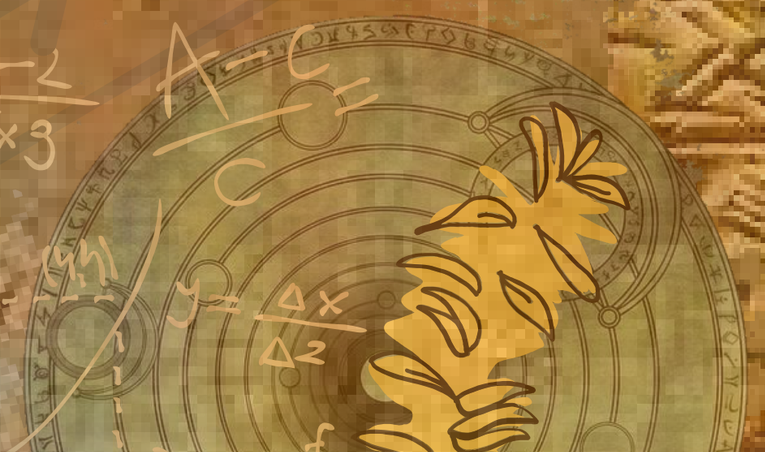
MATHOLOGIC

2021-2022

DEPARTMENT OF MATHEMATICS
GARGI COLLEGE
UNIVERSITY OF DELHI



MATHEMATICS IS AN ANCIENT WORLD
CREATED OUT OF PURE INTELLIGENCE

To Our Readers :

This fourth edition of Mathologic opens portals that take you back in time to the beginning of mathematics. We begin from the time of early civilizations, an era when there was no Archimedes, no theorems, no proofs, traveling through the contributions of various early civilizations and persons to this subject and we finally come back to the present, giving our readers a journey through times and phases which they never knew existed.

We are so pre-consumed by the prevailing state of mathematics and with all attempts to make its future better, very often, the rich history of a subject which is believed to be the Universe's language seems to drift away from mankind, trapped in books and scriptures. Archimedes said " Man has always learned from the past. After all, you can't learn history in reverse" ,inspired by these words Mathologic attempts to be your time machine to the past, giving you an insight of how the numbers, calculations, and theorems had come into existence and evolved over the years to make the subject look as we know it today.

The editorial board extends its gratitude to all the students of the mathematics department, the creative team, union members of Mathema, and our teacher advisors for their support, enthusiasm, and encouragement throughout the process of compiling
the annual magazine

Hence for all the math enthusiasts and for anyone who never miss a chance to run away from the subject, we have compiled something special with a lot of thought, love, and hard work in the belief that it will add precious treasures to your chest of knowledge and memories.

Love
Editorial board

Principal's desk:

I congratulate the team of students and teachers of the Department of Mathematics whose unremitting efforts has made this edition of Mathema available to us. Any such periodical gives an insight into the range and scope of the imagination and creativity of our students and faculty members collectively. As a Principal of Gargi College it gives me immense pleasure to experience the warmth of this literary tradition in resonance with the glorious past of the institution.

The past almost one year has proved that Life is not always a bed of roses but with determination, dedication and diligence you have made the unimaginable happen. We lived in a virtual world yet so meaningfully connected and you have performed every single duty whether academic or cultural so efficiently. These unprecedented circumstances have made it so evident that you are capable of handling the hurdles of life with your wisdom, skill and sophistication.

There is no doubt that this attitude will take you on a newer height in life. Grab every single opportunity that comes in your way and make your dreams come true but never forget that wisdom with which you use your knowledge, is the most precious gift. Make sure that a passion to grow in wisdom should never die because it will always guide you and show you the right path.

I congratulate the entire editorial team & contributors for the upcoming issue of Mathema and enthusiastically look forward to reading our students' perspective on various issues undertaken.

Prof. Promila Kumar

Interview With Mathematician

' Mathematics as an expression of the human mind reflects the active will, the contemplative reason, and the desire for aesthetic perfection. '

Interview with : Dr. Pooja Yadav
Assistant Professor in Kamala Nehru College, University of Delhi

What fascinates/motivates you the most about this subject?

Mathematics is a very logical and applied subject that can be found everywhere and that's why we used to consider this as a social science subject. It is very easy to visualize things and challenge yourself to do something out of the box.

Was there a moment in your career where you doubted the field you have chosen and what gave you the strength to overcome that and be the brilliant Mathematician you are today?

No, I was very clear from my school days that I will continue my studies in math only and will make a career with this only.

Which are the mathematician and theory/discovery which fascinates you the most?

The great mathematician Ramanujan and the lady calculator Sri Shakuntala Devi fascinates me the most .

What do you have to say about current situation of research in India?

A lot of research is going on in our country but since due to lack of employment and opportunities , students are moving outside for higher studies and they are doing very well.

Why do think students these days are more oriented towards applied field of mathematics than pure mathematics?

ince a majority of students are oriented towards the applied field, so what is your viewpoint on having more portion of applied in bachelor's course and pure in post-graduation?

SAs per the current scenario , students are inclined towards applied mathematics. They have vast opportunities there, But being a teacher , I would like to say that pure math is the backbone of mathematics . Students should be logically clear towards the concepts and only then they can do better in the applied part. Nowadays every semester includes applied papers such as SEC, DSE etc.

Please enlighten us with some of your research experience. How would you like to encourage the students who have entered into the field of research recently?

I did my Phd before joining the college. Then due to some family constraints , I left my personal research but being a teacher we are always involved with students . I used to give them projects so that they can have a better understanding of the concepts. Research needs free time. Students should go for higher studies in mathematics. They have the time to do so much better in research.

Mathematics is irreplaceable", what is your stand on this statement?

Yes, definitely. "Mathematics is irreplaceable ". We can't proceed further in any field from one's day to day life to interdisciplinarity research without this. In some or other way math is required everywhere. Infact, as an illiterate person you should know the basic math for daily requirements.

Has mathematics as a subject reached its peak or does the future hold as many possibilities for math enthusiasts as it holds for other fields?

Mathematics behave like an unbounded increasing function . Once we reach at some point , then we can see further aspects of the subjects as an application. We have done lots of pure math as one curriculum and must have noticed still there are problems which are unanswered. There are still or always will be lots of possibilities for math as it is applicable everywhere.

Any message for the young minds who have just started or are yet to start their journey in the world of Mathematics?

I would like to say to my young students that math is a very logical subject. You will never get bored if you have interest in this. YOu will always get new ideas that we can apply here and there. There are a lot of career opportunities as well in this field. You will never be hopeless while doing this subject.

All the best to you all.

Student Union Convenor

Student Union Co-Convenor

Student Union Advisor

We are extremely happy to bring out the fourth issue of our magazine" Mathologic ". The magazine is published annually with collective efforts of our students and teachers. For, a magazine carries the contributions reflecting ethos and aspirations of the students, and other team members of the department.

The magazine aims at bringing out the mathematics in ancient times. Through this magazine students have tried to tell, the history of mathematics has become an important study from ancient to modern times it has been fundamental to advances in sciences, engineering and philosophy.

The articles published in this magazine, which amply demonstrate the communication skills, imagination and creativity, humour and humanism, technical competence, and patriotism of the contributors.

We congratulate to the entire editorial team and thank the student union who have made untiring efforts to bring out this magazine. We wish them all success.

Ms Pooja Gupta(Convenor)

Mr Ramakant Prasad (Co-convenor)

Ms Anshika Agarwal (Advisor)

From Union President

I had begun my journey in the department union as an editorial board member in my first year. I have since then cherished every single endeavor that our union had taken up, even when we moved to an online mode of classes. Out of all the wonderful memories I have collected over these three years, two of my best ones would be the farewell that we hosted for our seniors last year as well the orientation welcoming event for our incoming first years this session.

Being instituted as the President of the academic session 2021-22 is definitely one of the proudest and happiest event of my college life. Though it came with a lot of responsibilities and challenges, I have been thoroughly enjoying my office. Also, I have got very supportive and wise office bearers in my team along with the best faculty advisors this session.

But of course, there were so many challenges in my way throughout the year. I always included my teams' opinions in decision making that affected the entire department and while hosting different competitions. When there were differences in opinion, I always tried to stay calm and think practically while taking any decision and executing it. To be able to convince and coordinate to make impartial and wise decisions without disappointing my team and the department was indeed the most difficult part of my journey as the President. Nevertheless, I have enjoyed every bit of this beautiful journey. Even though a major part of the year happened virtually, I got to learn a lot of valuable lessons from the successes and mistakes.

I have always believed that an individuals' growth also depends on co-curricular activities that help the person to horn their different life skills. This belief is what inspired me to follow the path that I took in my first year that marked the beginning of the journey to the department union President in my final year of college. Further, it is the same belief that I would like to pass on to my dear juniors.

Since my institution in the beginning of the year I have tried to be that leader who everyone can lean on for support and trust to help them. This is the impression that I hope to leave as the President of the department union of 2021-22.

Regards

President 2021-22

From Editor's Desk :

'Dark times are an opportunity to add glitters to life.'

~ Anushka Raghav

Editorial Head

We are thrilled to introduce new edition of Mathologic'22 : The annual magazine of the Departments of Mathematics , Gargi College. Along with bringing the origins of mathematics back to life , this magazine also provides a sneak peek into everything that the mathematics department did this year, together as a family. From impactful webinars , and hosting some special events, Mathema family has worked really hard to give opportunities to shine and reasons to smile to the students amid the academic pressure and covid restrictions and we only aspire to get better in our ways and ideas with each passing year.

This magazine marks the end of our year's journey, and beginning of another whose pages awaits to be filled with beautiful and enlightening lessons. We hope that every reader finds the same joy in these pages as we did while creating them.

'Life Is Made Up Of A Great Number Of Small Incidents And
A Small Number Of Great Ones.'

~ Prerna Panghal

Editorial Head

MATHEMA

The Mathematics Association

2021-2022

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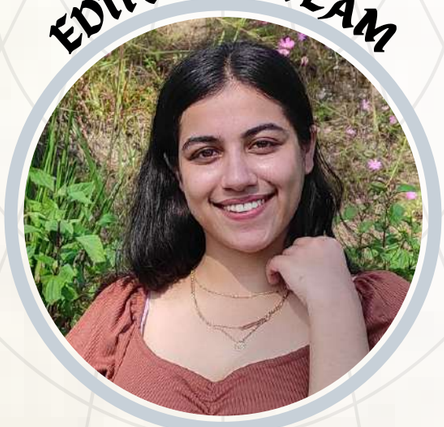


Diya Bedi

EDITORIAL TEAM

Huidrom Helen

EDITORIAL TEAM

Kinjal

Rise Of Mathematics In India

7000 BCE TO 3200 BCE

Rawest form of mathematics can be observed in the rough geometrical layout of scattered ruins of Mehrgarh culture that preceded Indus Valley Civilization.

[Bronze Age]

3000 BCE TO 1500 BCE

Excavations at Harappan Civilization points out the usage of standard weights and lengths which were based on binary and decimal ratios. The bricks used in construction of buildings were of the ratio 4:2:1. Highly precise workmanship in construction, with equally spaced lines suffered from only error up to 3 decimals in mm units.

[Iron Age]

1500 BCE TO 200 BCE

The Vedic Period lasting to 600 BCE saw birth of Brahmi numerals and the numbers were expressed as combinations of powers of tens.

One of the oldest written records of mathematics were The Sulba-Sutras. They contained many theorems ranging from geometry required to construct fire altars to the foetus form of Pythagoras theorem.

Pingala, a music theorist came upon what he called Meru-Prastara in his Chanda Sutra which was the premature form of Pascal Triangle of Binomial Theorem.

Jain scriptures give a detailed account on factorial and geometry basics. They were believed to be the bearers of the first documentation of permutation and combinations which were then referred to as “vikalpa”.

Chanakya tells about the administrative statistics used to record birth and death during the rule of Chandragupta Maurya.

Classical Period

300 CE TO 800 CE

Approximation of π to four decimal places, discovery of Pulveriser Method for solving linear equations and many were important contributions of Aryabhatta, the Father Indian Mathematics.

Hayashi, in his work, spoke of the emergence of Pati-Ganita (i.e. Maths of Algorithms) and Beej-Ganita (i.e. Maths of Seed) which were elements of arithmetic and algebra respectively.

Brahmagupta, a famous mathematician of the 8th century, gave formulae for the solution of quadratic equation, the area of the quadrilateral and Pell's equation.

Medieval India

900 CE TO 1300 CE

Mahavira asserted that the square root of a negative number did not exist.

Shripati in his work talked about calculating planetary longitudes, eclipses and planetary transits.

This period saw growth in the field of algebra, calculus, trigonometry and their usage in astronomy increased.

Medieval India

1400 CE TO 1800 CE

The Kerala School of mathematics and astronomy developed Taylor series expansions for the important trigonometric functions, differentiation, term by term integration, convergence tests and the theory that the area under a curve is its integral.

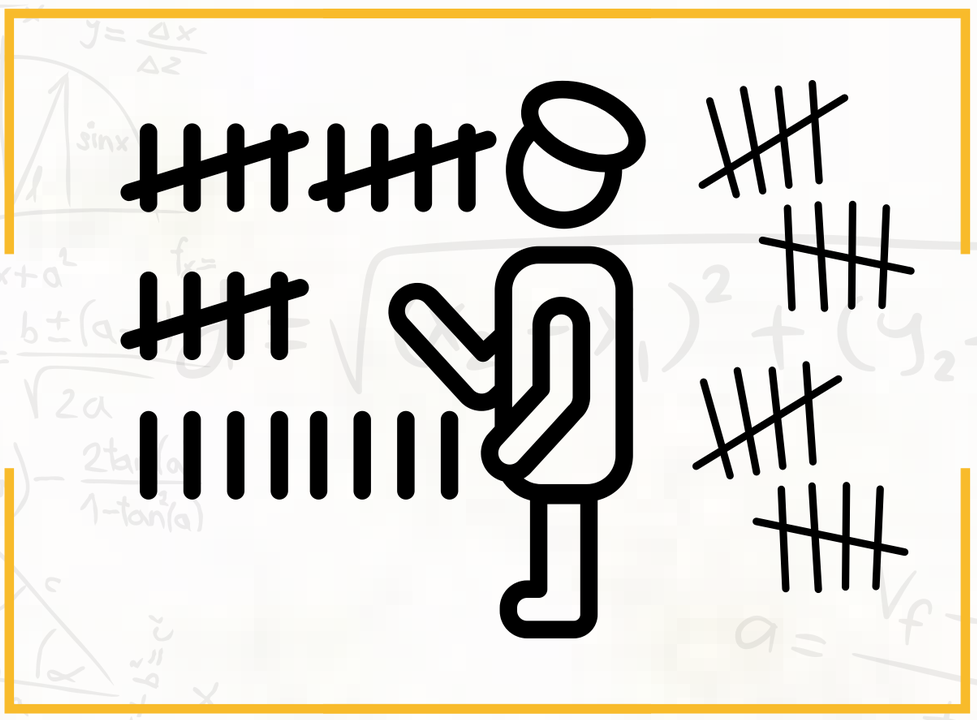
Citrabhanu was a 16th-century mathematician from Kerala who gave integer solutions to 21 types of systems of two simultaneous algebraic equations in two variables.

~ Kinjal
B.Sc. (H)Mathematics, 1st Year

Mathematics : An Unsolved Enigma

Can you estimate when was mathematics invented? Well, if that's the question then, we can indeed debate over this for very long, as it was not something that was in whole devised by us, as the innovation means something which is newly developed and which remains the same irrespective of the zone, cannot be molded. Mathematics was just there like all other things in the surroundings, say planets in the solar system and we are just exploring it. What we humans have done is that we have developed a language for mathematics, to scrutinize it, as we do for other things. And the one thing which failed is that we weren't able to provide a common language across the world to research it. We are required to decrypt it to the other terminology so that the people across the world can refer to it in the language they comprehend. For instance, the representation of numbers varies as soon as the region gets switched, say in roman we compose and express them differently, while in Hindi, we use different ways for its composing and expression.

Moreover, we weren't able to have a universal name for mathematics, say in ancient Greek, it is famous by the name of mathema, and in Latin by mathēmatica.



Why do we count till ten digit only?

Well, the point on numbers brings me to the fact that why did we have a 10 digit number system, we could have a 9 or 8 digit number system too. The answer comes from the attribute that we have only 10 fingers. Numbers are from one of the things that were developed back in ancient times. And unlike now we didn't have the advanced technology to count on, so we were strained to use very basic and oblivious things to count something or perform a task, thereupon that could be the most possible explanation for the same.

Also, it is known that The Sumerians were the first civilization to develop a counting system which is being practiced for over 4,000 years. Moreover, it is well-known by the fact that the decimal place-value system was first seen in India, which was then transmitted to the Islamic world, and eventually to Europe which is still in practice today. Indian mathematicians have been contributing to the discoveries of mathematics fields for a significantly long while.

The ancient Sumerians of Mesopotamia developed a complex system of metrology from 3000 BC. From 2600 BC onwards, the Sumerians wrote multiplication tables on clay tablets and dealt with geometrical exercises and division problems. The earliest traces of the Babylonian numerals also date back to this period.

Clay tablet, mathematical, geometric-algebraic, similar to the Pythagorean theorem. From Tell al-Dhabba'i, Iraq. 2003-1595 BCE. Iraq Museum

Clay tablet, mathematical, geometric-algebraic, similar to the Euclidean geometry. From Tell Harmal, Iraq. 2003-1595 BCE. Iraq Museum

During the era of 400CE to 1200CE influential contributions were made by the scholars like Aryabhata, Brahmagupta, Bhaskara ll, and Varahamihira.

Indian mathematicians were the foremost across the world to give in the notion of zero, infinity, negative numbers, arithmetic, algebra, and calculus, which were then transmitted to the Middle East, China, Europe. The further developments in these domains are nowadays the foundations of numerous areas of mathematics.

The beauty of mathematics is not cracked yet, because we are still exploring it. And we shall say the same thing in the near future also, as it is infinite like a real line which can only be extended to uncertainty but endpoints cannot be obtained.

~ Snehal
B.Sc. (H)Mathematics, IIIrd Year

Did you know?

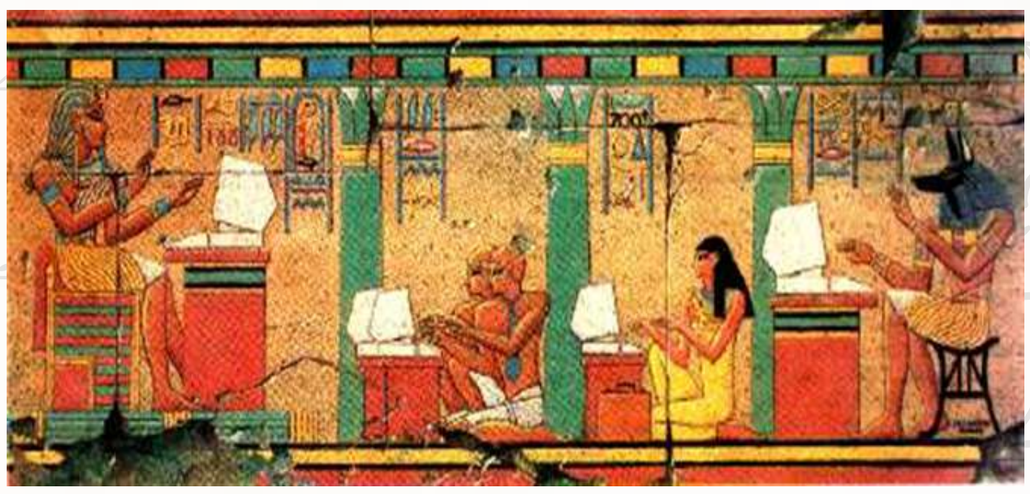
"FORTY" is the only number that is spelt with letters arranged in alphabetical order.

In The Folds Of 'GIZA'

Pharaohs to the Mummies and Pyramids to the Tombs.

Egyptian Civilization has always been a mind-twisting topic for the readers from all ages. Undoubtedly, ancient Egypt has contributed to modern-day society with its many cultural developments as well as it's blistering architects. Leaving behind thousands of unsolved mysteries challenging us every second of the day.

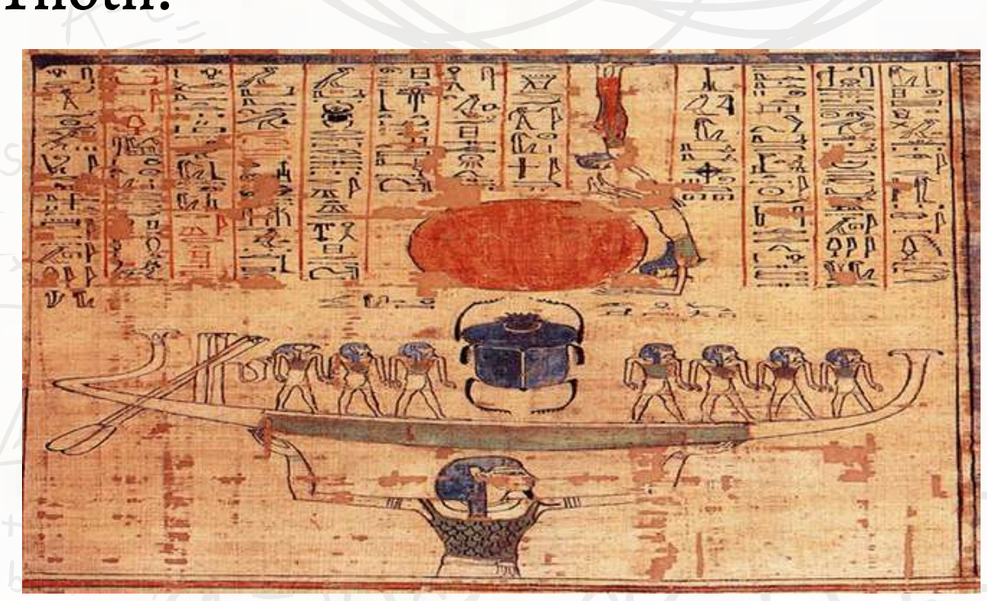
With no specialized tools, no thundering loud machineries to use. How come a bunch of ancient men measured using feet and hands utterly understood the concepts of surface area and volume of third dimension all together.



Scribes Learning The Application Of Mathematics In Egyption Schools.

Egyptian papyrus not only talked about architectural engineering but highlighted the theories proposed by the earlier Egypt in the field of geometry and applied arithmetic.

Even the Greeks believed that mathematics originated in Egypt then transferred to the various parts of North Africa, Colonial states and Asia. it may be of interest to note that they themselves believed that mathematics had been given to them by the god Thoth.



Literary text written to god Thoth for getting architectural advice. (Between 26th century BC to 22nd century BC)

Mainly, to send their Pharaoh to the 'Journey Of Moon' in the afterlife. Giza's scribes state the invention of twin pillars of egyptian mathematics, that is, hieroglyphics and written tablets. Done by none other than the god of the moon, Thoth. The story goes like whenever any scribe was caught up with a mathematical problem. He used to write a letter - considered as a fictional one - to either a fellow scribe or god of wisdom for solving the same. Though it is astonishing to record that the surviving sources from the ancient texts contain the replies with the solutions. One of the well known is , a literary text written by a scribe named Hori and addressed to another scribe named Amenemope.

Revolving around the point of view of Hori calling Amenemope's work second rated and ridiculed in a satirical manner.

Taken From Catalogue Of 4th Dynasty Pàgina, representing symbols of numeral system.

To the extent that egyptian mathematics left a legacy at all, it was through its impact on the emerging mathematical tradition all over the globe. Whether it's the Greek intellectuals learning from egyptians or the decimals system followed by Russians afterwards. However, the egyptians were very practical in their approach to mathematics by which they succeeded in placing the base of the Golden Proportion, sometimes called the Divine Proportion from the beginning of creation. The harmony of this ancient proportion, built into the very structure of creation, can be unlocked with the key of cosmos. **Broadly, opening to us it's marvelous mathematical beauty.**

~Prerna Panghal
B.Sc. (H)Mathematics, IInd Year

Multiplying Ones Always Gives You Palindromic Numbers.
Hence, if multiply 111,111,111 × 111,111,111 you get 12,345,678,987,654,321 - a palindrome number that reads the same forwards or backwards. And that works all the way back down to 11 x 11 (121) or just 1 x 1 (1).

Facts

Did You Know?

Most mathematical symbols weren't invented until the 16th century. Before that, equations were written in words.

Calendars & Clocks

Five thousand years ago, Sumerians in the Tigris-Euphrates valley in today's Iraq had a calendar that divided the year into 30 day months, divided the day into 12 periods (each corresponding to 2 of our hours), and divided these periods into 30 parts (each like 4 of our minutes)

The Egyptians devised a 365 day calendar that seems to have begun around 3100 BCE, which thus seems to be one of the earliest years recorded in history.

Back to the Past !

The Ancient Egyptian obelisks, constructed about 3,500 B.C., are also among the earliest shadow clocks. The oldest known sundial is from Egypt it dates back to around 1,500 B.C

An early prototype of the alarm clock was invented by the Greeks around 250BC. The Greeks built a water clock, called a clepsydra, where the rising waters would both keep time and eventually hit a bird that triggered an alarming whistle.

Hourglasses were the first dependable, reusable, reasonably accurate and easily constructed time-measurement devices.

The very first mechanical clock that was created by I Hsing in 723 AD was also an astronomical clock.

~ Diya Bedi
B.Sc. (H)Mathematics
IInd Year

Srinivasa Ramanujan

An Intuitive Mathematical Genius

Born on 22nd December 1887 in Madras and son of Shrimati Komalatammal and Shri K. Srinivasa Iyengar ,was an Indian mathematician who lived during the British Rule in India.
At his time of birth, the priest told his father that he would not live so long. But his father wasn't disappointed.

From the very beginning of learning Ramanujan had a curious approach towards the mathematical facts. The age when children used to play with toys, he loved to play with math. He had a lot of friends even above his age. Though he was the topper in school, he failed twice in college exams. His family wasn't rich and the reason for failing is that he only studied math & math for whole days. To support his family he tried to get a job as a clerk and he did by entering into Madras Port Trust. His research papers were sent to M.C.Hill, a well known mathematician of London. But got rejected. Then they were sent to another mathematician Hardy of Cambridge, England. Even though his papers were selected, at first Ramanujan faced neglect. After waiting for long he chose to go there himself. All his doubts about ROW to live there were cleared by a friend of Hardy, being a mathematician as well. He went there via ship. And focused on solving more and more complex mathematical problems with other mathematicians in Cambridge.

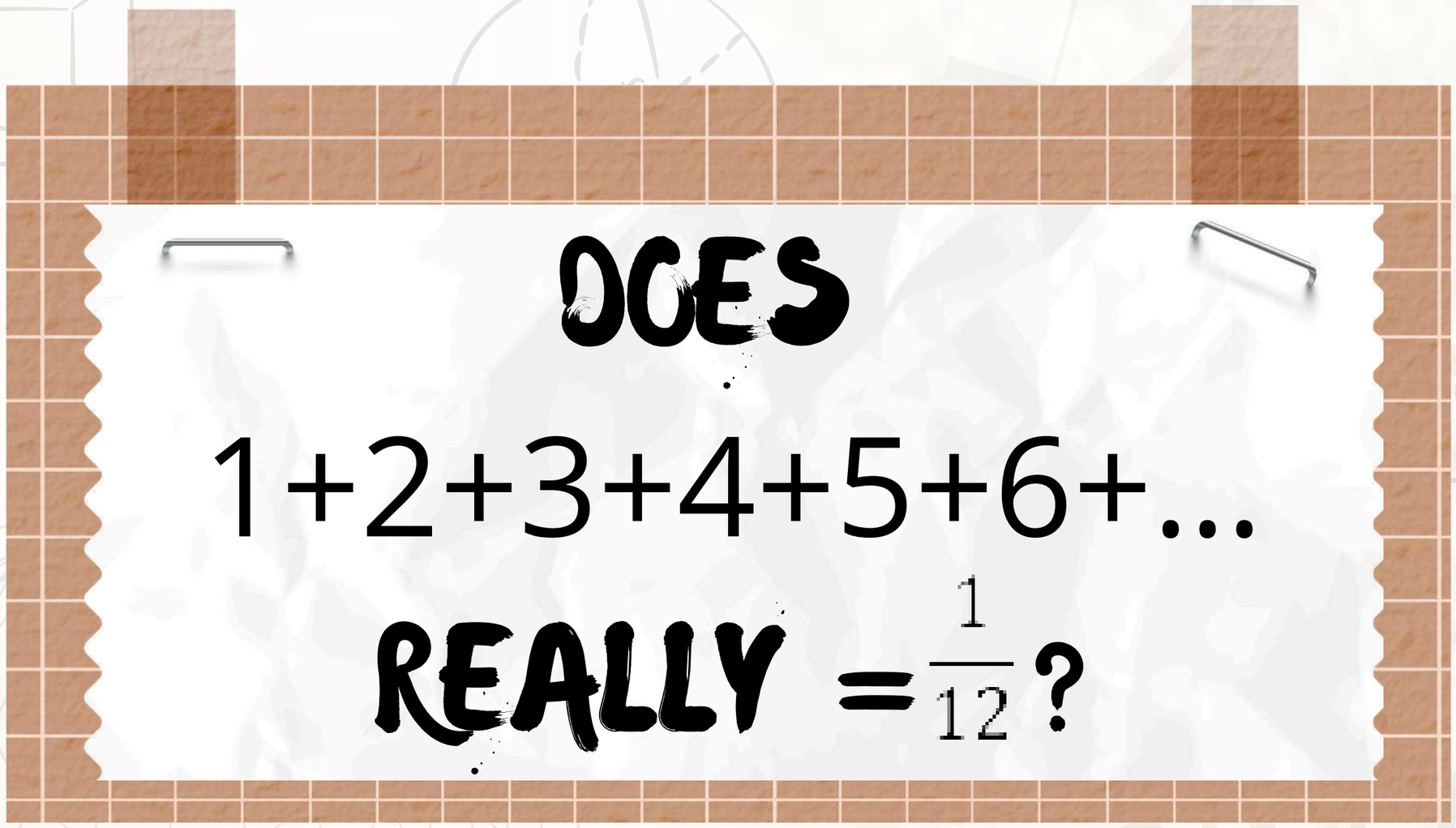
At the time, he gained his BA degree. It was a time of war and there were soldiers in and out of the country. Following his passion he completed a

PHD in the field of mathematics. He constantly wrote letters to his home town and maintained contact with his family. Suddenly he was diagnosed with Tuberculosis.
But he didn't stop and practiced his love for mathematics each day. At last he left this world in 1920 at the mere age of 32.

Some of his famed discoveries and predictions are :

- If you add all the natural numbers, that is 1, 2, 3, 4,.... and so on, all the way to infinity, you will find that it is equal to -1/12.
- He also predicted the existence of black holes.
- He discovered that 1729 is the sole number which can be expressed as the sum of the cubes of two different sets of numbers, therefore called it a magic number.

~ Ankita
B.Sc. (H)Mathematics, 1stYear



Sum of natural numbers upto infinity is negative

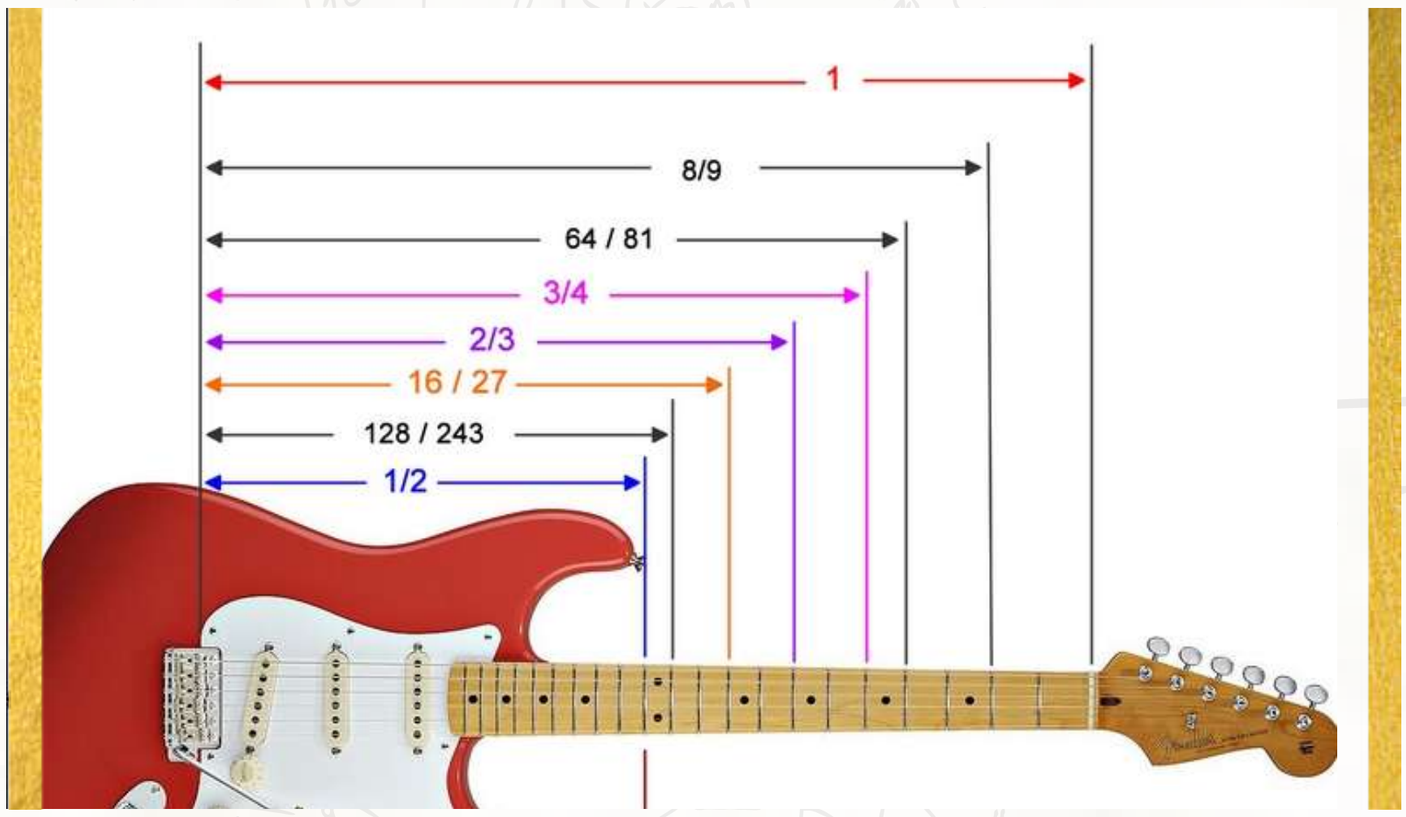
The infinite series and mind-blowing result.

MUSIC

A Genre Of Maths

Music and Maths are normally thought to be two different disciplines without actual overlap but they, are indeed related.

Pythagoras Ratios for Guitar Frets



Pressing down at the 12th fret makes the string half of its full length, which produces an "Octacve" or "High 8th" note.

Putting light to this concept is the Willow flute.

Norwegian folk flute

Mathematical harmonies with seljefløyte / willow flute.

Humans have long been related with producing sounds of different frequencies. The Norwegian Folk Flute is a primary example as it does not depend on finger holes to produce different pitches. Rather, it produces different pitches by varying the strength of the air blown into the flute. The answer to the different tones produced by the willow flute lies in the mathematics of sound waves .

The one dimensional wave equation

$a^2 (\partial^2u/\partial x^2) = \partial^2u/\partial t^2$

gives the behavior of the air molecules in the tube , where the symbols specify the following:

a- A positive constant

u - Pressure in the tube

x - Position along the length of the tube

t - Time

The pressure across the tube is almost constant so direction is neglected. And , the tube being open on both ends , pressure remains the same on both the ends .

So, if L is the length of the tube, $u(0, t) = 0$ and $u(L, t) = 0$.

Thus, solutions to the wave equation are sums of solutions of the form

$u(x, t) = \sin (n\pi x/L) [b \sin(an\pi t/L) + c \cos(an\pi t/L)]$

where n =1,2,3..... and b and c are constants .

The solution thus, predicts the frequencies of tones produced by the flute.

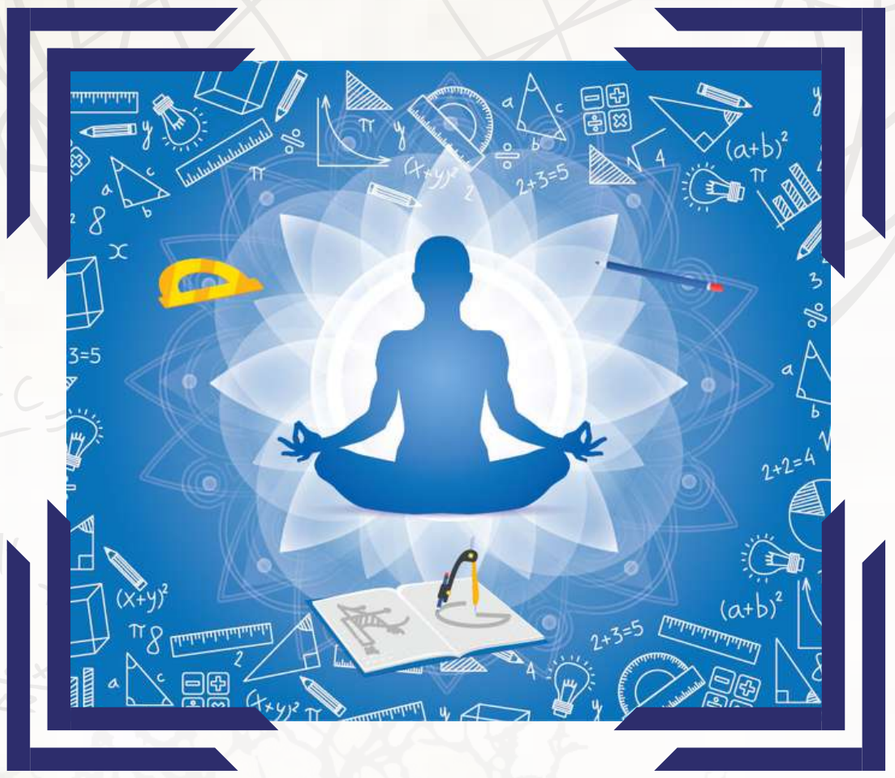
Did You Know

Mathematics is full of interesting numerals concepts. One such number is a hundred. The number 100 does not actually mean 100. It is derived from the Old Norse word "hundrath," which actually means 120.

~ Helen
B.Sc. (H)Mathematics
IInd Year

Vedic Maths :

Discovered by Indian mathematician Jagadguru Shri Bharathi Krishna Tirthaji,Vedic Mathematics is a collection of Techniques/Sutras to solve mathematical arithmetics in an easy and faster way and the origin to the concept of mental maths where the prime focus is to perform tedious calculations without pen and paper.
It consists of 16 Sutras called Formulae and 13 sub-sutras called Sub Formulae, which can be applied to the solving of problems in arithmetic, algebra, geometry, calculus, conics and all other spheres of the subject.



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

Markings on animal bones indicate that humans have been doing maths since around 30,000BC.

It consists of 16 Sutras called Formulae and 13 sub-sutras called Sub Formulae, which can be applied to the solving of problems in arithmetic, algebra, geometry, calculus, conics and all other spheres of the subject.

SUTRAS

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. (Anurupye) Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
16. Gunakasamuccayah

Comparison : Multiplying by 11

32^{*} 11

Vedic math

Step 1: Divide 32 into 3 and 2

Step 2 : Put 3+2=5 in the middle

Step 3 : Combine the above two = 352

Normal computation

$$\begin{array}{r} 32 \\ \times 11 \\ \hline 32 \\ +320 \\ \hline =352 \end{array}$$

Multiplication number with same digit at tens place

Vedic Maths

$63^{*}67$

the multiplication becomes :

$63 \times 67 = 6 \times (6+1)/3 \times 7$

$= 6 \times 7/3 \times 7$

$= 42/21$

$= 4221$

Normal computation

$$\begin{array}{r} 67 \\ \times 63 \\ \hline 201 \\ +4020 \\ \hline =4221 \end{array}$$

3. Sqaure of a number ending with 5

$75^{*}75$

Vedic Maths

$7^{*}(7+1) = 56$

$5^{*}5 = 25$

Joining the above two : 5625

Normal computation

$$\begin{array}{r} 75 \\ \times 75 \\ \hline 375 \\ +5250 \\ \hline =5625 \end{array}$$

~ Anushka Raghav

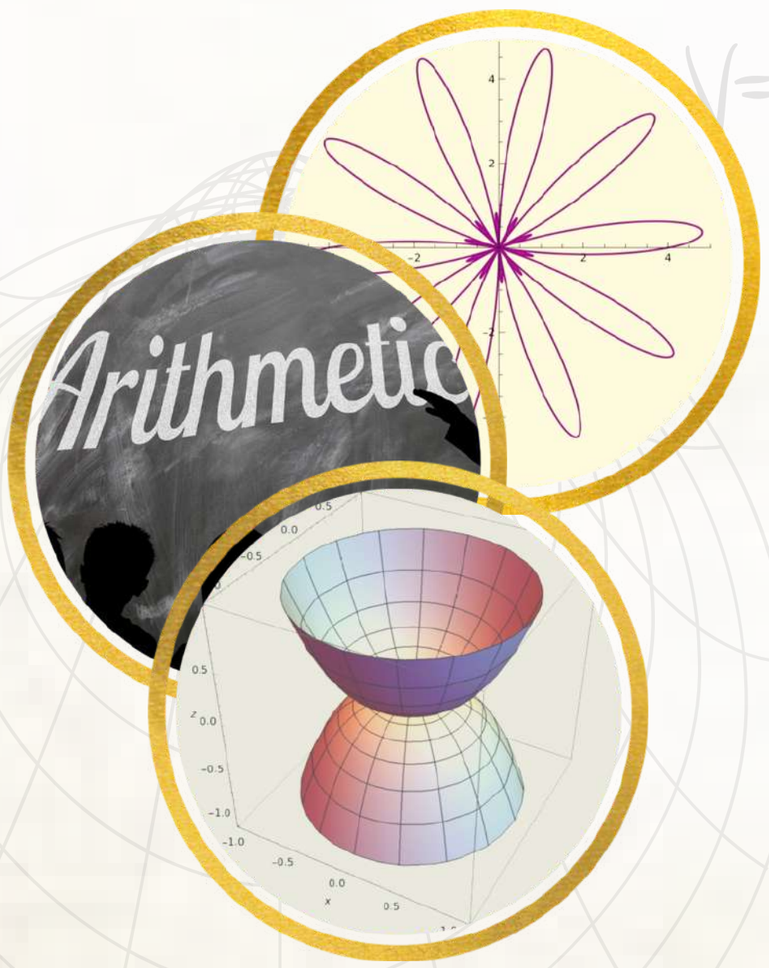
B.Sc. (H)Mathematics, IInd Year

Mathimatiki Melodies

" It all started with numbers,
and went upto infinity,
Indeed it's the glory of mathematics,
the glory of divinity.
Pythagoras, Algebra and many other
are known to us since ages,
And many other concepts
are used to find numbers or wages.
What did Aryabhatta do,
to make mathematics the thing?
He gave the value of pi,
and made circle a measurable thing.
Arithmetic and Trigonometry
are too sound since the past,
Today, everywhere, they still do cast.
Decimal system has also made it till today.
Oh mathematics, on the present
you have such a wonderful say!
What about the sum and angles that prevail,
Oh! Ancient Maths you Hail... "

~ Prerna Panghal
B.Sc. (H)Mathematics, IInd Year

Source:https://pixabay.com/photos/infinity-light-camera-1737624/
Credit: Mari Carmen Diaz



" Math is a miracle
give the way to live life.

Math is a black hole of knowledge
never let you go back.
Math is like life
a little thing make big difference
& choosing one wrong way
lead to wrong proof.

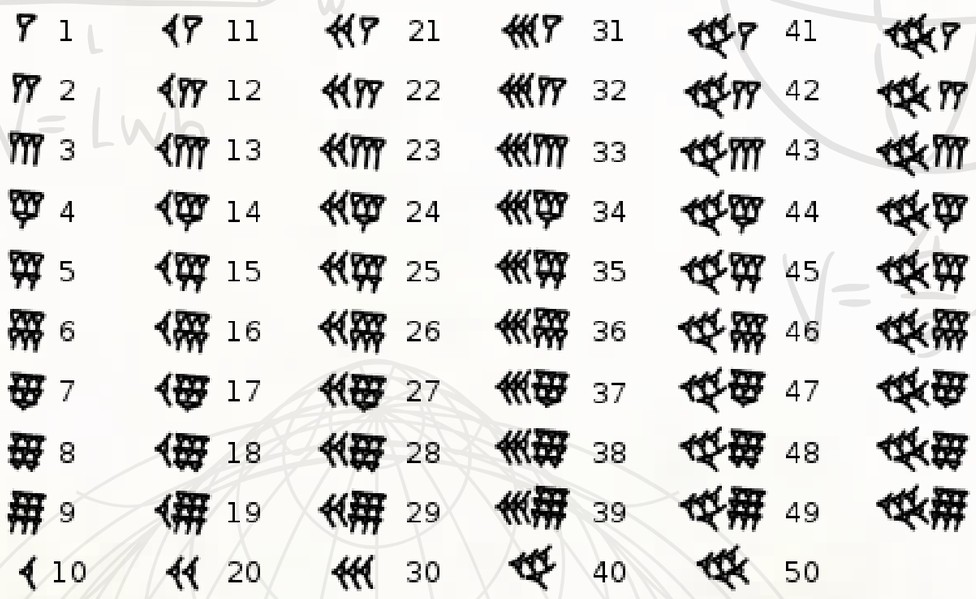
Having infinity like our thoughts
Math can be anything
but can never be nothing

~ Sumiti
B.Sc. (H)Mathematics, Ist Year

Astronomy & Mathematics

The contemporary field of astronomy has expanded 'exponentially' after the development in science and technology. But, this was not the scenario thousands of years ago. Nevertheless, we observe major growth and achievements in astronomy all over the globe during every period of human history. This was all possible with the help of mathematical theories, principles and models.

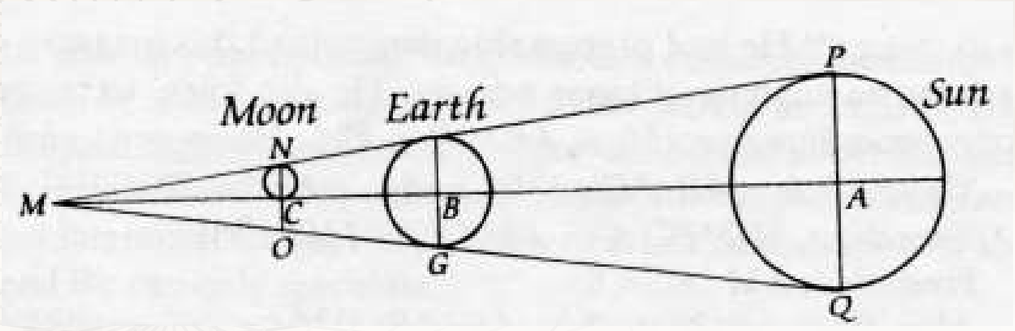
Mesopotamia, one of the cradles of civilization, is believed to have the earliest documentation of the celestial occurrences. Coordinate systems were known to be used in locating the heavenly bodies like moon sun and the constellations.



Sexagesimal Number System

FOUR is the only number in the English language that is spelt with the same number of letters as the number itself.

They also used a sexagesimal number system, which simplified the task of recording very large and very small numbers. Scholars talk about Chaldeans, the priests-scribes who were responsible for developing new mathematical principles to calculate the movements of the celestial bodies. Nabu-Rimmanni, the moon god priest, devised a group of ephemerides, giving the positions of the Moon, Sun, and planets at any given moment. His system was superseded about a century later by Kidinnu's System, a refined mathematical method for finding celestial positions more accurately. George Sarton in his work points out that the arithmetical and empirical nature of planetary models which were different to that of geometrical or philosophical nature of Hellenistic model. One of the unearthed cuneiform tablets holds the calculations regarding the movements of Jupiter while another one records Venus movements. Later stages in astronomy witnessed that astronomers who used previous written text to predict phenomenon had now developed mathematical models that allowed them to predict with computation itself.



Aristarchus's 3rd century BC calculations on the relative sizes of the Sun, Earth and Moon

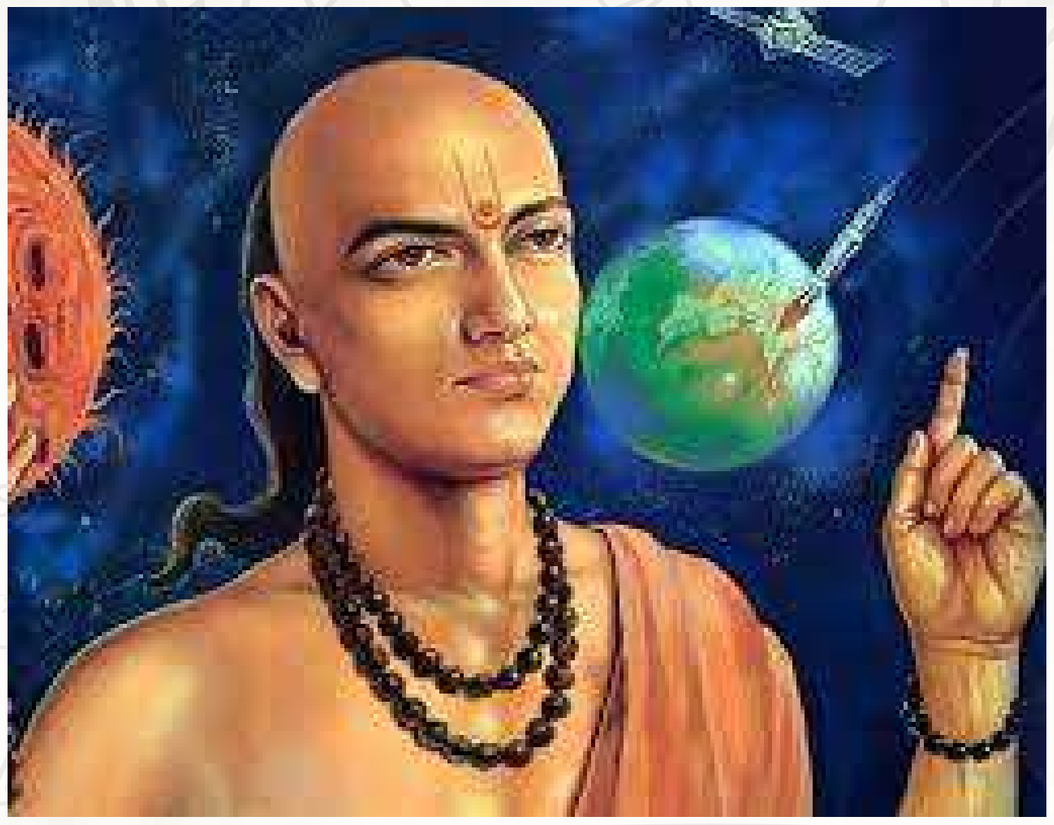
On the foundation laid by the Mesopotamian priests, the Greek erected a whole new set of constructions with help of geometry. Geometrical models were encouraged in 'the classical Greece' to mimic the planetary motions. The famous scholars like Eudoxus of Cnidus and Plato were the flag bearers of classical astronomy. Eudoxus gave the very first model depicting the heavenly system in concentric spheres followed by Plato who claimed the earth to be the center of the solar system. Mathematical scholars gave the 'eccentric model' and the epicycle on a different model which described the planetary motion around the earth. Famous scholars like Ptolemy and Aristotle constructed their models on the same concept of geocentrism. In the 3rd century BCE, Aristarchus proposed the heliocentric model of the solar system. He also calculated the distance between the sun, the moon and the earth.

The solar system was only the primary puzzle of knowledge unraveled by humankind. The above paragraphs only mention the Mesopotamian and Greek contributions to astronomy achieved with the aid of mathematics. However, we can never ignore the contributions of the ancient Mayan, Chinese and Indian scholars just because they were never documented as extensively as their western counterparts. We have come a long way from the time where our ancestors determined the movements of the planets by only giving out theories and models. Advancements in calculus and physics as well as invention of precise instruments and technology have allowed us to discover the vast universe and its constituents. We, as a whole species, wield the capacity to unravel the mysteries the universe hold and the key lies in mathematics" the mother of all sciences".

~ Kinjal
B.Sc. (H)Mathematics
1st Year

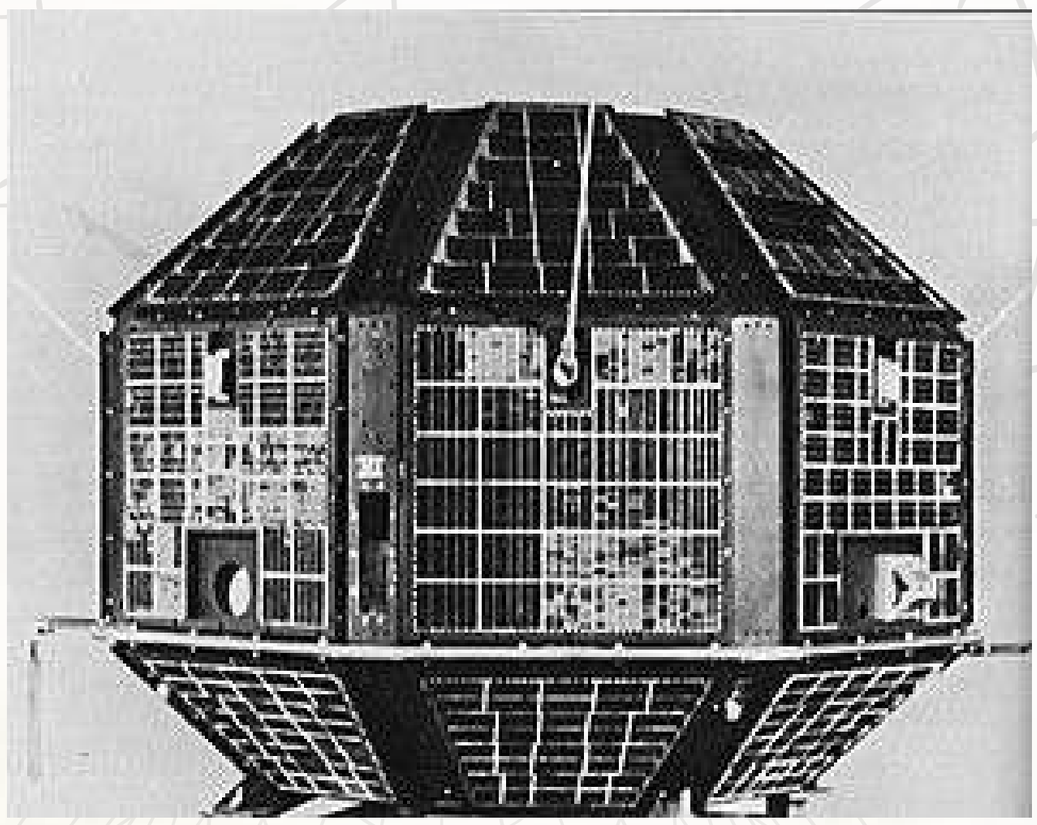
Aryabhata

Aryabhata was also known as Aryabhata I or Aryabhata the Elder to distinguish him from the mathematician with the same name. He was born in 479. Though there is widespread debate on his birthplace with theories ranging from South all the way to the North-East, he at some point in his life settled in Kusumapura near Pataliputra which was then the capital ,during Gupta Dynasty. It was in Kusumapura where he published his magnum opus is his reatise in mathematical and astronomical observation, named Aryabhatiya and his now lost work Aryabhatasiddhanta.



Aryabhata

Source:
https://wonderthatwasindia.blogspot.com/2018/06/the-great-mathematician-astronomer.html

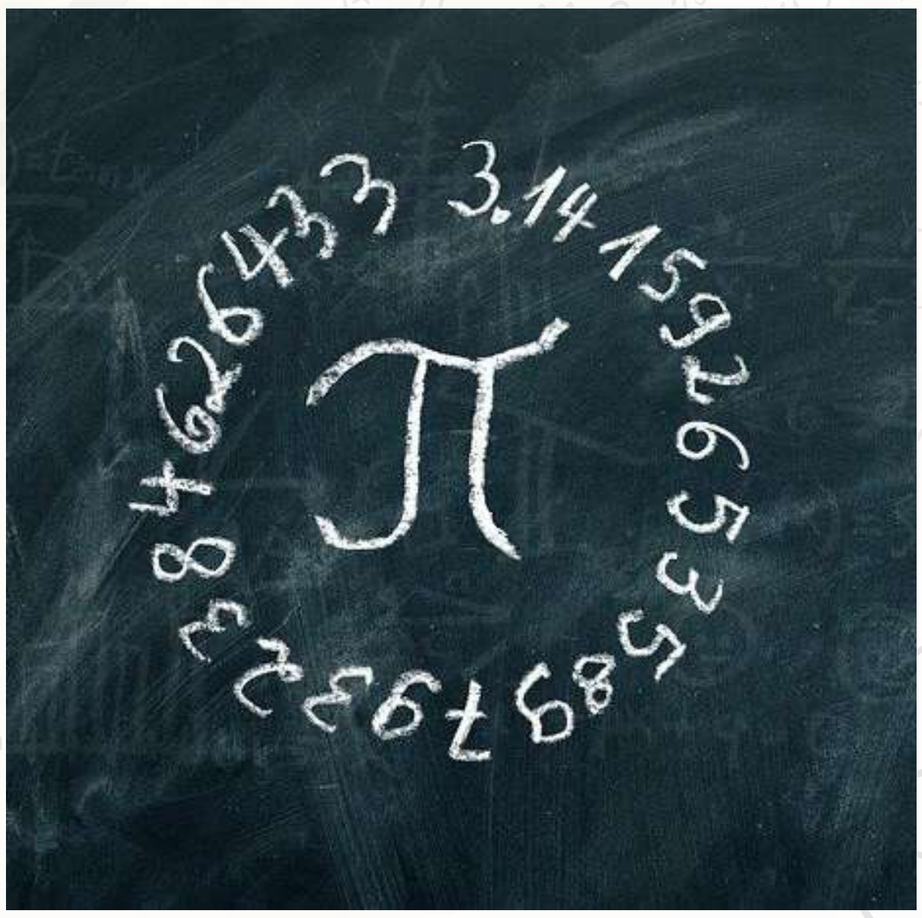


First satellite of India named after genius mathematician

Source: Wikipedia

His first surviving work Aryabhatiya was particularly popular in South India. Several mathematicians wrote numerous commentaries over the ensuing millennium. It was written in verse couplets and dealt with mathematics and astronomy. It followed an introduction that contained astronomical tables and Aryabhata's system of phonemic number notation in which numbers were represented by a consonant-vowel monosyllable, the work is divided into three sections: Ganita ("Mathematics"), Kala-kriya ("TimeCalculations"), and Gola ("Sphere").

His second work Aryabhatasiddhanta circulated mainly in the northwest of India and, through the Sāsānian dynasty (224–651) of Iran.It profoundly influenced the development of Islamic astronomy. It is one of the earliest astronomical works to assign the start of each day to midnight. His work spread westwards where he was known as Arjabad to the Arabic Muslim Scholars and to the Europeans in the middle ages as Ardubarius.



The value of pi as calculated by the genius which was 3.146 was accurate upto 3 decimal digits.

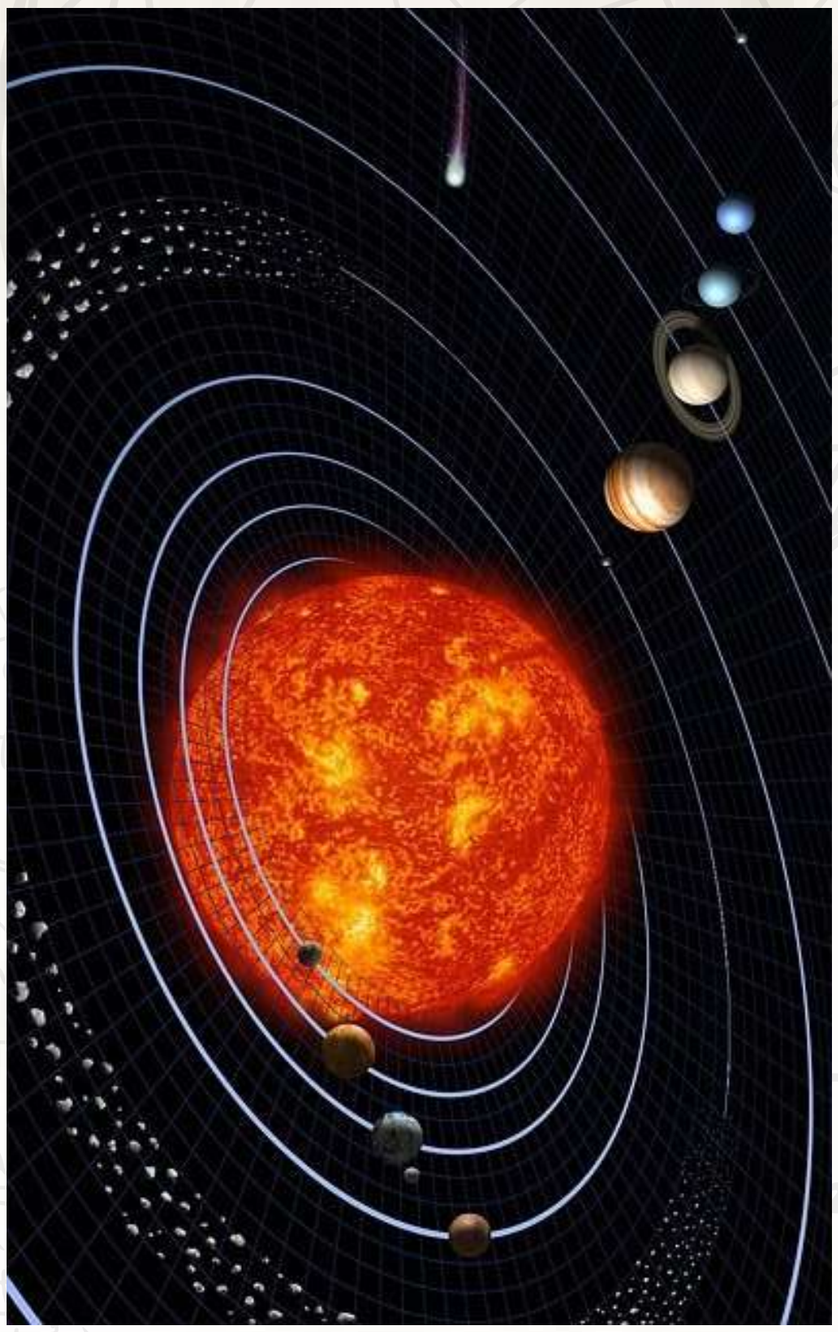
Turning to astronomy with Kalakriya he treated planetary motion along the ecliptic. The topics included definitions of various units of time, eccentric and epicyclic models of planetary motion, planetary longitude corrections for different terrestrial locations,and a theory of “lords of the hours and days” .

Aryabhata used the word 'Shuniya' for zero when representation of numbers change from Sanskrit word to Brahmi numerals.

Insights from his surviving work shows how his findings were revolutionary for his time. Ganita, the first part of his surviving work gives algorithms to obtain square and cubic roots using the decimal number system by naming the first 10 decimals. Geometric measurements—employing 62,832/20,000 (=3.1416) for π, very close to the actual value 3.14159—and develops properties of similar right-angled triangles and of two intersecting circles. He obtained one of the two methods for constructing his table of sines using the Pythagorean Theorem which brought him to the realization that second-order sine difference is proportional to sine.Arithmetic and algebraic topics included.

Back in a jiffy? You’d better be fast! A “jiffy” is an actual length of time, equal to about 1/100th of a second.

Aryabhatiya ends with spherical astronomy in Gola, where application of plane trigonometry to spherical geometry by projecting points and lines on the surface of a sphere onto appropriate planes is witnessed . Further, he also explained solar and lunar eclipses scientifically rather than mythologically instead of the prevailing cosmology in which eclipses were caused by the dieties 'Rahu' and 'Ketu' .He also made an explicit statement that the apparent westward motion of the stars is due to the spherical Earth's rotation about its axis. He ascribed the luminosity of the moon and planets to reflected sunlight.



Aryabhata's calculations on astronomy may have been constructed upon the model of helicentrism.

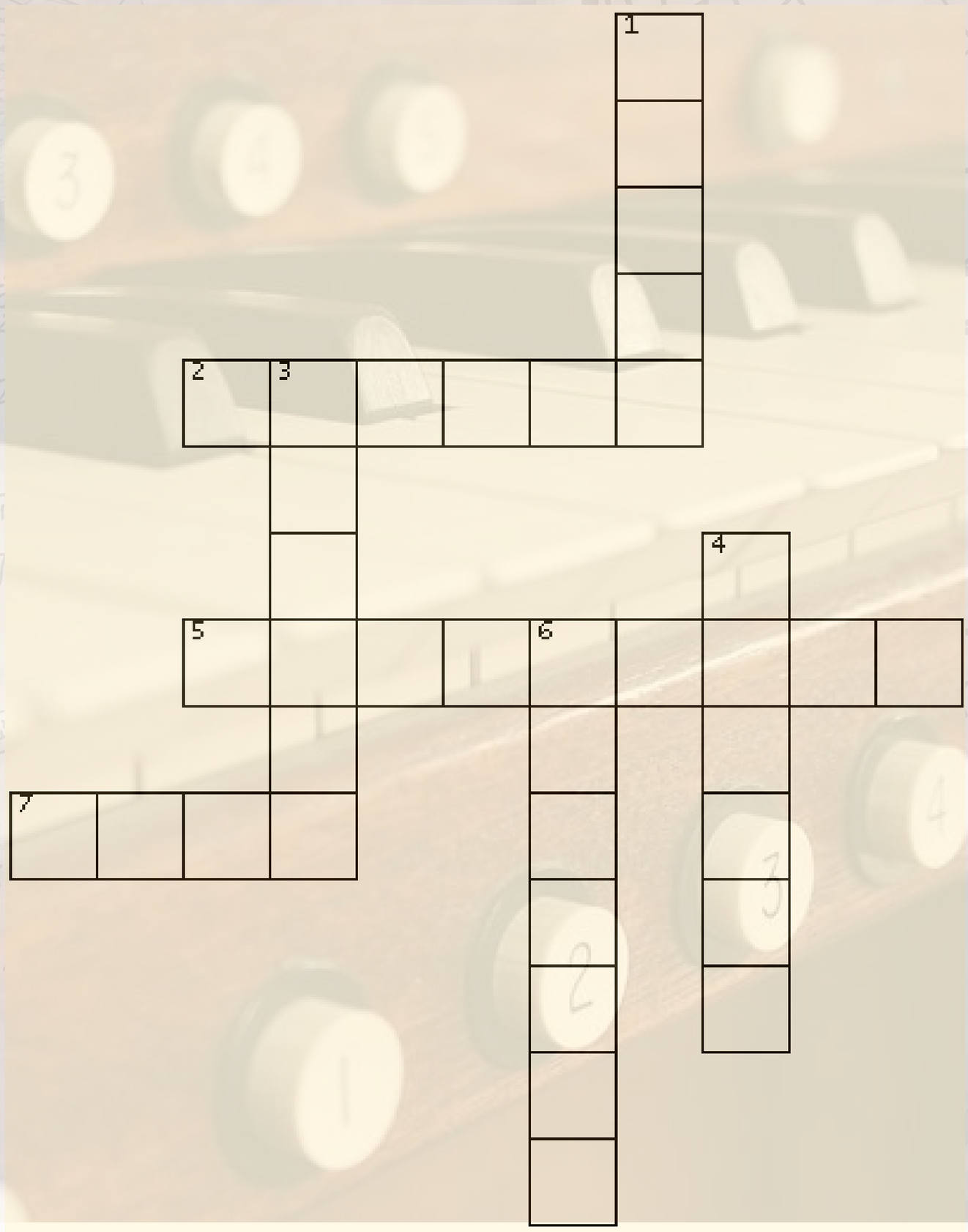
Although his genius in the field were recognised,there are controversies surrounding them even during his lifetime and subsequent centuries. Despite the criticisms ,Aryabhata has not been forgotten due to the ensuing school of mathematical thought in southern India and the Arabic translations. To honour Aryabhata's role as the subcontinent's most influential astronomer, the first Indian satellite was named after him.

If you count up the number of letters in the 13 different kinds of playing cards (ace, two, three, four, five, six, seven, eight, nine, ten, jack, queen, king) you will find that there are 52 letters, exactly the number of playing cards in a deck (excluding jokers).

अधिकाग्रभागहारं छिन्द्यादूनाग्रभागहारेण ।
शेष परस्परभक्तं मतिगुणमग्रान्तरे क्षिप्तं ॥
अधउपरिगुणितमन्त्ययुगूनाग्रच्छेदभाजिते शेष ।
मधिकाग्रच्छेदगुणं द्विच्छेदाग्रमधिकाग्रयुतम् ॥

A verse in Aryabhatiya Explaining kuttak

Word Play With Music



ACROSS :

2. An interval that is five semitones apart
5. This instrument originally came from West - Bengal with zebra skin like striped keys equally distributed in number on the playing board.
7. A squared plus B squared equals C squared, is ofcourse the Pythagorean theorem from basic geometry. But Pythagoras was intrigued by this musical instrument and his method of understanding the musical scale eerily foreshadowed the sequence of steps leading to the development of Quantum Mechanics and modern physics.

DOWN :

1. A music interval that is seven semitones apart.
3. A prominent musical interval which Pythagoras observed, that highlights the universality of his findings in the musical scale.
4. A string instrument which follows the Helmholtz motion creating a sinusoidal frequency of $y=A\sin[B(x-c)]+D$.
6. A musical instrument named after a Greek God, who is a renowned theatrical critic.

ANSWERS

1. Fifth
2. Fourth
3. Octave
4. Violin
5. Harmonium
6. Orpheus
7. Lyre

~ Helen
B.Sc. (H) Mathematics, IIst Year

Singing Note
On Indian Place Value System

Like the crest of the peacocks,
the gems on the hoods of the cobras,
mathematics is at the top of the Vedanga Sastras.

The above verse from Vedanga Jyotisha shows the importance given to mathematics in earlier Indian society.

The globe is aware of the fact that the place value system originated in the ancient streets of India. Aryabhatta of the
5th Century once said :

एकं च दशं च शतं च सहस्रमयुतं तथा प्रयुतम् /
कोटयर्बुदं च वृन्दं स्थानात् स्थान दशगुण स्यात् //

which interpreted as
Numerals are as follows 1,10,100, 1000..... starting from 1, each number obtained by multiplication by 10.

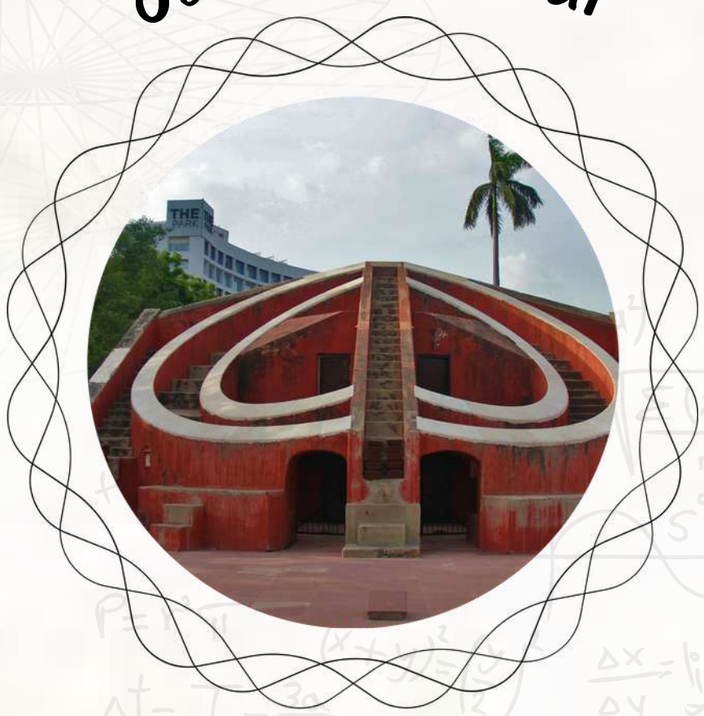
Fact

Indian Mathematicians invented place value system much before zero "0" as they used Sanskrit letters instead of Brahmi numerals to write the numbers.

~ Anjali Choudhary
B.Sc. (H)Mathematics
1st Year

Wonders Of Mathematics

Jantar Mantar



It represents the revolutionary step to shorten the bridge to the mysteries of space.

Maharaja Jai Singh II of Jaipur had five Jantar Mantars constructed between the years of 1724 and 1735 in places like New Delhi, Jaipur, Ujjain, Mathura and Varanasi.

It's filled with ancient instruments like Chakra Yantras, Digamsha Yantra Rama Yantra and many more.

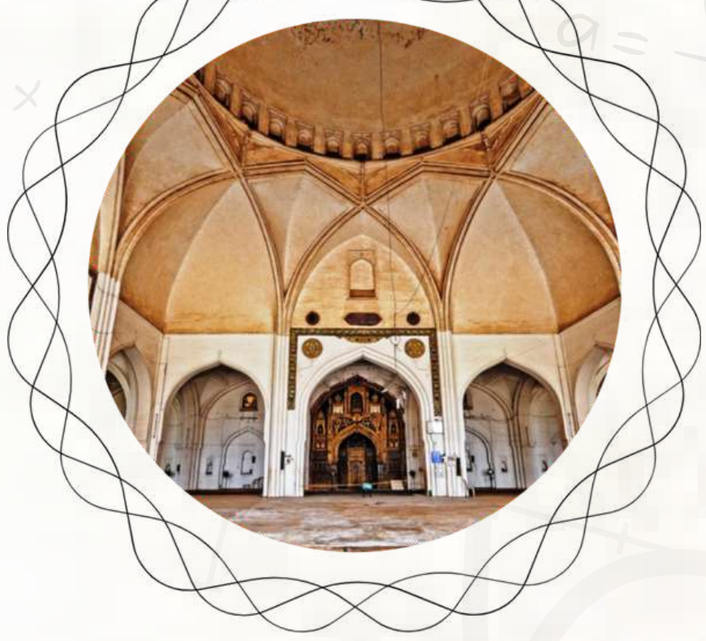
Fact

The power of exponential growth is shocking. You can actually reach the moon by folding a paper of 0.01mm 45 times.

Did You Know?

From 0 to 1000, the only number that has the letter "a" in it is "one thousand". And every odd number has an "e" in it.

Gol Gumbaz

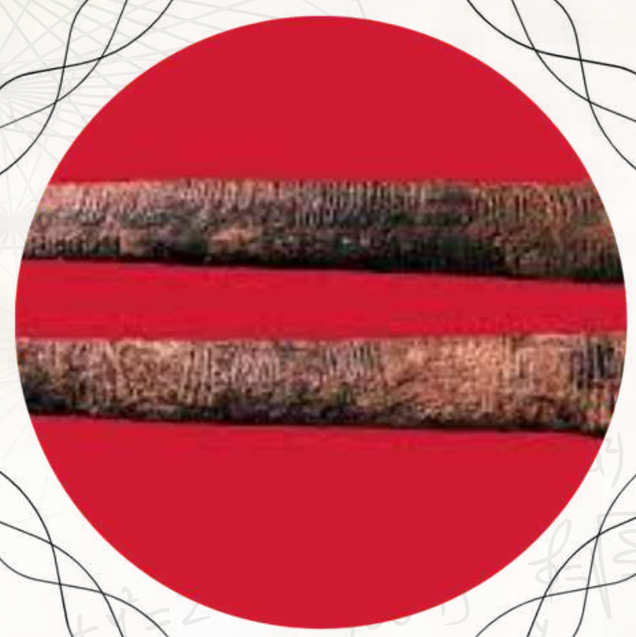


Does innovate and distinctive architecture interests you? Visit the second largest dome of the world and form on its no pillar construction

Completely constructed in the year of 1656 in the city of Bijapur,Karnataka,Gol Gumbad is one of the biggest chamber spaces of the world.

Tthe whispering gallery of the tomb amplifies and echoes back even the smallest sound 7 to 10 times.

Ishango Bone



Engraving in Ishango Bone may describe on bases of 12 and simple arithmetic calculations, was first estimated to have originated between 9,000BC and 6,500BC

Speculation by Scholars says that a woman may have craved the lunar calendar in relation to her menstrual cycle

Mesopotamian Lyre

Different points on a string will produce a different sound. It's all the play of mathematical frequencies. Sing to that!

It's sound producing component were the strings and the resonating soundbox.

They were tuned on basis of certain procedures operating system of 7 scales, originated around 3200 BCE.

Did You Know?

Have ever noticed that there is no representation of ZERO in Roman numerals.

Quipus

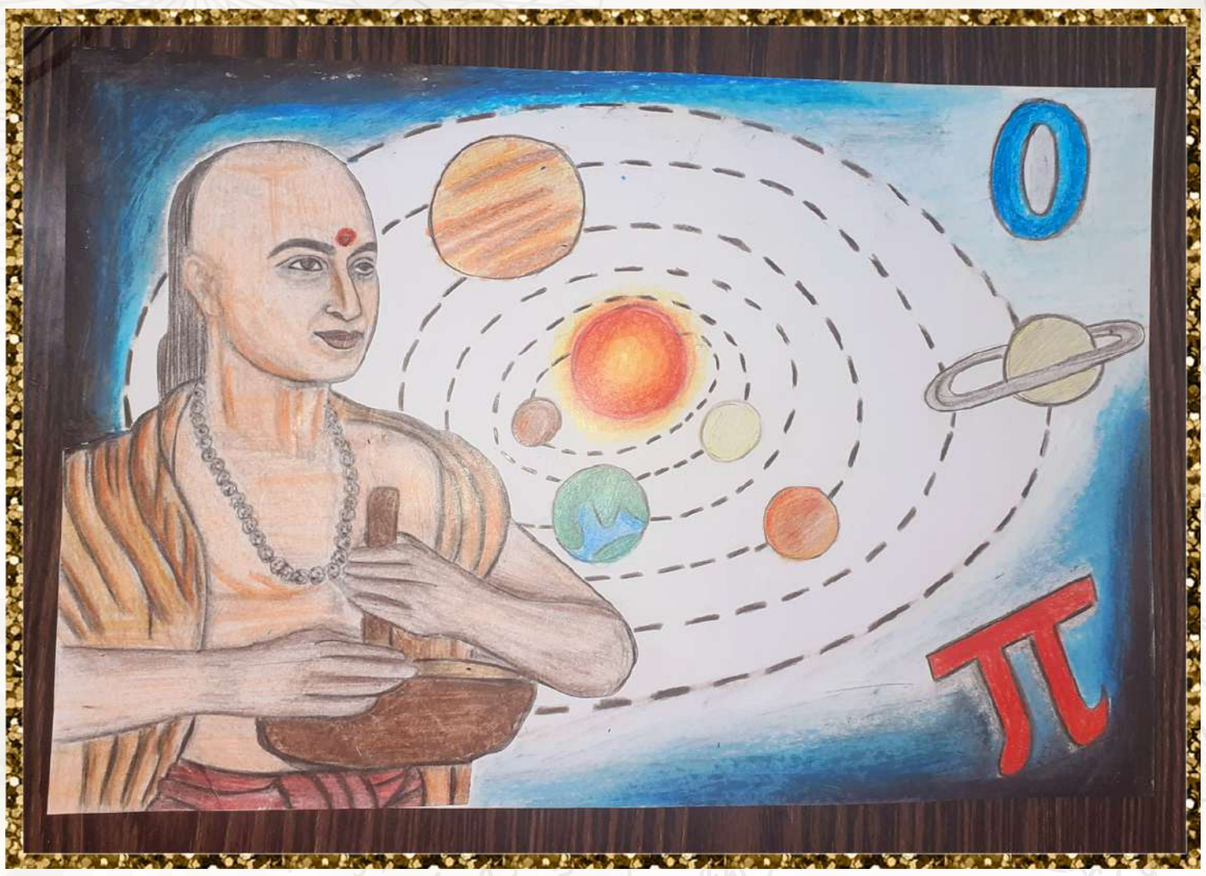
Quipus originated in 2500 BCE, from Inca empire contains knots that stores data as numerical codes.

these numeric code for encoding and menu four types of notes:
simple overhand knots, long notes finger eight knots, and a finger-eight knot with an extra twist.

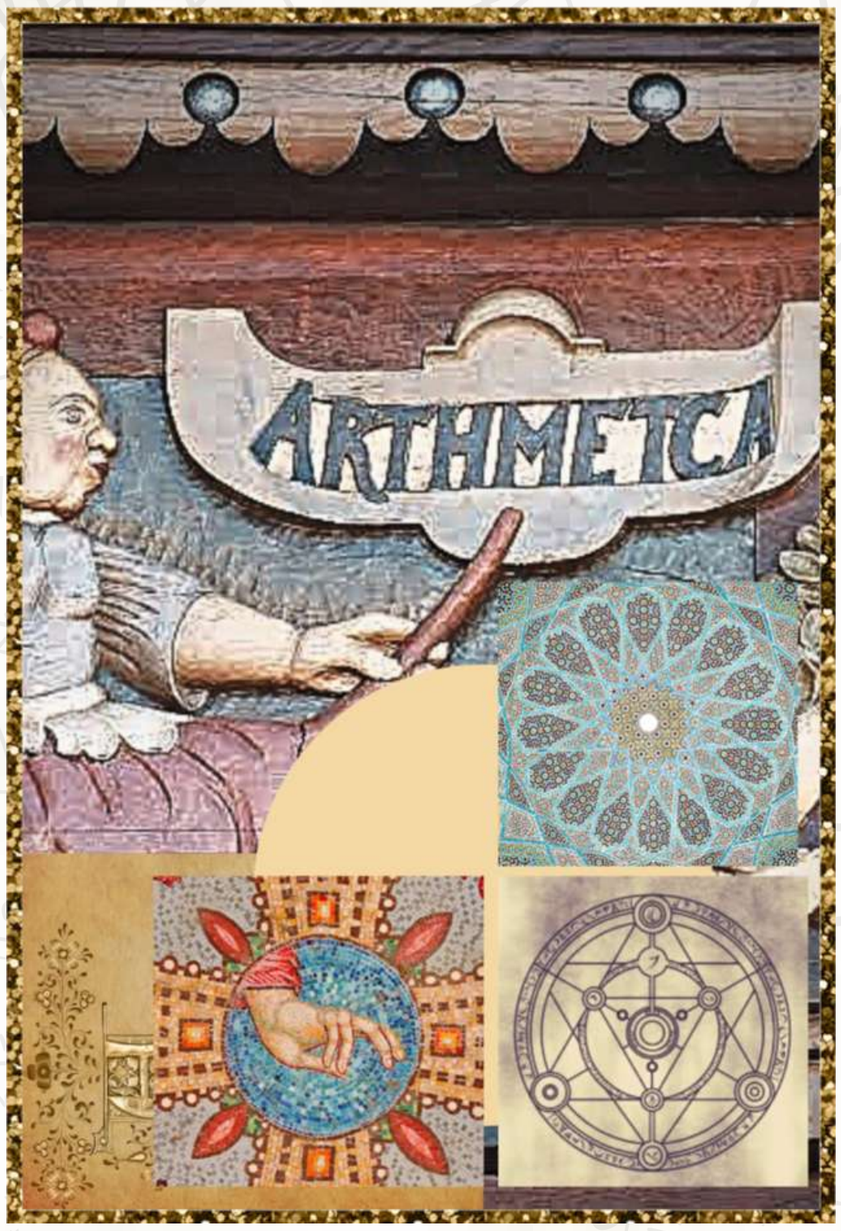
According to Scholars, even the colours may have some significant by conveying different informations

~ Kinjal
B.Sc. (H)Mathematics
1st Year

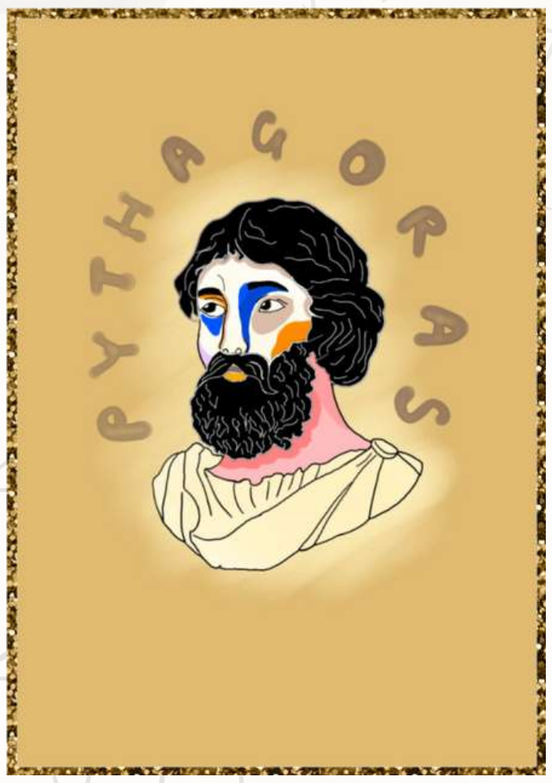
Creative Arena



Ruchita Ray, B.Sc. (H) Mathematics, Ist Year



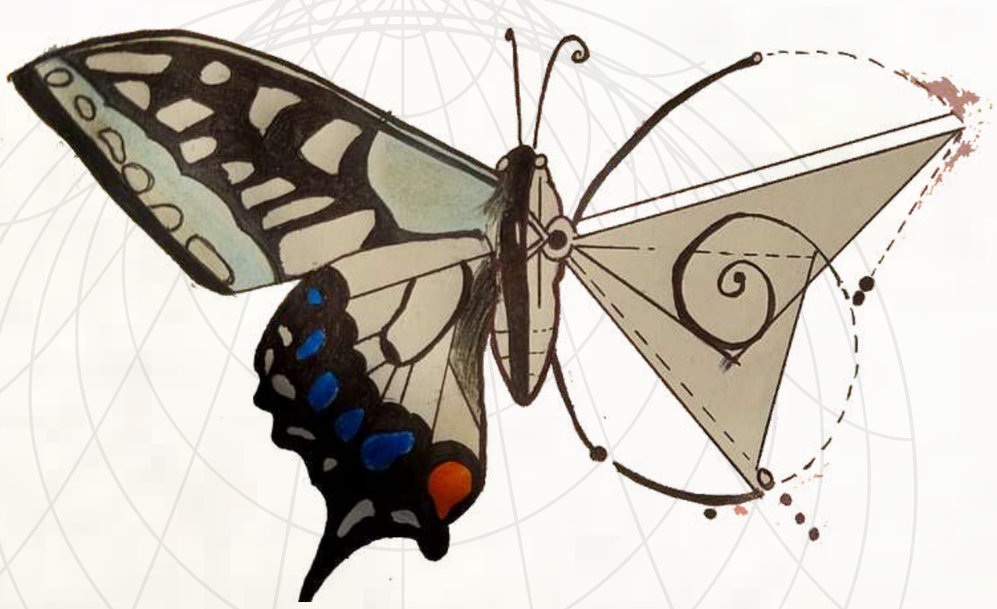
Gargi Bisht, B.Sc. (H) Mathematics, Ist Year



Palden Dolma Bhutia, B.Sc. (H) Mathematics, Ist Year

Sofia, B.Sc. (H)Mathematics, IInd Year

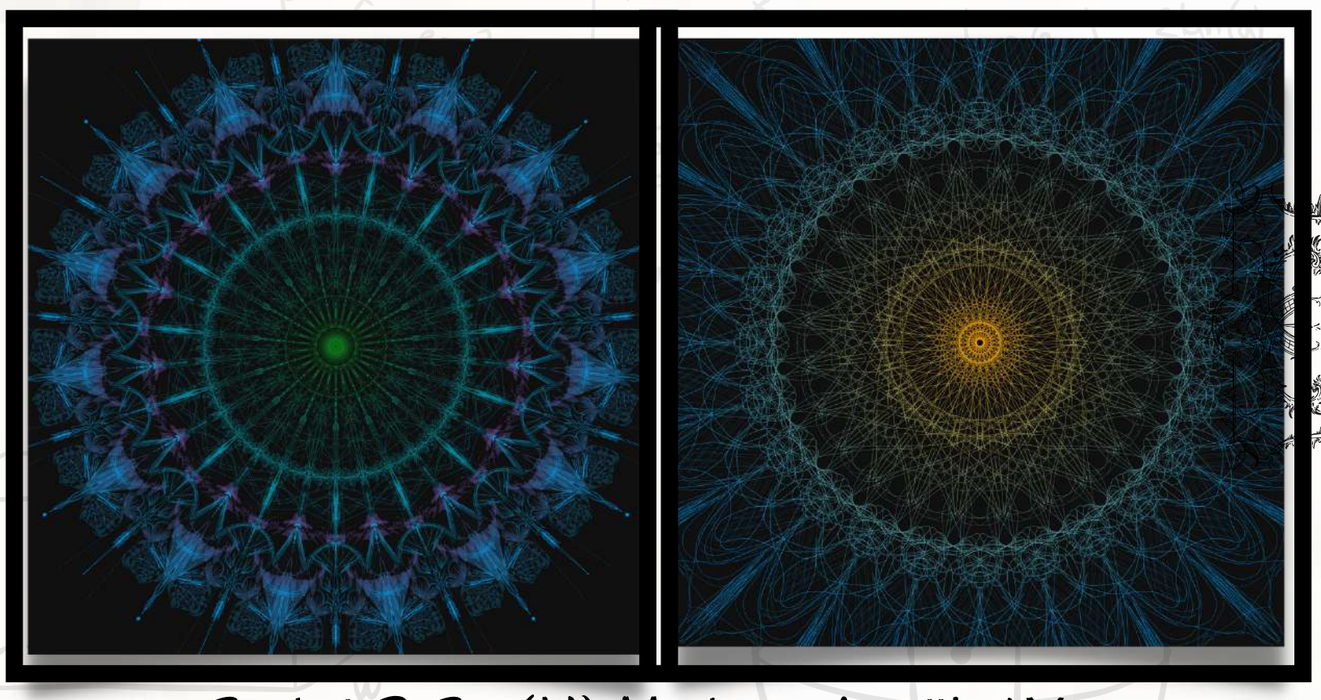
Ishita Soni, B.Sc. (H) Mathematics, Ist Year



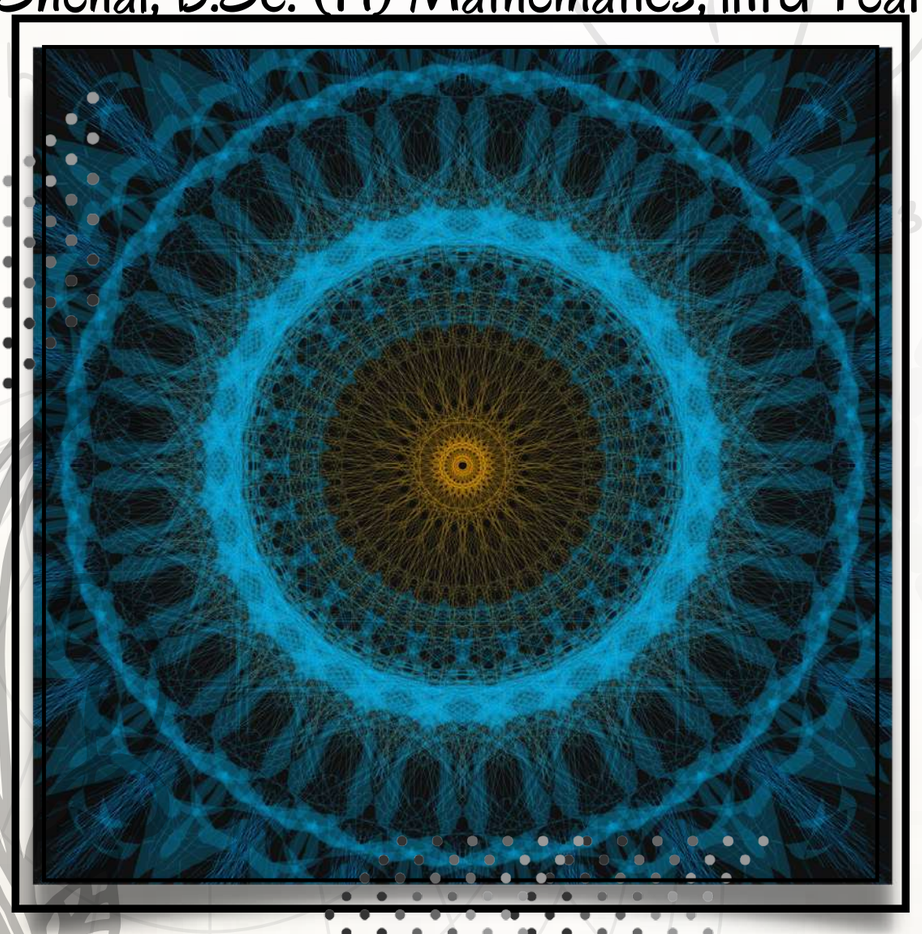
Deepanshi Yadav, B.Sc. (H) Mathematics, Ist Year

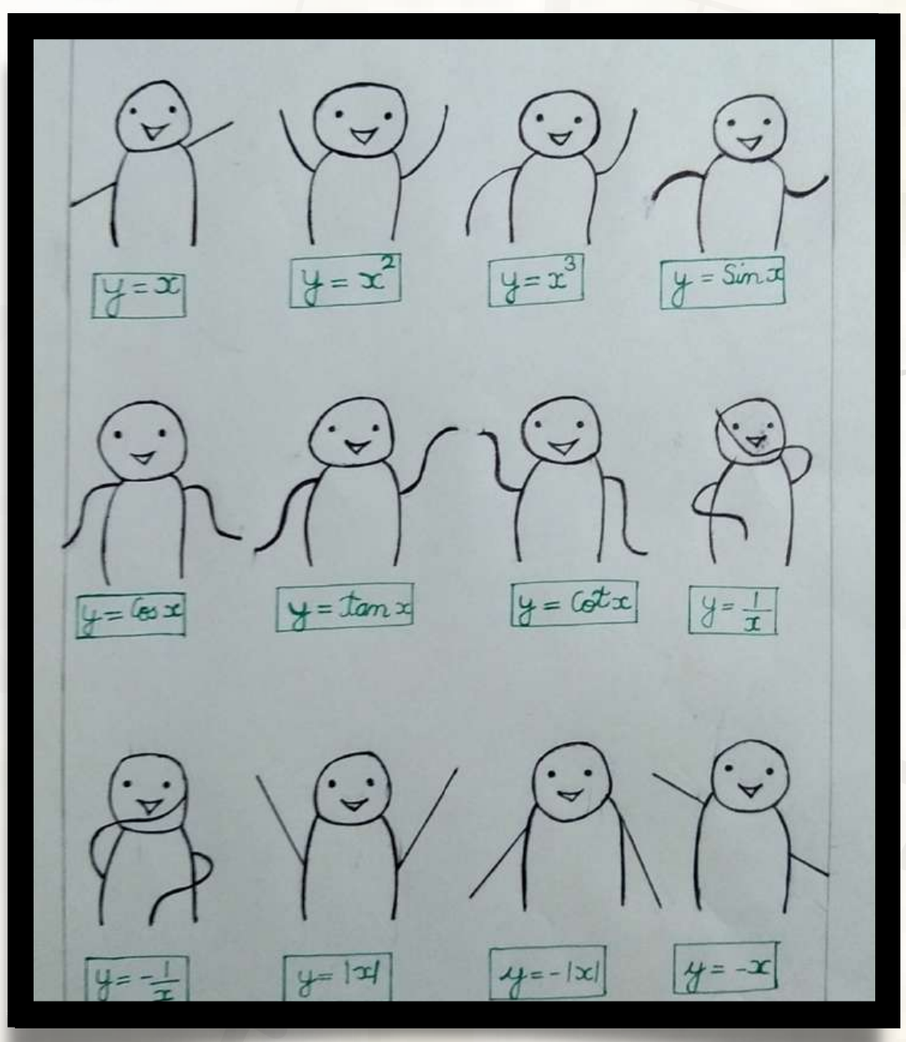
Aastha Jha, B.Sc. (H) Mathematics, Ist Year

Swati Yadav,
B.Sc. (H) Mathematics, IInd Year



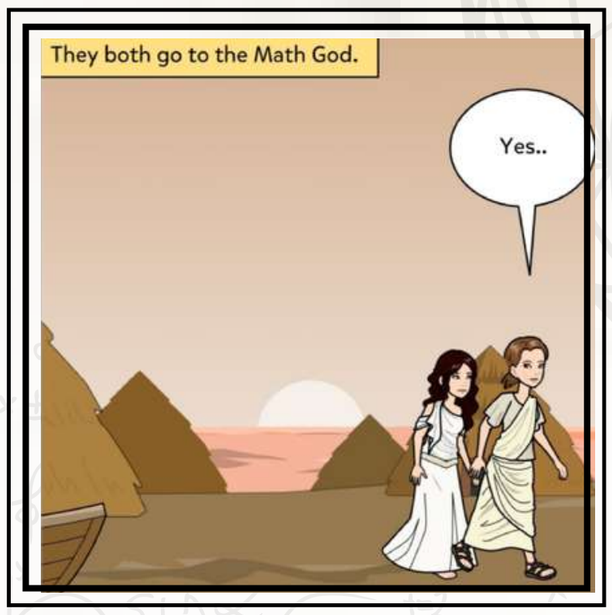
Snehal, B.Sc. (H) Mathematics, IIIrd Year

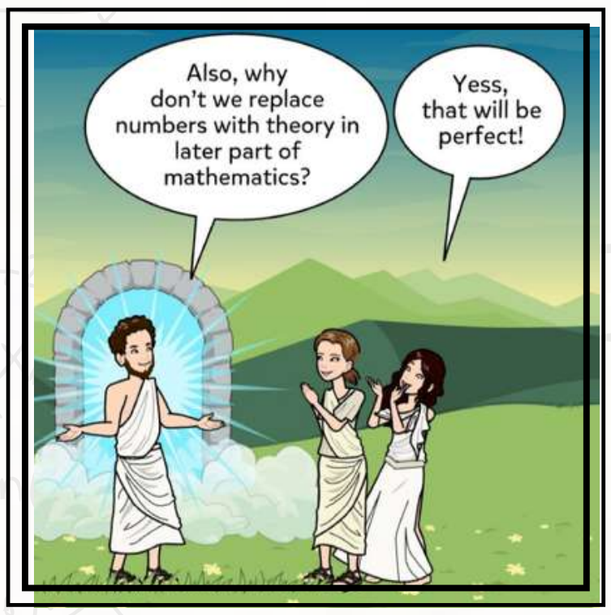


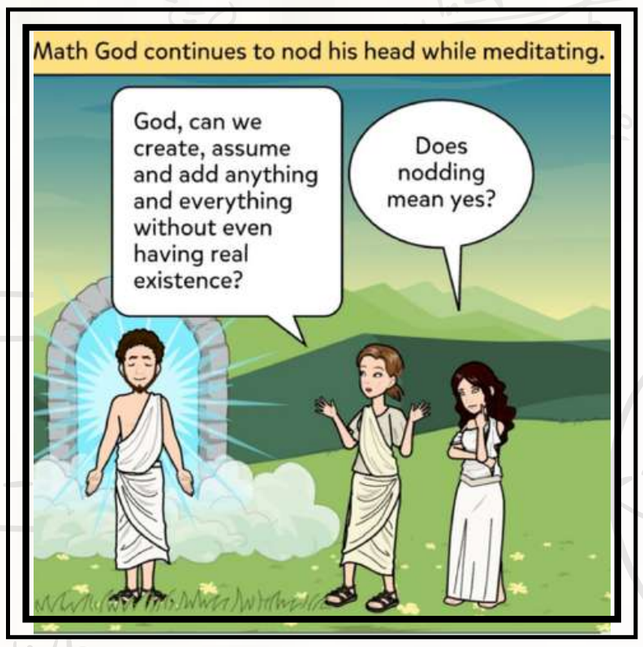


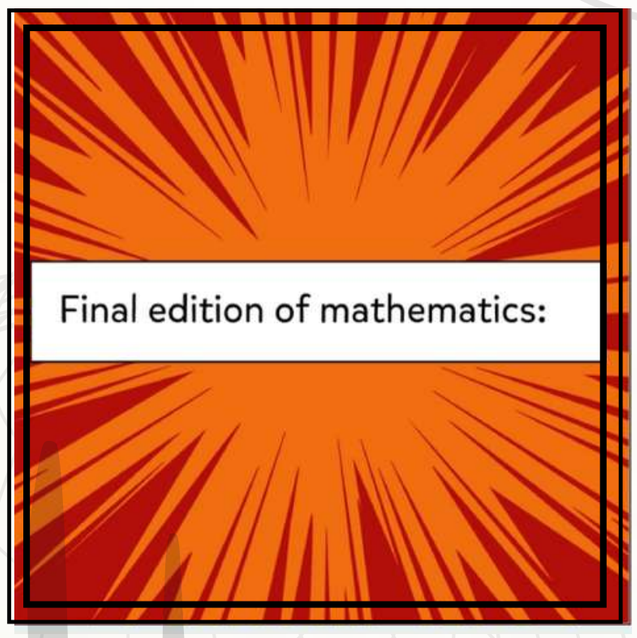
Preeti Hooda, B.Sc. (H) Mathematics, Ist Year

"Let" it be true!









COMICTRIP

~ Diya Bedi
B.Sc. (H)Mathematics, IInd Year

Winning Article of Arcticle Writing Competition

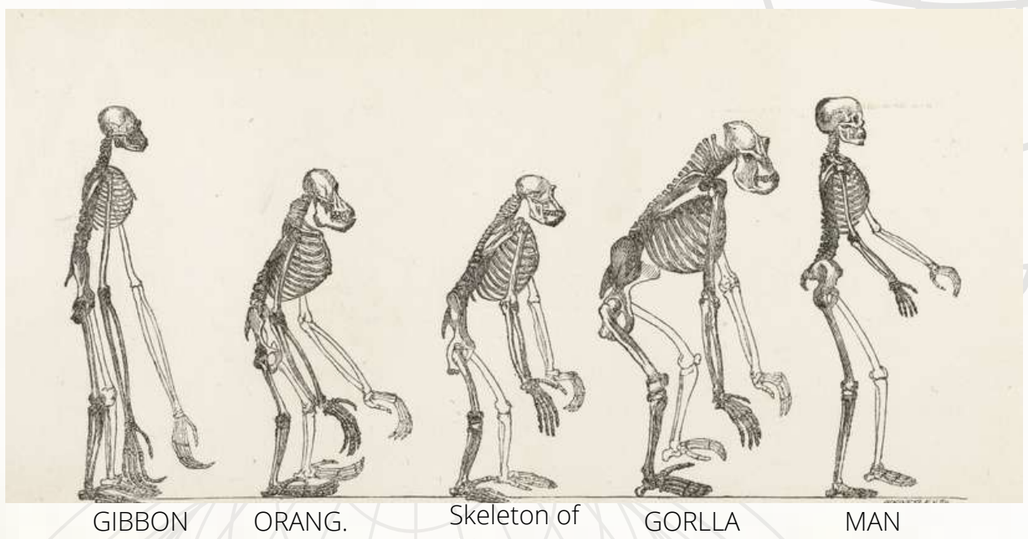
The topic of the competition was "Role of Mathematics in Evolution "

Mathematics :

An Invisible Pillar Of Evolution

Stephen Hawking rightly stated, “There is no need of invoking God, as long as we have mathematics.”

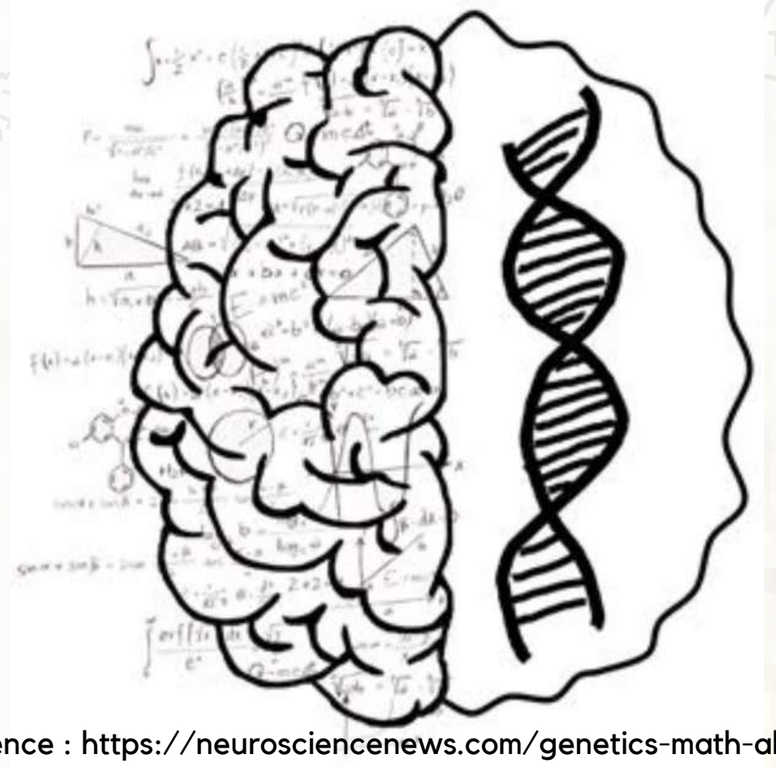
It might have all started with a zero for humankind, but Mathematics had a hand in our evolution from the start. A naked eye might miss the patterns of numbers on which nature works, but keen observation has highlighted that we humans need a structure to evolve, grow and develop, a structure provided by Mathematics. Evolution might be all about getting the equations right.



Photographically reduced from Diagram of the natural size (except that of the Gibbon, which was twice as large as nature), drawn by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

Reference : https://www.sciencehistory.org/distillations/a-world-without-darwin

Most of us are familiar with Charles Darwin’s survival of the fittest theory. The concept is based on the phenomenon of natural selection, replication and variation, which in its basic form means reduction, multiplication and creation of small quantitative differences in ratios, respectively. His theory of evolution add a mathematical foundation and thus, showcases the the role of mathematics in our evolution.



Reference : https://neurosciencenews.com/genetics-math-ability-17207/

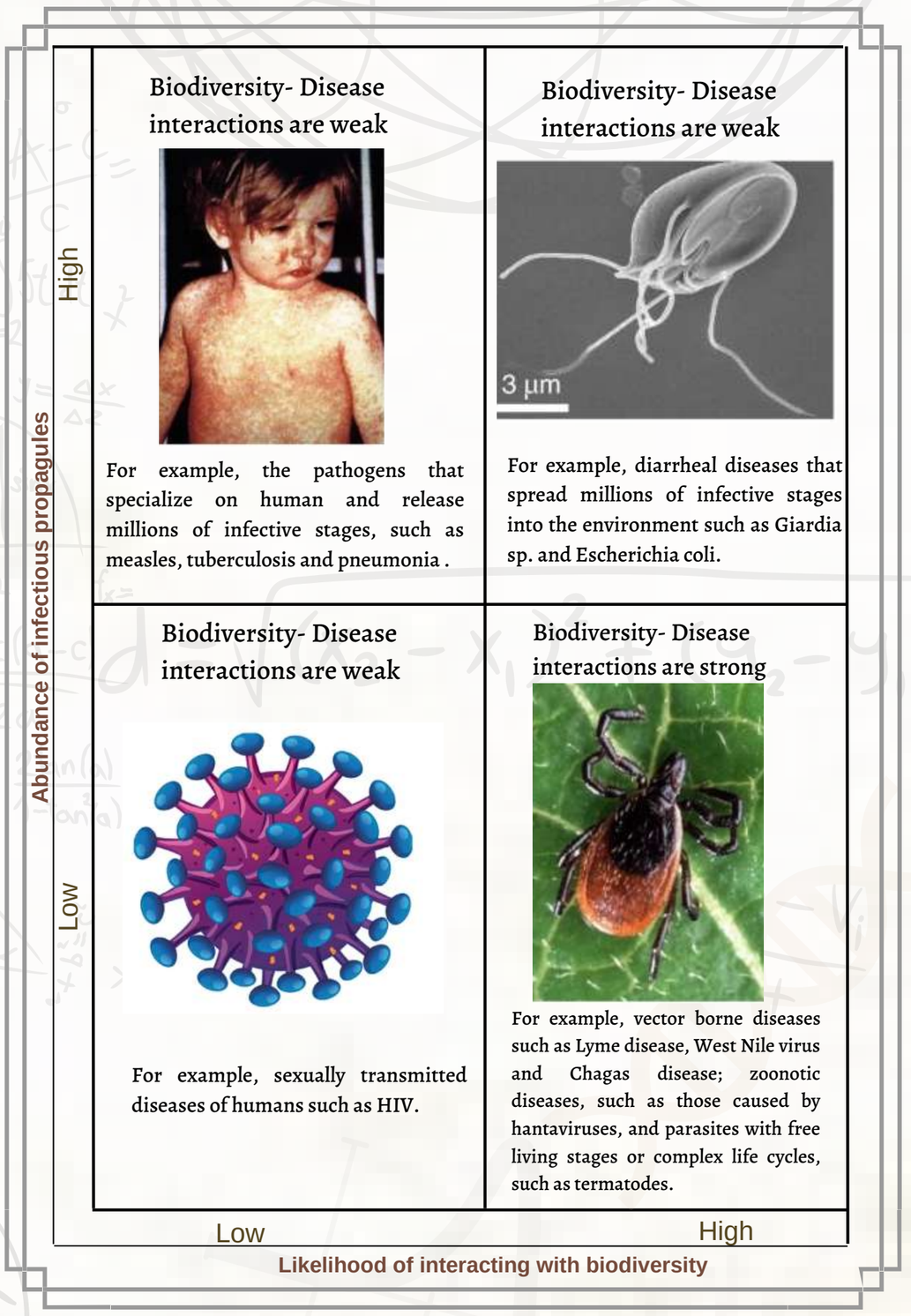
Various mathematical models of evolution are created to provide generalized descriptions of biological changes such as genotype and phenotype variations in large populations over a period of time. Mathematics converts theory into equations and numbers and gives humankind a system on which biology

seems to work on. Mathematics is used to explain how an animal might develop anatomically and how hereditary information is passed from generation to generation. With time, from biological fitness, humans shifted to social fitness and made it the criteria for natural selection. Humans are information carriers, and through the process of reproduction, this information is passed on. Hence, in an evolving population, replication is the process through which knowledge is gained.

Any mistake in this process results in variation. Selection is then made for the ones who manage to survive are to be the fittest.

Humans are social beings, and our evolving social populations are influenced by the basic concepts of mathematics. These models provide the basis for existing cultural differences. For instance, the IQ-intelligence quotient of an individual is a product of both nature and nurture.

Mathematics connects the two in a dynamic system where both of their influences are considered. Diseases are a threat to our evolution resulting in undesired evolutionary processes. Cancer may be seen as a replication of malignant cells as a result of mutation.



Making use of graphs and probabilities, a model of attacking selection is put forth, showcasing populations as mathematical abstractions and how they may be able to overpower or reinforce the effects of natural selection. Let us consider the current pandemic; COVID-19. One might wonder on what basis the authorities in power make decisions about when to initiate lockdowns, give estimates of likely

infected the percentage of the population and come to make predictions about how long a disease would last.

Mathematics is a vital component of the answers to all these questions. Through charts, graphs ho and comparative tables, a mathematical model of the disease is formed, which gives insights into the functioning of a disease. This model is then utilized to make predictions about the workings of a disease, thus, prompting the authorities to initiate timely, wise decisions that are in the welfare of the population. The hospitals receive an idea about the approach they should employ while forming their budgets as these models help in predicting the required medical equipment from ICU beds to medicines. We are a part of an ecosystem. What affects nature seems to concern our kind equally. Our lives need to be in sync with the dynamics of nature for our survival. Nature works on patterns of numbers. From the branches of a tree to the petals of flowers to the reproduction of rabbits and bees to the spirals of galaxies, numbers are all around us.

The cosmos speaks the language of mathematics. Through mathematics, we get a glimpse into the world of stars and gain knowledge about the inner workings of the universe, which is passed on to the next generations through replication, and the process of evolution continues. Mathematics has become a way of communication. No matter the domain, you belong to, you will find that equations form the foundation of your niche.

Mathematics is the essence of evolution, and though few of us might be able to recognize its contributions, no one can deny that Mathematics is an invisible pillar of evolution.

~ Shivangi Dhiman
B.A. (H) Applied Psychology
1st Year

Fact

The spiral shapes of sunflowers, snails and shells follow the Fibonacci sequence, where the two previous numbers are added together to get the next. (1, 2, 3, 5, 8, 13, 21, 34...)

Events Galleria

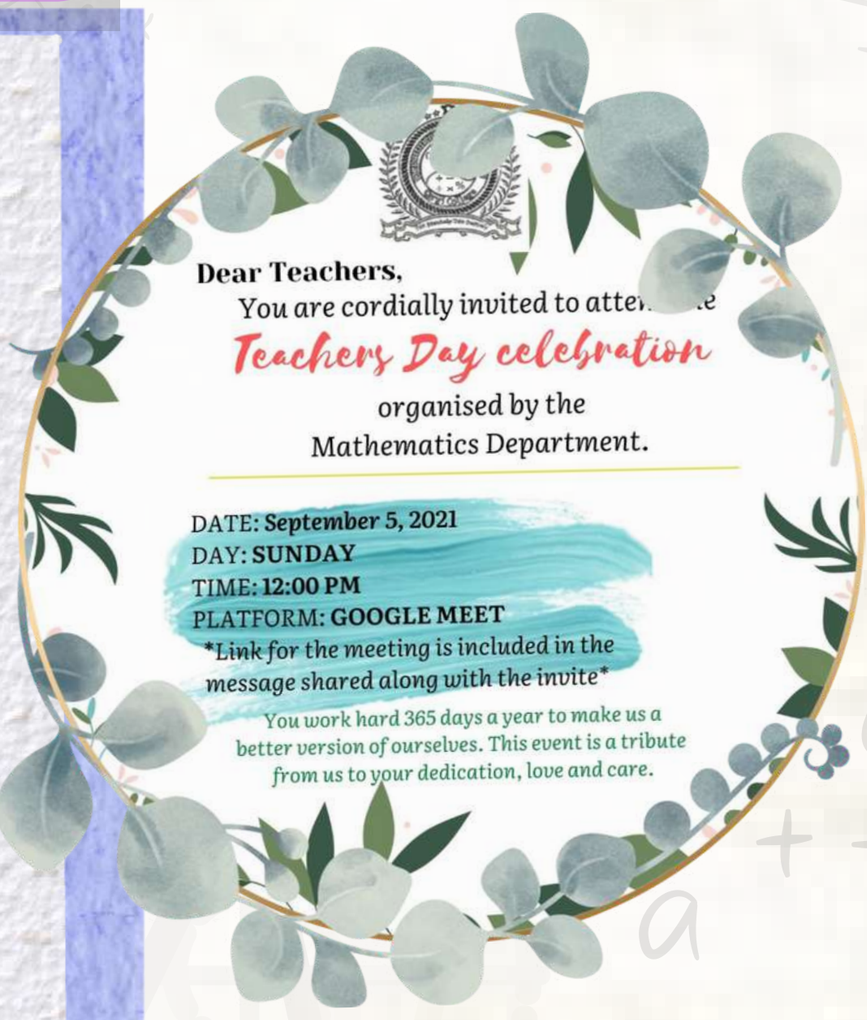
Plans are nothing, However Planning is everything.

A ravishing glimpse of productive
activities and events conducted by the Mathematics Association of
Gargi College, 'Mathema' during the academic year 2021-22.

Teacher's Day Celebration

5th September 2021

For the day, an online event was conducted where the complete department was gathered. The event began with the President welcoming the gathering. A beautiful video compiled by the third year students warmed every heart in the meeting and rejuvenated the energy. ! The title ceremony, in which students bestowed math-related titles on all of their professors, was the highlight of the afternoon.



Department Orientation

DEPARTMENT OF MATHEMATICS
GARGI COLLEGE

22nd November 2021

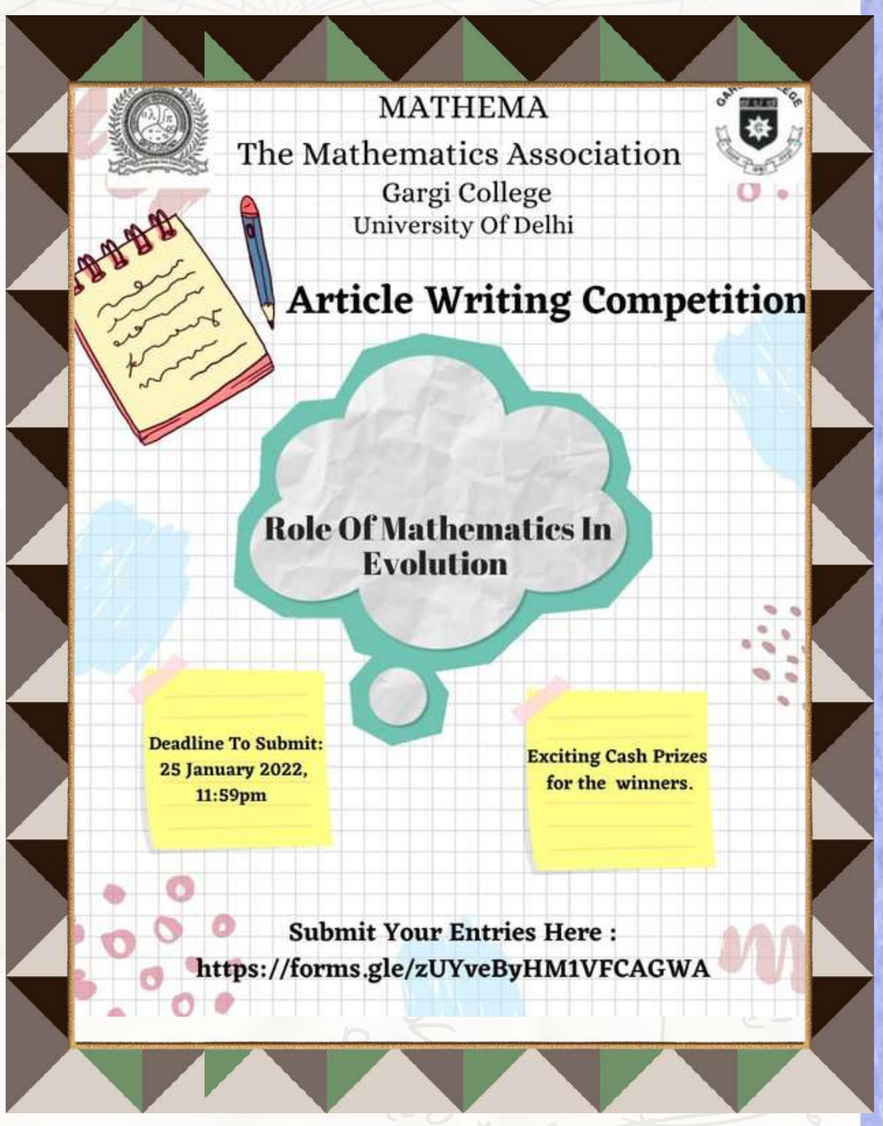
- For The Freshers, 22nd November 2021 Following the legacy of online mode during pandemic, the year as well the Department Orientation forthe first year students took place digitally. To enhance the piousness of the session Principal Prof. Promila Kumar addressed the gathering and motivated the students for their new journey. All the department teachers wre present too. Through the orientation program first year students were informed about their course structure, weekly time table followed by department and college activities

Webinar : The Tales Of The Constant e

27th January 2022

- Mathema, The Mathematics Association organized a webinar on "The tales of the constant e" underthe aegis of IQAC Dr. Tanvi Jain, associate professor, Indian Statistical Institute, Delhi. It was impressively a successful event in which students across the colleges and the faculty joined the webinar. It was a great learning opportunity and the webinar was quite insightful. There were open questions in the end that made the session more lively and interesting

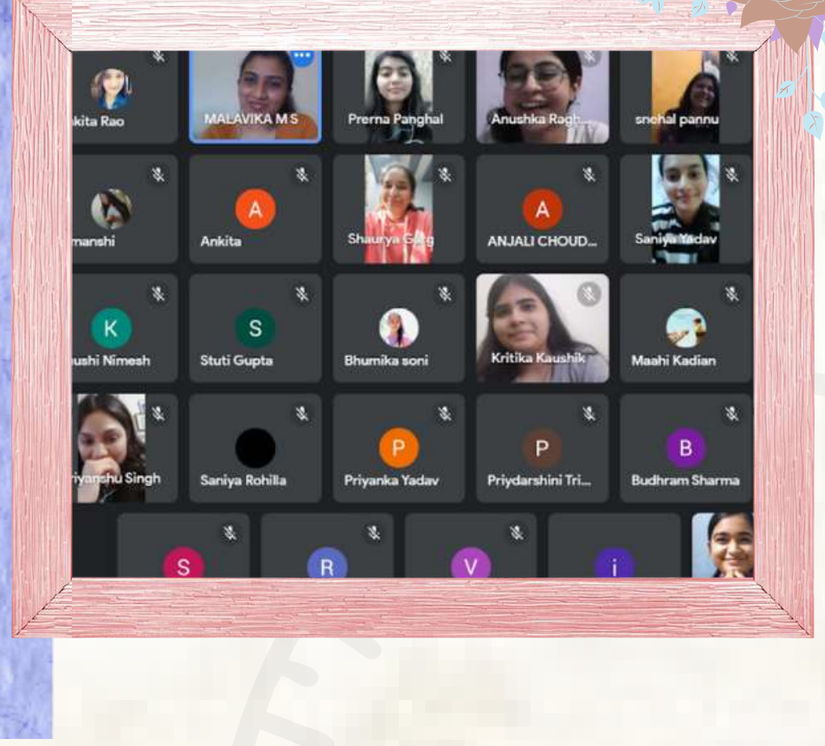
Article Writing Competition



- Keeping in mind the inexhaustibility of magic that words have , the department organized an article writing competition on the topic “role of mathematics in evolution”. The enthusiastic participation of students across departments and colleges , made choosing a winner challenging. Shivangi Dhiman of Gargi College was the writer of the winning article, while articles by Malavika MS and Rushda won the second and third position respectively. Winners were awarded by cash prizes and e certificates.

Interactive sessions

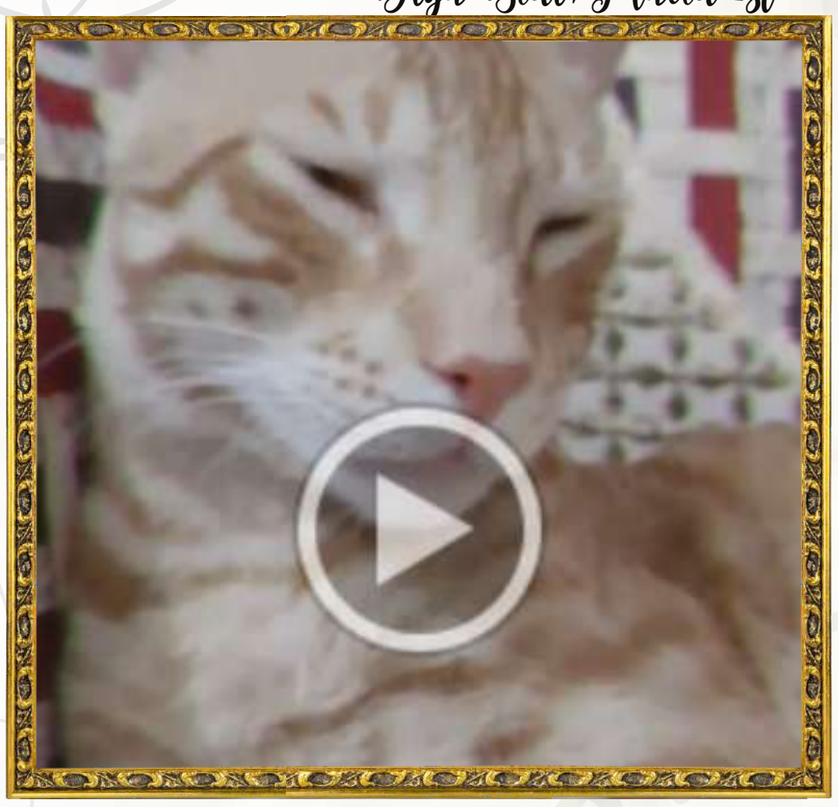
- Leadership is not about titles, positions or flowcharts, it is about communication and teamwork. Keeping in mind the same fact, the core team of mathematics department decided to conduct an interactive session for the department students. The main objective of the session was "to feel connected with each other and to include all students and their viewpoints for the issues of the office".



Reelmatics : Reel Making Competition

The monotonousness of the month of September was broken by the rhythms, tunes, music and laughter brought by REELMATICS-the reel making competition organised by Mathema. The topics given to participants were what people think mathematics students do VS what they actually do and a day in the life of a Mathematics student. The ideas and creativity of the participants indeed surprised everyone , all reels were hilarious and at the same time relatable to all mathematics undergraduates and this made the task of choosing the winners a difficult one for the judges.

Diya Bedi, Placed 1st

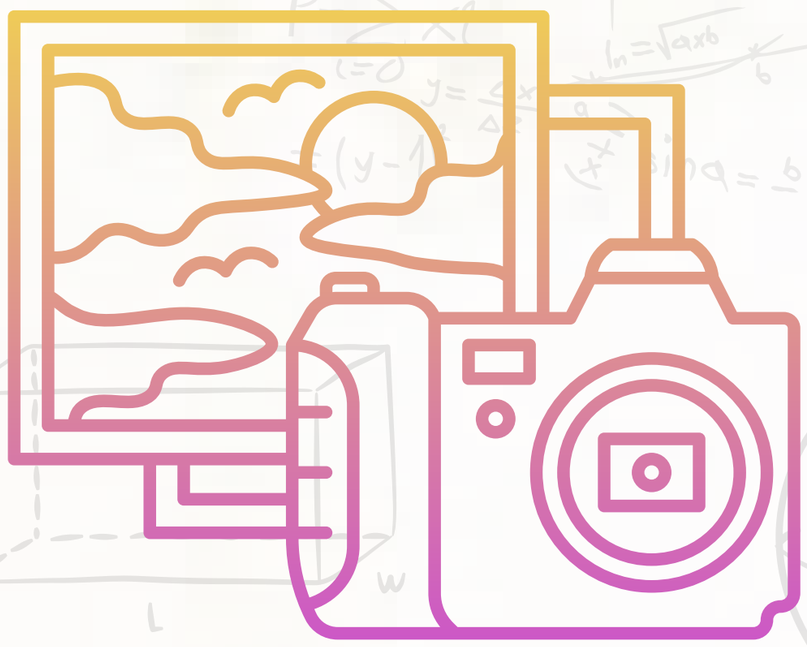


Pallavi Raj, Placed 2nd

Shivangi Thapliyal, Placed 3rd

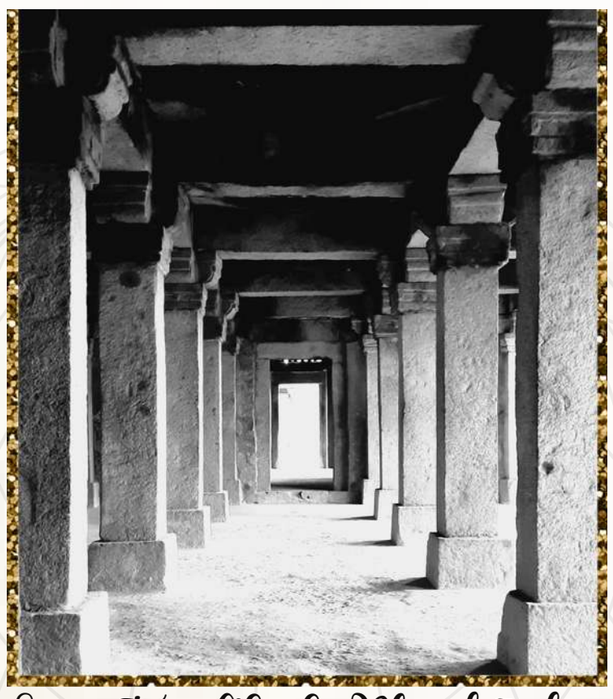
Photography Competition

Where our eyes can't go, our lenses can. CLICK! What can be better than a visual expression of subjects that defied verbal articulation. Mathema conducted a competition for all our photography enthusiasts and the theme for the competition was "Geometrography", which was open to interpretation. The participants had to capture a picture accordingly and give their own interpretation as well.



Tisha Mondal, Placed 1st

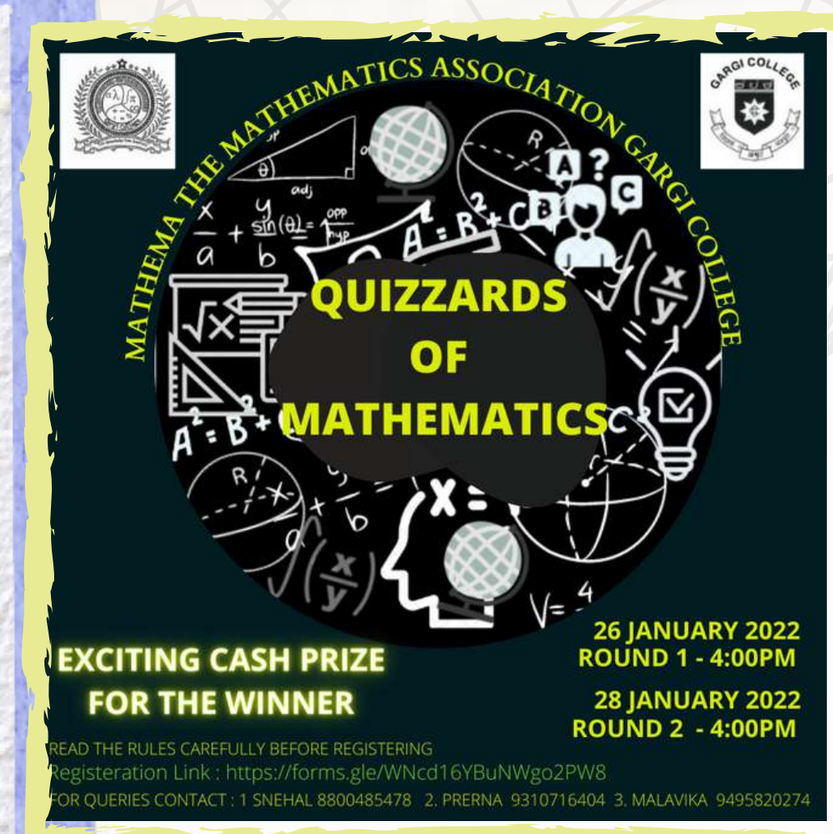
Anjali Kumar, Placed 2nd



Sayantani Ghosh, Placed 3rd

Quizzards Of Mathematics

- MATHEMA conducted an online quiz competition, hence provided a platform to all quizmasters to test their knowledge and win exciting prizes. The competition took place into two segments namely round 1 and round 2. The event experienced a huge number of enthusiastic participants. Who not only exhibited their rugged zeal to win but practiced a healthy competition among themselves. Manish Chauhan from Motilal Nehru College, University Of Delhi transpired as the winner of the quiz.



Career Counseling

- Our path to success is molded by the guidance of our mentors and in order to provide the students of mathematics department enriching guidance which will help them to choose a career path and the way to walk on it a two day career counseling session was also conducted. The guest speakers were Mr. Siddharth Rathore, Assistant Professor, Department of Economics, Gargi College and Ms. Madhu Meena, CDGA . The session revolved around government jobs and not only introduced many job opportunities which were new to the students but also provided a strategy for beginning the preparation.

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