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ganith

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Founder Chairman
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Dr. Neena Gupta, born in India in 1984, is a mathematician specializing in commutative algebra and affine algebraic geometry. She is a professor of the Indian Statistical Institute (ISI). She has won Saraswathi Cowsik Medal (2013), the Swarnajayanti Fellowship (2014), the A.K. Agarwal Award (2015), and the Ramanujan Prize for Young Mathematicians from Developing Countries (2021). She was also the youngest recipient of the highly coveted Shanti Swarup Bhatnagar (SSB) Prize in 2019.

From the Editor's Desk

Do not wait for anybody or anything. Do whatever you can, build your hope on none.

-Swami Vivekananda

Ganith, the newsletter of the Department of Mathematics stands testimony to the Mathematical curiosity, thirst for knowledge and creativity of the students of the department. It creates an opportunity for the students to sharpen their writing skills aand look at the lighter side of Mathematics. We sincerely hope every reader enjoys reading this issue as much as we enjoyed bringing it out. I congratulate the entire editorial team for their hard work and perseverance that has resulted in the publication of the issue of this newsletter.

~ *The Editorial team*

The word 'Vedas' means 'knowledge' and they are the oldest texts of Hinduism. They originated from the ancient Indo-Aryan culture of the Indian Subcontinent and was passed down through generations as an oral tradition before being written in Vedic Sanskrit between 1500 and 500 BCE. Later, between 1911 and 1918, Sri Bharati Krishna Tirthaji Maharaj rediscovered an ancient system of calculation from the vedas and we now know it as Vedic Mathematics. According to him, there are 16 Sutras and their names and meanings are given below.

Sutras Name	Meaning
1) Ekadhikina Purvena	By one more than the previous one
2) Nikhilam Navatashcaramam Dashatah	All from 9 and the last from 10
3) Urdhva-Tiryagbyham	Vertically and crosswise
4) Paraavartya Yojayet	Transpose and adjust
5) Shunyam Saamyasamuccaye	When the sum is the same that sum is zero
6) Anurupyena- Sunyamanyat	If one is in ratio, the other is zero
7) Sankalana-Vyavakalanabhyam	By addition and by subtraction
8) Puranapuranabyham	By the completion or Non-completion
9) Chalana-Kalanabyham	Differences and Similarities
10) Yaavadunam	Whatever the extent of its deficiency
11) Vyashtisamanstih	Part and Whole
12) Shesanyankena Charamena	The remainders by the last digit
13) Sopaantyadvayamantyam	The ultimate and twice the penultimate
14) Ekanyunena Purvena	By one less than the previous one
15) Gunitasamuchyah	The product of the sum is equal to the sum of the product
16) Gunakasamuchyah	The factors of the sum are equal to the sum of the factors

By Harini S and Bagyashree G
III B.Sc. Mathematics

A REVIEW OF THE BOOK 'HOW NOT TO BE WRONG' by Dr Jordan Ellenberg

- Fathima N, II B.Sc. Mathematics

The book 'How Not To Be Wrong (The power of mathematical thinking) is written by Jordan Ellenberg. Ellenberg is a professor of mathematics at the University of Wisconsin, Madison. He is a bit of a child prodigy. He taught himself to read by the young age of two. He is by definition, a gifted student. He helped his teenage babysitter with her math homework when he was only in second grade! He took advanced-level and college-level courses during high school.

He scored a perfect 800 on math in SAT when he was twelve. When he took the SATs as a high school junior, he score a perfect 1600. He also has the honor of winning two gold medals and one silver in the International Mathematical Olympiads. This is just scratching the surface of all the glory he has achieved. His primary area of research is arithmetic, geometry, number theory, and algebraic geometry. He has written both fiction and non-fiction novels.

Harvard graduate Ellenberg's book 'How Not to be Wrong' is a New York Times best-selling book. This book mainly focuses on how great of an impact mathematics and statistics have in our day-to-day life. The book is divided into five parts and eighteen chapters divided amongst them. This is a pretty long book, jam-packed with information about incidents of the past, implications of math and statistics in them. The author has also very charmingly titled the final chapter of the book "How to be Right" where he concludes by saying that it's alright to not know everything and all of us are designed to learn from failure as well. He suggest that mathematics is something we have been using since birth and we are highly unlikely to ever stop using it.

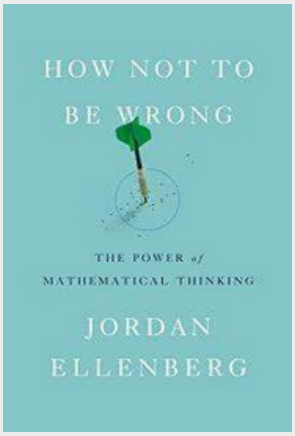
Book:
How Not To Be Wrong (The Power Of Mathematical Thinking)

Author: Jordan Ellenberg, Ph. D,
Publication : Penguin Press,
Price: ₹599 (on Amazon)

The author proves that mathematics and statistics have a huge hand in daily life situations. Some of the interesting concepts dealt in this book include how mathematical thinking helped craft the most efficient armor for war craft planes, how there is not always an apparent relation between SAT scores and tuition fee across universities, how proportions can be slightly misleading when they are compared with different data such as comparing the casualties in a country with a considerably smaller population to that of America, how the overall percentage of unemployment rates in a particular time period is not the end-all be-all explanation of the job market in the nation then, how mathematical manipulation or trickery can be undertaken to win rigged lotteries over and over again, how some prophecies in religious texts where decoded using math, how people reacted to formulated theorems and proofs back then, and a multitude of more interesting concepts. Additionally, the titles of the chapters in the book are so intriguing and it kept me looking forward to each chapter!

The book is written in an easy-flowing manner, and it is pretty easy to follow. The author has been mindful to not use too many academic jargon and really strived to ensure that this book is accessible to any layman. Although the book has a healthy amount of mathematical terms and information, the author has taken key efforts to ensure that it is seamless and easily digestible for people lacking an intense mathematical background. It is advisable to read this book at a slow pace as this is not designed to be read in one sitting. It is best to take one's time with this book and focus on parts (or stories, as I find it to be) of it at a time. Each chapter of the book focuses on two or three stories and explains the mathematics involved in it. The style of writing effortlessly flows and is not too overwhelming. The author also adds witty remarks and personal remarks throughout the book.

In conclusion, this book will be right up the alley of those who want to see what uses math holds in real life, revolution of math, the history of math through the eyes of a mathematician. It is an interesting book for anyone who has an inkling of interest in math and as a bonus, referencing any story from this book in a real life conversation is sure to make you sound cool and knowledgeable!



A WONDER WITH WONDERFUL MATHEMATICS

-Afreen Banu J, III B.Sc. Mathematics

Whenever we hear the word "wonder" one of the places which strikes in our mind is Taj Mahal. It is the best known wonder of the world. Because Taj Mahal is not only a beautiful memorial, it also has a mind blowing structure.

Can anyone believe that Math is behind this Marvel? Yes!
Taj mahal was constructed using Mathematics especially **Geometry.** It is also a tribute to mirror symmetry. All the windows and doors are at equal distance from one another. All the four minarets are identical and of equal **measurements**. To safeguard the Taj Mahal from severe plate tectonic shifts, the entire structure is built on a 90 foot deep foundation filled with sand up to 30 feet deep.
The structure is situated in a raised square base and the tomb is located at the exact center of the base.

Many geometrical structures are used to build this spectacular monument. The floor tiling pattern combines regular hexagons with **six pointed stars**. The stones are laid into a walkway using a pattern that combines **Square and Elongated Hexagons** to create **Regular Octagon**. On the whole Taj Mahal is surely one of the world's most impressive and beautiful examples of the use of **symmetry** in Architecture and Design. Math behind this construction astonished everyone. Mathematics is not only a subject that we can learn from the surroundings. If we relate math to real world examples, then it will be easier to comprehend it. Not only Taj Mahal was designed using Mathematics but so were other wonders of the world. That's why we can say

MATH IS WONDERFUL!

REMARKABLE RAJARAJESWARAM

-Harini E, III B.Sc. Mathematics

Brihadeshwara Temple, Tanjore

The Brihadeshwara temple is a Hindu temple dedicated to the god Shiva located in Tanjore, built by the great King Raja Raja Cholan. This temple plan and construction make practical and effective use of the **axial and symmetrical geomety rules**.
The Peruvudaiyar temple is built on a higher platform of a man-made mound. The temple complex may be a **rectangle** that is almost **two stacked squares** covering 240.79 meters (790.0 ft.) east to west, and 121.92 meters (400.0 ft.) north to south. In this space there are five main sections: The sanctum with the towering superstructure (Sri Vimana), the Nandi hall ahead (Nandi-mandapam), in between the most main community hall (Mukha mandapam), the good gathering hall (maha mandapam), and the pavilion that connects the great hall with the sanctum (Antrala).

It is also of Dravidian architecture and encompasses a 100 ft. vimana, several gopurams, paintings, carvings, and domes. The temple was built employing a measure of "3/8 inch" called an angula (finger). Interestingly, together with math, physics was also applied to construct the vimana, and also the belief is that its shadow never falls on the ground! It is a famous tourist spot, even after thousands of years. The total height of the temple tower is 247 ft. and therefore the distance between the Shiva lingam and Nandi statue is 247 ft. which was built evoking the whole number of letters in Tamil is 247! Having survived many disasters, it still stands magnificent and remarkable.

Taj Mahal
Built on 1631-1653

Brihadeshwara Temple
(officialy called "Rajarajeswaram")
Built on 11th century

● The word zero came via French from Venetian Zero.

THE FIBONACCI SEQUENCE: When Maths turns Gold

-Shalini. T. A
I M.sc. Mathematics

LEONARDO DA VINCI: Learn how to see and realize everything connects to everything

Fibonacci

Fibonacci also known as Leonardo Bonacci, Leonardo of Pisa, or Leonardo Bigollo Pisano, who popularized the Indo-Arabic numeral system in the western world through the book of calculation "Liber Abaci" in 1202. He also introduced Europe to the sequence of Fibonacci numbers.

Fibonacci brings the numerals 0-9 to Europe and identifies a number sequence that exists in nature. He solved many problems with algebra for the first time using the shortened versions of numbers that used the Hindu-Arabic numerals. Leonardo Fibonacci came across this pattern when soving the rabbit problem.

He discoverred that if he starts with 1 and adds the number before it a recursive pattern forms, pre-existing in nature.

0,1,1,2,3,5,8,13,21,34,.....

FIBONACCI SEQUENCE

The Fibonacci sequence is a type series where each number is the sum of the two that antecedes it. It starts from 0 and 1 generally. The Fibonacci sequence is given by 0,1,2,3,5,8,and so on. The result generation by generation, was a sequence of figures latterly known as Fibonacci figures.

The Fibonacci figures can be allowed of as nature numbering system. They appear all over in nature, from the splint arrangement in shops to the pattern of the buds of a flower, the bracts of a pine cone, or the scales of a cell, a grain of wheat, a hive of freaks, and indeed all of humanity.

If we take the rate of two consecutive figures in Fibonacci's series and divide each by the number before it, we will find the following series of figures:

1/1=1, 2/1=2, 3/2=1.5, 5/3=1.666, 8/5=1.6,....

The rate seems to be settling down to a particular value, which we call the golden rate or the golden number and it has a value of roughly 1.618034, and we denote it by . Now, let us get introduced with some of the endless cases that make Fibonacci a wonder or golden sequence.

FLOWER PETALS:

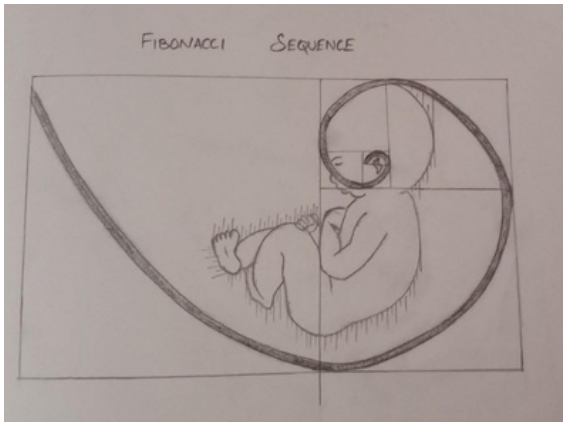
The number of petals in a flower constantly follows the Fibonacci sequence. Well-known cases include the Lilly, which has three petals, butter mugs which have 5, chicory's 21, the daisy's 34, and so on.

SEED HEADS:

The head of a flower is also subject to Fibonaccian process. Typically, seeds are produced at the centre and then migrate towards the outside to fill all the space.

FIBONACCI IN HUMANS:

The cochlea of the observance is a Fibonacci circle as is the circle of the umbilical cord. The progression of the Fibonacci figures and rate are well suited to describe organic growth in the mortal body because they have the properties of tone similarity and of "Gnomoic growth", that is, only the size changes while the shape remains constant. The maturity of organs in the human body maintain their overall shape and proportion as they grow.



Fibonacci sequence (Foetus in womb) art by Keerthana G

Using the Fibonacci forumla, find the seventh and eighth element in the Fibonacci sequence?

THE KNIGHT'S TOUR

-Shruthi. B
III B.Sc. Mathematics

The Knight's tour problem consists of having a Knight traverse across all squares on a chessboard without visiting any square twice. Paduka Sahasram by Sri Vedanta Desikan presents a solution to the problem in verses 929 & 930. The first verse is written sequentially and the next is read along the path taken by the knight yielding the result.

These two slokams are to be read together as one set. This chithra bhandham is known as "Chathuranga-Turanga padha bhandham". Chathurangam means a chariot and Turangam means a horse. These two slokams fit like a horse-drawn carriage as a unit. The verse moves like the steps of a horse drawing the chariot.

One has to position the 32 aksharams of the first slokam in four rows and follow it up with the 32 aksharams of the second slokam in the same manner. Then one has to use the movement regulations of a horse in the chess game (chathurangam). That movement is to jump to the next position and from there gallop to the end of the daigonal position. There is this common saying that people who are good at language are bad at math and vice versa but it looks like ancient Indians could master both, and, as a result, give us a beautiful amalgam of the best of both the worlds.

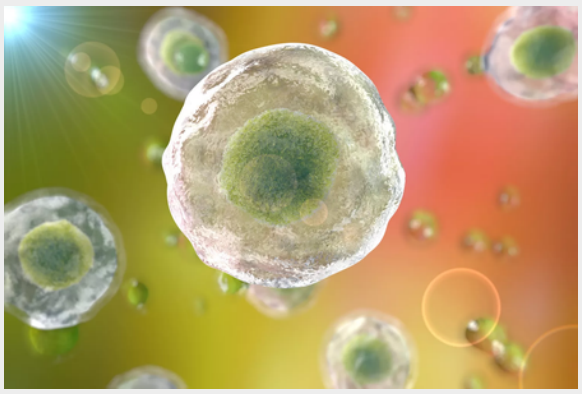
Let us all delve deep into our own Indian literature, interpret and appreciate such works of art. Let us take pride in what our ancestors were able to achieve, learn from them and try to continue their legacy.

A TRIP BY FACTOR 10

-Subalakshmi Prabhakaran
III B.Sc. Mathematics

In recent times, our generation has become more tech-savvy introducing us to the amazing in-depth details of nature. Our school days were filled with information about the tiniest substance to the unknown size of the Milky Way galaxy and other galaxies. The fascinating combination of mathematics and nature can be found by discovering the objects based on factor 10.

Let's open our imaginations now and see this pattern from microcosmos to macro cosmos. 10^{-15}(1 Fentometer) beginning with the face of the scientific imagination this gives face-to-face with a proton, 10^{-14}(10 Fentometers) next we could observe the nucleus of the carbon atom, 10^{-12}(1 Picometer) showing the empty space between the nucleus and the electron orbits, 10^{-11}(10 Picometer) introduces us to the miniature world of the electrons orbiting the atoms which are similar when our TV is in static mode. 10^{-10}(1 Angstrom) it appears like clouds of electrons, these are the carbon atoms that form our world, isn't it fascinating to think of such tiny substances from our world?



10^{-8}(10 Nanometers) our characteristics are visible that is the DNA chain, 10^{-6}(1 micron) the nucleus of the cell is visible, $10^{-3}$the cellular structures of the leaves began to show, 10^{-2}(1 Centimeter) next we can observe the structure of the leaf, 10^{-1}(10 Centimeters) getting closer at 10 cm we can delineate the leaves, 10^{0}we arrive at the point where we can touch the leaves visible to our eyes, 10^{1}(10 meters) bushes and trees are visible, 10^{2} (100 meters) at this distance we can see the limits of the forest and the edifications, 10^{4} (10 km) the city could be observed but can't view the houses, 10^{6} (1,000 km) the typical sight from the satellite, 10^{8}(100,000 km) the earth has begun to been to shrink in size, 10^{9} (1 million km) the earth can be seen within the moon's orbit which might just the size of a rice grain, 10^{10}(10 million km) part of the earth's orbit, 10^{13}(10 billion km) at this height of the trip we could observe the entire solar system and the orbits of the planets, 10^{15} (1 trillion km) thinking about the impossible right now the sun has become the size of an ant and is a small star in the middle of thousands of stars, 10^{16}(1 light year) now our saviour sun is very small might not be visible through naked eye, 10^{17}(10 light years) nothing but infinity, 10^{19} (1,000 light years) at this distance the view might be dreamy and enchanting and now we are travelling in the Milky Way galaxy, 10^{21} (1 million light years) we can see the entire milky way and other galaxies as well, 10^{23} (10 million light years) from this distance all the galaxies look small with immense empty spaces in between.

Doesn't this seem similar? It is like our never-ending syllabus during our exam season, we could move upward but just give thought to what would our size be when compared to the maximum. If possible imagine the view of a fairyfly wasp to the most giant creature, a blue whale. Well, it is breathtaking. This is the power of mathematics that introduces us to the astounding journey. Hope you enjoyed the trip.

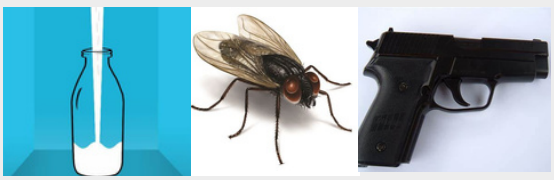
CONNEXIONS

1)

2)

3)

4)



● A "PIZZA" that has radius "Z" and height "A" has volume "Pi x z x z x a".

Mysterious Number 6174

- Sharmilee Dhanasekaran
I B.Sc. Mathematics

At frist glance, the number 6174 looks no more interesting than any other number. But fascinatingly, that is not the case. What is so amazing about this ordinary-seeming four digit number? Anyone who can subtract can discover the mystery that makes 6174 so special.

6174 is known as Kaprekar's constant, named after the Indian mathematician D. R. Kaprekar from Devlali, India. He devised a process which is now known as kaprekar's operation. The number 6174 is renowned for the following rule:

1. Take any four-digit number, using at least two different digits (leading zeros are allowed)
2. Arrange the digits in descending order to get two four-digit numbers, adding leading zeros if necessary.
3. Subtract the smaller number from the larger number.
4. Now take a new number and repeat from step 2.

It is a simple operation, but kaprekar discovered that it led to a surprising result. For example, let us take the four digit number 9215. Applying the 4 given steps on this number, we have

9521 - 1259 = 8262
8622 - 2268 = 6354
6543 - 3456 = 3087
8703 - 0378 = 8352
8532 - 2358 = 6174
7641 - 1467 = 6174

The above process is known as kaprekar's routine. It is found that this procedure will always reach at a fixed point, 6174, in atmost 7 iterations. Once 6174 is reached, the process will continue yielding 6174. The only four-digit numbers for which kaprekar's routine does not reach 6174 are repdigits such as 1111, which give the result 0000 after a single iteration. All other four-digit numbers eventually reach 6174 if leading zeros are used to keep the numbers of digits at 4

For number with three identical numbers and a fourth number that is one number higher or lower (such as 2111), it is essential to threat 3-digit numbers with a leading zero; for example ;

2111 - 1112 = 0999
9990 - 0999 = 8991
9981 - 1899 = 8082
8820 - 0288 = 8532
8532 - 2358 = 6174

Similarly, there can be analogous fixed point for digit lengths other than four; for instance, if we use 3-digit numbers, then most sequences (i.e., other than repdigits such as 111) will terminate in the value 495 in at most 6 iterations. Sometimes these numbers called "kaprekar constants".

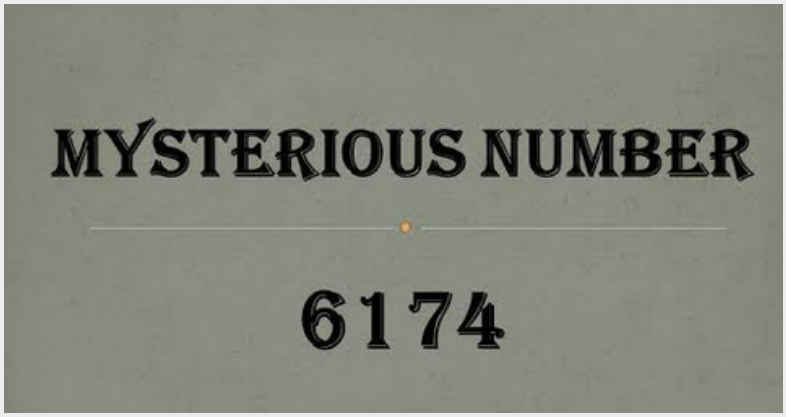
But interestingly, till today, there has been no proof found for these results. It is just assumed to be purely coincidental.

What are some other properties of the number 6174?

- 6174 is a 7-smooth number, i.e., none of its prime factors are greater than 7.
- 6174 can be written as the sum of the first three degrees of 18.
  $18^3 + 18^2 + 18^1 = 5832 + 324 + 18 = 617$
- The sum of sequence of the prime factors of 6174 in a square:
  $2^2 + 3^2 + 3^2 + 7^2 + 7^2 + 7^2 = 4 + 9 + 9 + 49 + 49 + 49 = 169 = 13^2$

Apparently, in 1949 kaprekar had introduced the magic number at a conference in Madras but many mathematicians ended up making fun of him and his discovery. Most pepole thought the invention of 6174 was useless and baseless.

It was only in 1970 that people started recognizing kaprekar's in a magazine titled ' Scientific America'. Today, kaprekar's contribution in the field of mathematics is known to the entire world. He certainly discovered a unique pattern that no one has been able to explain, till date.



RIDDLES

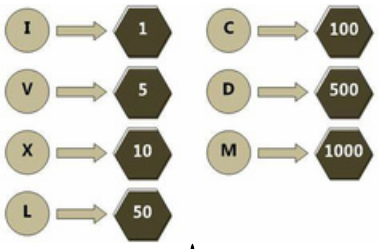
1. Using only addition, add eight 8s to get the number 1,000.
2. My twin lives at the reverse of my house number. The difference between our house number ends in two. What are the lowest possible numbers of our house numbers?

Answers:

1.888+88+8+8+8=1000
2.The lowest possible numbers for the houses are 19 and 91. The difference is 72.

COOL FACTS ABOUT MATH:

- (6x9) + (6+9) = 69
- Six is the smallest perfect number.
- Six weeks = 10! seconds



Roman Numerals were invented as a means of trading.

The word Mathematics comes from Ancient Greek word

máthēma (μάθημα)

meaning "which is learnt", "what one gets to know", hence also "study" and "science".

Connexions answers:

1.Integer, 2.Adjacent, 3.Orthogonal, 4.Polygon

- Ilakia S, II M.Sc. Mathematics

MATHS POEM

MATHEMATICS IN LIFE

To **add** noble qualities
To **subtract** bad habits
To **multiply** love and friendship
To **divide** equal thoughts among us
To **root** out dreadful caste and creed
To **equate** rich and poor in the society
To **eliminate** the social evils
To **differentiate** good from bad
To **integrate** people of our country
To **minimise** our ignorance
To **maximize** our IQ and EQ
To **expand** our unity among the world
To **simplify** our difficulties.

by Mohana Shree P, I B.Sc.Mathematics

WORD SEARCH

S	A	A	C	P	J	O	L	K	P
O	D	X	O	D	O	I	L	J	A
P	I	E	N	R	X	I	T	O	R
Q	O	T	G	O	V	N	N	B	A
D	Z	R	R	H	Q	L	Y	T	L
V	E	E	U	C	L	I	D	U	L
M	P	V	E	R	P	N	H	S	E
U	A	P	N	E	I	E	D	E	L
R	R	W	T	E	O	I	G	V	Q
X	T	K	S	C	A	L	E	N	E

GEOMETRY

1.Who is the Father of Geometry?
2.What is the position in a space referred as?
3.What is the intersection point of two sides of a plane figure?
4.The line segment between tow points on a given curve is known as _____ .
5.The line segments which do not intersect are known as ____line segments.
6.An angle greater than 90 degrees but less than 180 degrees is called _____.
7.A quadrilateral plane figure having two parallel and two non-parallel sides are called ____.
8.A continuous extent of length is known as ____.
9.Triangle which has three unequal sides and angle is called____.
10.Geometric figures having the same size and shape is called____.

Answers:

1.Euclid 2.Point
3.Vertex 4.Chor
5.Parallel 6.Obtuse
7.Trapezoid 8.Line
9.Scalene 10.Congruent

By Ilakia S, II M.Sc. Mathematics

There are 43,252,003,274,489,856,000 ways to scramble a Rubik's Cube.

Department Highlights

NUMERA 2K22

The Annual Association meet **"NUMERA 2K22"** of the Department of Mathematics (Aided & Self-Supporting) for the academic year 2022-2023 started off with the Inter-class quiz on 19th September 2022. On 20th September 2022 our very first edition of the **Newsletter of Department of Mathematics 'Ganith'** was launched, and various **Inter-departmental events** and **Intercollegiate events** were conducted. and On 27th September 2022, the **Interclass Exhibition** was conducted after two long years which was a huge success.

Release of 'Ganith' (First Edition)

Inaguration of the Interclass Exhibition

International Conference on Indian Contribution to Mathematics - Ancient & Modern

The Department of Mathematics and the Department of Sanskrit together organised a Two-Day International Conference on 'Indian Contribution to Mathematics - Ancient & Modern, ICICM - 2022 **on 13th and 14th October 2022**.

Release of the conference ICICM's Proceeding

Ramanujan Day

The Ramanujan Day Celebration was conducted by the Department of Mathematics on 9th January 2023, commemorating the 135th birth anniversary of Srinivasa Ramanujan, there was a guest lecture followed by various Inter-class events like Connections, Dumb Charades, Math tune, and Potpourri in which students of the Department of Mathematics took active participation.

Guest lecture by Dr. Arun Janarthanan, Silicon Architecture, Qualcomm India (Previously Intel), Chennai, India.

Ramanujan Day Celebration - 09/01/2023