 1st year of college.
- I got placed through campus placement.
- I did about 7 internships in college, which included 2 in-office full-time internships.
- I got selected for the Indian Academy of Sciences Summer Research Fellowship Program.

Message to Juniors:

A single-word answer would be "Explore"! A more detailed yet specific answer would be to create your OWN "checklist" and plan your college life accordingly, don't worry, you can take hints from mine :

- Give auditions to various cultural & non-cultural societies & organisations
- Start with a side hustle
- Build an income stream and start by paying your own college fees
- Make genuine connections
- Feel whatever you want to feel but do express
- Build strong relationships
- Wake up early & stay late but get the work done
- Go on college trips
- Start documenting your life on social media maybe Instagram

At the end whatever you do make sure you make the most of these 3-4 years!

In conversation with Sejal



Sejal Arora (Batch'22):
sejalaroraa@gmail.com
Pursuing MSc Business Analytics,
Imperial College Business School,
London, UK

How was your experience in college?

"Embarking on this journey at Sri Venkateswara College, University of Delhi, was like stepping into an enchanting realm of knowledge and self-discovery. Over the course of my bachelor's degree in mathematics, my college experience has been nothing short of extraordinary. The exposure, personal growth, invaluable lessons from remarkable teachers, and the bonds forged with friends have collectively shaped me into the person I am today. The experiences gained in college were the reason I was able to secure admission to the world's 6th-best university (QS World University Rankings 2023).

The rigorous academic curriculum challenged me to push beyond my limits, developing resilience, perseverance, and a strong work ethic. I was constantly encouraged to think critically, analyze problems from multiple perspectives, and develop innovative solutions.

The faculty members not only imparted knowledge but also nurtured a thirst for learning. They fostered an interactive and engaging learning environment, encouraging us to ask questions, challenge conventional wisdom, and think independently. The teachers' commitment to our growth extended beyond the classroom, as they provided guidance and mentorship, nurturing our intellectual and personal development. They instilled in me a love for learning, the value of discipline, and the importance of perseverance.

College would not have been the same without the incredible friends I made at Sri Venkateswara College. Together, we embarked on a rollercoaster ride of emotions, navigating the highs and lows of academic life.

I will forever cherish the memories, lessons, and connections forged during my time at this remarkable institution, knowing that it has laid the foundation for a future filled with limitless possibilities."

What were your accomplishments during college life?

President, Trisectrix - The Mathematics Association, SVC (2021-2022)
Editor-in-Chief, The Magazine Committee, Department of Mathematics, SVC (2021-2022)
Cultural Head, Trisectrix - The Mathematics Association, SVC (2020-2021)
Editor, The Magazine Committee, Department of Mathematics, SVC (2020-2021)
Rank 1 (CGPA - 10) in 2nd year (Academic Year 2020-2021)

Message to Juniors:

From the moment you stepped onto this campus, you brought a vibrant energy, fresh perspectives, and a sense of enthusiasm that breathed new life into our department. Each one of you is unique in their own amazing way and possesses extraordinary talents that make you stand out in the crowd. These are probably the best years of your life, so make the most of it. Seize every opportunity and make the best out of it. Embrace the exposure that awaits you. I hope you achieve everything you desire and much more!

In conversation with Jaskaran



Jaskaran Singh (Batch'22)
email.jaskaransingh@gmail.com
Pursuing MSc Mathematics ,
IIT Bombay (Second Year)

How was your experience in college?

I definitely had to sit down and list a few keywords to be able to express what impact the Department of Mathematics at Sri Venkateswara College has created in my life. I very well remember the first day I joined the college, it was the twenty-second day of July'19. I can't recall whether it was my introverted nature or the humid weather but I was definitely sweating with nervousness. And now, if I take a jump towards the end of my third year here, the key aspect that describes my college life was my social life. I am grateful to Venky, it taught me some amazing life skills. I was a member of the department throughout my enrollment at the college. This experience gave me exposure to what it could be like to work with a team with such diverse points of view. It definitely taught me how to lead a team and be a team member and some other basic life skills like dealing with peer politics as well (chuckles). My experience with my batchmates was quite interesting, I learned a lot from many of them. Some of them have really motivated me to become the best version of myself.

I also am thankful to the whole faculty of the department that helped me polish my love for mathematics, without them, I don't think I would have made it to one of the best institutes in India, IIT Bombay. Teachers like Mainak sir and Shakuntala mam always make sure that no student is left behind irrespective of their academic or non-academic professional goals.

Lastly, I am glad that I could be a senior of the batch of 2023 and 2024. The juniors I met mostly through Trisectrix had a remarkable effect on my personal and professional life. They have taught me leadership skills and given me a sense of confidence.

What were your accomplishments during college life?

Vice President, Trisectrix - The Mathematics Association, SVC (2021-2022)
Editor-in-Chief, The Magazine Committee, Department of Mathematics, SVC (2021-2022)
Joint Secretary, Trisectrix - The Mathematics Association, SVC (2020-2021)
Core team member in NBHM funded MTTS Alumni club.
AIR-15 JAM Mathematics 2022
Joined the Indian Institute of Technology Bombay for masters in Mathematics.

Message to Juniors:

I want to wish the best of luck to the batch of 2023 in all their future endeavors as they pass out from college. My best wishes to the batch of 2024 who are entering the most important (final) year of their graduation. I hope you guys figure out your career paths. And the freshers, you have a long journey to cover, I haven't exactly interacted with you all, but one thing I'm sure, you all can do wonders. To all the juniors, you're enrolled in one of the best colleges in the country, and I hope you make the department proud someday. Just don't refrain from exploring new horizons, and you'll definitely excel in every aspect of life.

In conversation with Anant



Anant Narayanan (Batch'22):
anantn@iisc.ac.in
an Integrated PhD student at
Department of Mathematics,
IISc, Bangalore

How was your experience in college?

I witnessed half of my college life through my laptop screen, but our amazing batch and of course, great faculty made that experience fun in a unique way. The other half has defined me in ways that I didn't imagine before I joined Venky. I am eternally grateful for the experience.

What were your accomplishments during college life?

General Secretary, Trisectrix - The Mathematics Association, SVC
Vice President, Empathise- The Mental Health Club, SVC
Joint Secretary, Trisectrix - The Mathematics Association, SVC
Cracked IIT JAM AND TIFR
SCUDEM VI - 2021 : Outstanding award
Rank 1 (CGPA - 9.64) in 1st year (Academic Year 2019-2020)

Message to Juniors:

To my juniors, eat well because you will miss the street food outings with your friends once/if you leave Delhi. If you want something that you feel will make your parents and yourself proud, don't hold back. Go for it.

In conversation with Disha Gupta



Disha Gupta (Batch'22):
eway2disha@gmail.com
Working as an analyst
at KPMG

How was your experience in college?

My experience in college was truly unforgettable. The vibrant atmosphere during fests was simply amazing, with electrifying performances and a sense of camaraderie that filled the air. Being a part of the mathematics association was a delightful and enjoyable experience. The teachers were incredible mentors, always ready to guide and inspire us to achieve our best. Despite the disruption caused by the COVID-19 pandemic, the final semester in college became a cherished chapter of my life. The bonds formed with my batchmates were strong, and together we navigated through the challenges, making the most of the time we had left. It was undeniably the best way to conclude my college journey.

Message to Juniors:

To all my juniors, seize the moment and make the most of your college experience. Embrace every opportunity, and participate in events, clubs, and activities. Step out of your comfort zone, try new things, and meet new people. Cherish these years, for they pass swiftly, and you will undoubtedly miss the vibrant and enriching life that college offers. So, dive in, create memories, and embrace the journey while it lasts.

In conversation with Aishwarya



Aishwarya Jayant Rauthan (Batch'22):
aishwarya.rauthan@gmail.com
Maket Research Analyst, Knowledge Sourcing Intelligence
Upcoming Boston Business Analytics Student

How was your experience in college?

College for me was a roller coaster ride that opened opportunities for me to pursue my creative interests alongside academics. All this greatly helped me mold my all round personality while exploring new and exciting things.

What were your accomplishments during college life?

- Got appointed as the President of Nritya, The Choreography Society. Participated and won in various national-level dance competitions at colleges like IIT Bombay, SRCC, BITS Pilani, and so on.
- Got selected as one of the finalists for the Mr. Uttarakhand pageant and got a chance to model for various Indie designers.

Message to Juniors:

Being someone who was always involved in extracurriculars, I would advise everyone to never say never to explore new things. You never know what might strike a chord with you, and that is something that will add a lot of value to your overall experience.



Yash Goel (Batch'22):
yg17381@gmail.com

In conversation with Yash

How was your experience in college?

It was nice, teachers were helpful, though some liberation can be done with attendance and all

What were your accomplishments during college life?

I worked with multiple international startups, cracked international programs with less than 0.1% selection rate and competition from all around the world, and also took seminars to help non-tech students break into tech.

Message to Juniors:

Dedicate yourself to one thing you really believe in, don't run after multiple things or backups, that never leads to anything or anywhere



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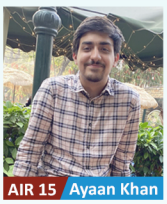
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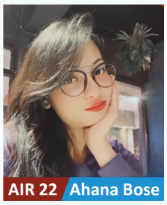
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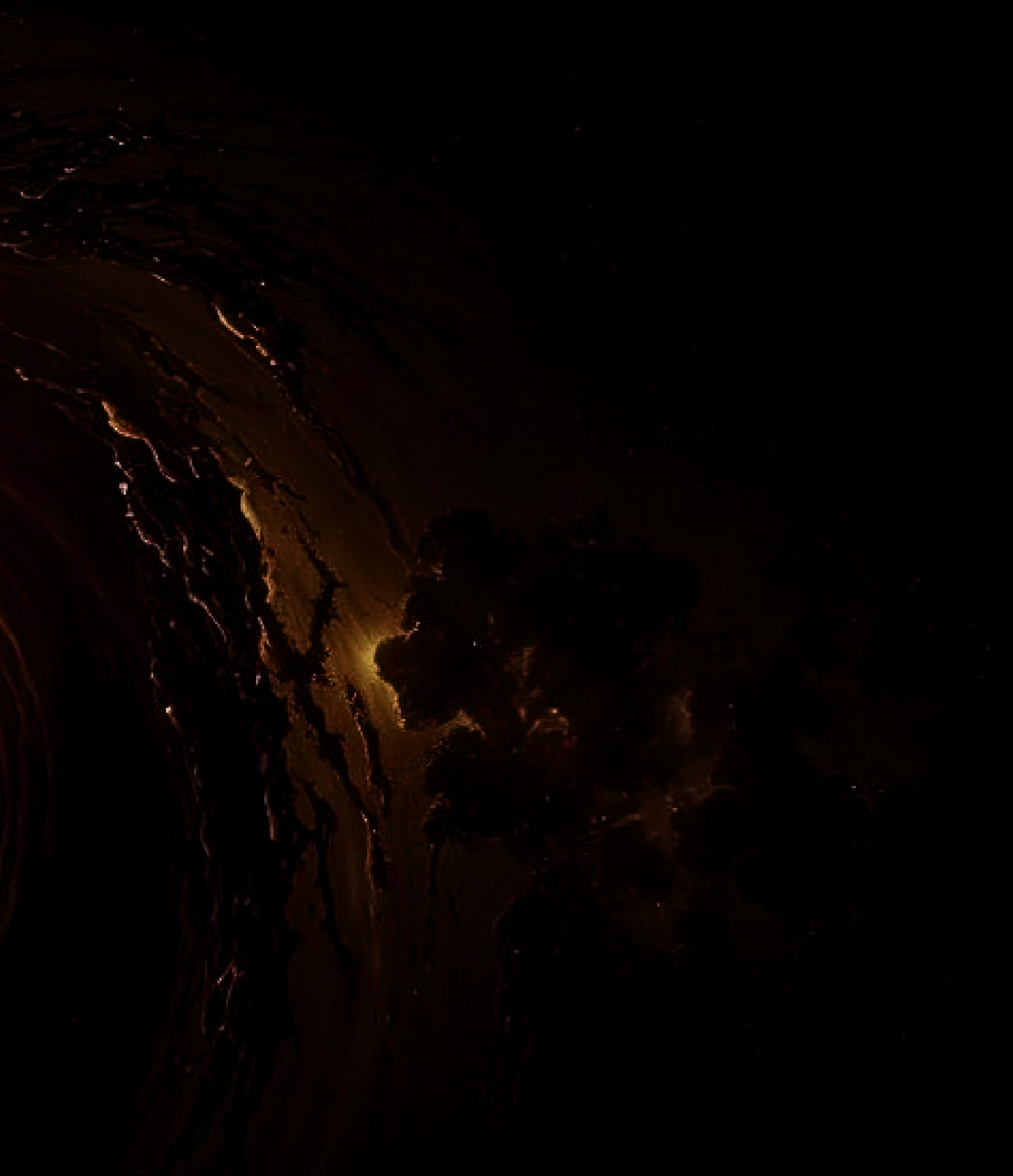


AIR 41 Souhardya



AIR 42 Ayan Prandab

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