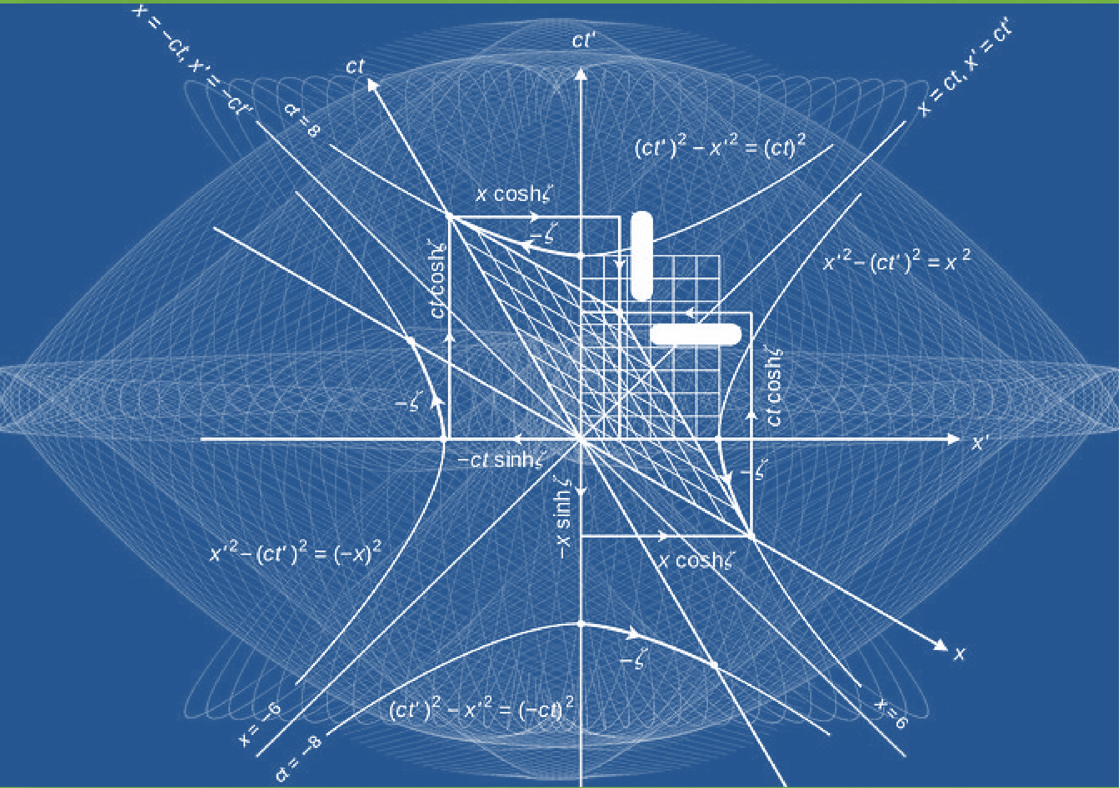
Math Quest



April 2019

Vol I

*I am happy to release the first copy of "**Math Quest**". With the support of an efficient team, it will be in your hands annually. This magazine by the Department of Mathematics is a special collection of Articles and available informations regarding mathematics rendered by our Professors, Alumnae and Students. This issue includes article referring to the highest, Nobel prize equivalent Fields Medal for Mathematics, Application of Mathematics in various fields, Dance moves as Mathematical Derivative and some drawings. Hope it will be an enjoyable reading for all !*

Printed and Published

By

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Content

Fields Medal – The Nobel Prize for Mathematics

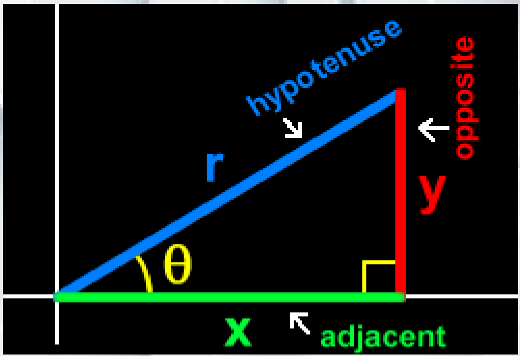
*How many of us know, the Nobel prize, the most prestigious award, for the intellectual achievement in the world, awarded annually includes only the achievements in chemistry, physics, physiology or medicine, literature and peace but not mathematics. One of the highest honors a mathematician can receive is the **Fields Medal**. It is awarded to 2 to 4 mathematician under 40 years of age in every 4 years. It is awarded at the International Congress of the International Mathematical Union (IMU). The medal was first awarded in 1936 to Finnish Mathematician Lars*

Ahlfars and American Mathematician Jesse Douglas. After that it has been awarded every four years since 1950. The speciality of the year 2018 is one of the winners of Fields Medal is New Delhi born Akshay Venkatesh, a renowned Indian Australian Mathematician. He is currently teaching at Stanford University and has won the medal for his profound contributions to an exceptionally broad range of subjects in Mathematics and his strikingly far reaching conjectures.

BY

Dr.N.Meenakumari & Dr.K.Palani

Trigonometry - Pathway of Real Life Weighing Up



Trigonometry simply means calculations with triangles (that's where the tri comes from). It is a study of relationships in mathematics involving lengths, heights and angles of different triangles. The field emerged during the 3rd Century BC, from applications of geometry to astronomical studies. Trigonometry spreads its applications into various fields such as architects, surveyors, astronauts, physicists, engineers and even crime scene investigators.

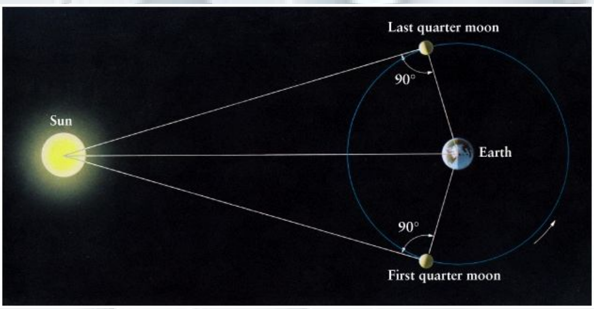
Can trigonometry be used in everyday life ?

Trigonometry may not have its direct applications in solving practical issues, but it is used in various things that enjoy so much. For example music, as you know sound travels in waves and this pattern though not as regular as a sine or cosine function, is still useful in developing computer music. A computer cannot obviously listen to and comprehend music as do, so computers represent it mathematically by its constituent sound waves. And this means sound engineers need to know at least the basics of trigonometry. And the

good music that these sound engineers produce is used to calm us from our hectic, stress.

Great Trigonometrical Survey

From 1802 until 1871, the Great Trigonometrical Survey was a project to survey the Indian subcontinent with high precision. Starting from the coastal baseline, mathematicians and geographers triangulated vast distances across the country. One of the key achievements was measuring the height of Himalayan Mountains and determining that Mount Everest is the highest point on Earth.



The kind of trigonometry needed to understand positions on a sphere is called **spherical trigonometry**. Spherical trigonometry is rarely taught now since its job has been taken over by linear algebra. Nonetheless, one application of trigonometry is astronomy.

Webliography

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By

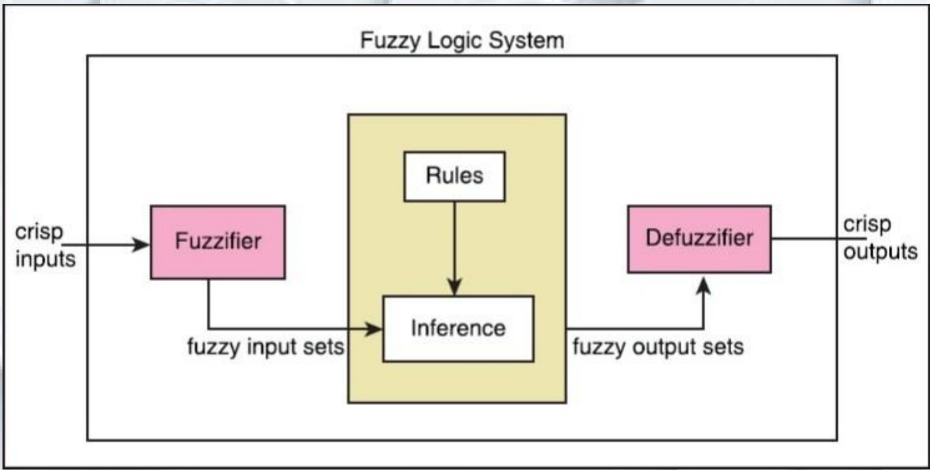
Dr.R.Rajeswari, Assistant Professor

Fuzzy Logic and its Application Areas

Fuzzy Logic: The term fuzzy means Things which are not very clear or vague. In real life, we may come across a situation where we can't decide whether the statement is true or false. At that time fuzzy logic offers very valuable flexibility for reasoning. We can also consider the uncertainties of any situation.

Fuzzy logic helps to solve a problem after considering all available data. Then it takes the best possible decision for the given input. The fuzzy logic method imitates the way of decision making in a human which consider all the possibilities between digital values True or False. Fuzzy logic has been applied to various fields. It was designed to allow the computer to determine the distinctions among data which is neither true nor false, something similar to the process of human reasoning like little dark, some brightness etc.

Fuzzy Logic Architecture



Application Areas of Fuzzy Logic

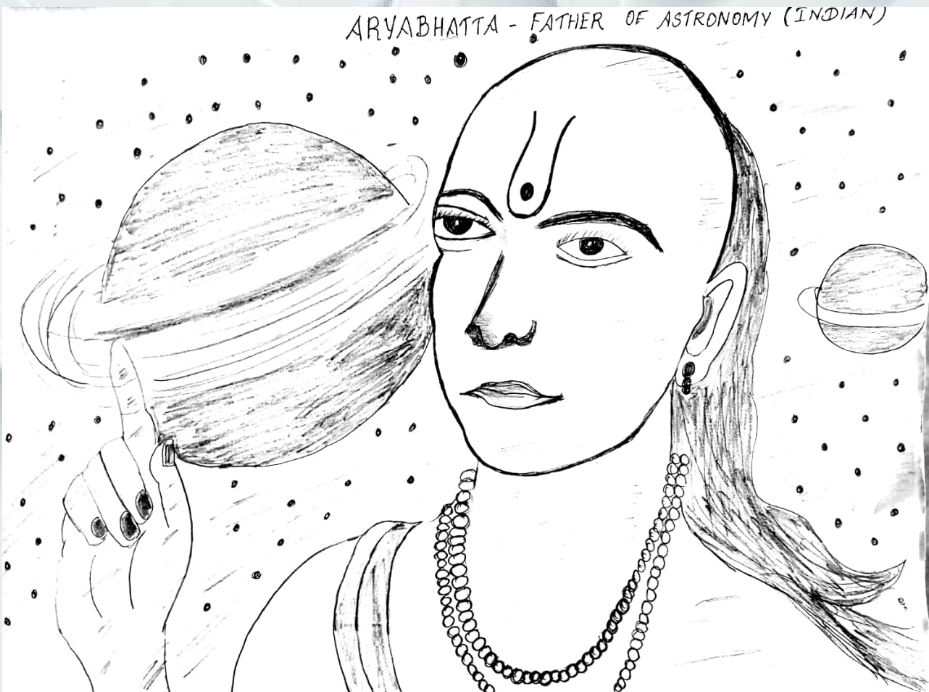
The below given table shows how famous companies using fuzzy logic in their product.

Product	**Company**	**Fuzzy logic**
Anti - lock Brakes	*Nissan*	*Use fuzzy logic to control brakes in hazardous cases depend on car speed acceleration, wheel speed and acceleration*
Auto Transmission	*Nok / Nissan*	*Fuzzy logic is used to control the fuel injection and ignition based on Throttle setting, cooling water, temperature etc.*
Auto Engine	*Honda, Nissan*	*Use to select gear based on engine load, driving style and road conditions.*
Dish washer	*Matsushita*	*Use for adjusting the cleaning cycle rinse, and wash strategies based depend upon the number of*

		dishes and the amount food served on the dishes.
Palmtop Computer	Hitachi sharp, Sanyo Toshiba	Recognizes hand written by Kanji Characters
Kiln control	Nippon Steel	Mixes Cement
Elevator control	Fujitec Milsubishi Electric Toshiba	Use it to reduce waiting for time based on passenger Traffic

BY

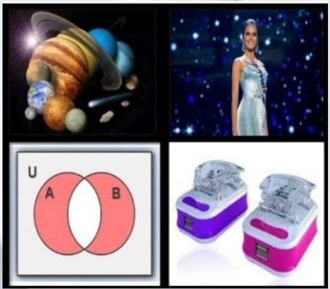
Dr.M.MuthuKumari, Assistant Professor

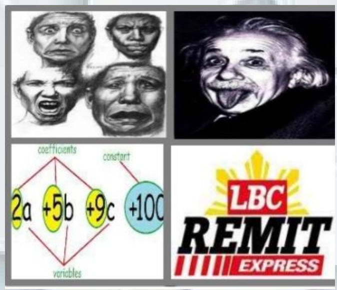


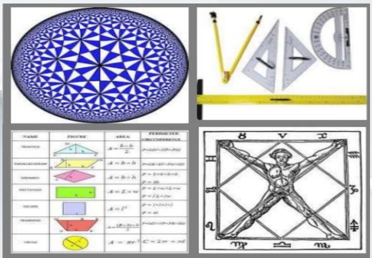
BY

Ms.P.Meenakshi, Assistant Professor

4 Pictures 1 Word







Ans:

1. Universal　　*2. Statistics*

3.Symmetric　　*4. Expression*

5.Geometry　　*6.Angle*

BY

Ms.J.Siva Ranjini, Assistant Professor

Queen of Sciences

Mathematics in the Ancient World

*Prehistoric people must have used simple arithmetic. However, when people became civilized, mathematics became far more important. In Iraq a people called the **Sumerians** counted in sets of 60. We still divide hours into 60 minutes and minutes into 60 seconds. We also divide circles into 360 degrees.*

*The **Egyptians** had some knowledge of practical geometry which they used to build the **pyramids**. Around 600 BC a Greek called **Thales** calculated the height of a pyramid by measuring its statue. The most famous Greek mathematician was **Pythagoras** (c.570 - 495 BC). He is famous for his theorem **The square on the hypotenuse is equal to the sum of the squares on the other two sides**. **Euclid** (325 - 265 BC) is most famous for his book about **geometry elements**. **Eratosthenes** (c.276 - 194 BC) calculated the **circumference of the Earth**. **Archimedes** (287 - 212 BC) worked out formulas for the **area of shapes and the volumes of solids**.*

Roman numerals consists of I meaning one, X meaning ten, L meaning fifty and C meaning 100. They had no symbol meaning zero. However the Indians invented a symbol for zero and the numerals we now use were invented by them.

Mathematics 500 - 1800

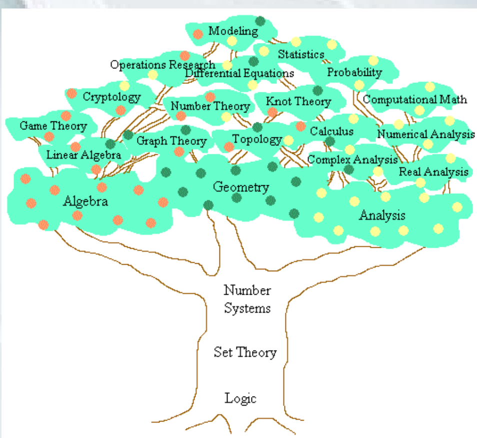
***Aryabhata** (c.476 - 550 BC) and **Bhramagupta** (c.598 - 670) are the great Indian mathematicians during this era. A Persian named **Al-Khwarizmi** was also a famous mathematician who lived in the early 9th century, wrote about **Indian numerals and algebra**. In Europe, an Italian called **Fibonacci** (c.1175 - 1250) a great mathematician of the Middle Ages* *discovered the **Fibonacci series of numbers**. (Each number is equal to the sum of the previous two numbers 1,1,2,3,5,8,13 etc.)*

*During the 17th century mathematics made rapid progress. A Scot named John **Napier** (1550 - 1617) invented **logarithms**. **John Graunt** (1620 - 1674) was the first man to study **Statistics**. Meanwhile a Frenchman named **Blasie Pascal** (1623 - 1662) studied **Probability**. **Renes Descartes** (1596 - 1650) invented the **Cartesian co-ordiante system** with x and y axes. **Gottfried Leibniz** (1646 - 1716) invented **Calculus**. One of the greatest mathematicians of the 18th century was **Leonhard Euler** (1707 - 1783) who wrote hundreds of books on mathematics.*

Modern Mathematics

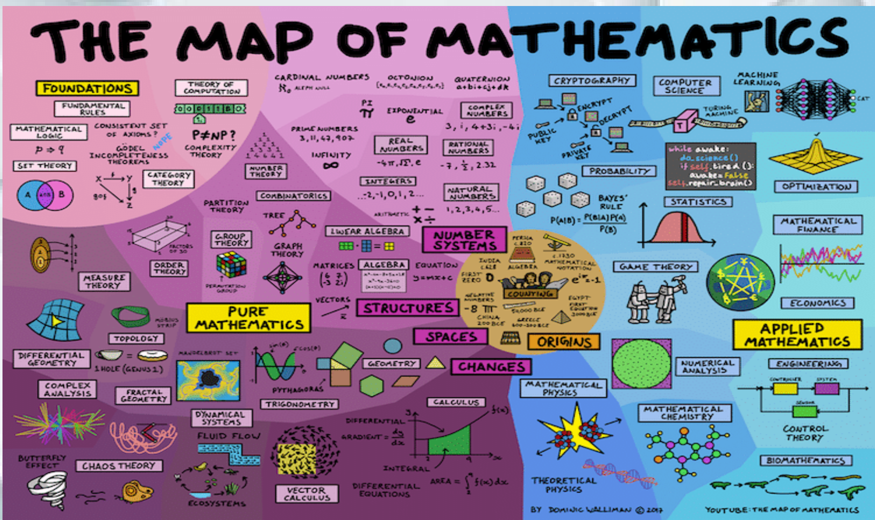
***Carl Friedrich Gauss** (1777 - 1855) made contributions to **Algebra, Geometry and Probability**. **George Boole** (1815 - 1864) created **Boolean Algebra**. Meanwhile in 1801 **William Playfair** (1759 - 1823) invented the **Pie Chart**. (Florence Nightingale did not invent the pie chart although she did use them). **John Venn** (1834 - 1923) invented the **Venn Diagram**.*

After this mathematics has been developed in various branches. The branches of mathematics and their relationships are as follows:



I conceive of mathematics as a fantastic citrus tree: the three main branches of oranges, limes and lemons representing the major fields of algebra, geometry and analysis. Each part of the upper canopy takes advantage of what is below it. Thus, number theory has two great approaches, one *algebraic and the other analytic. Topology makes use of all three fields, as does the very different field of mathematical modeling.*

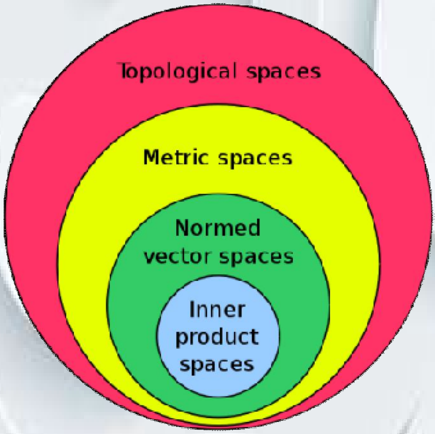
All trees have woody parts, foliage and fruit. The trunk and branches absorb water and nutrients from the soil. The foliage absorbs energy from the sun, using it to convert the nutrients to usable food and allowing the tree to grow. The fruit allows the tree to reproduce. I have represented the foundations of mathematics as the trunk of the tree, the support and food supply. The foliage and fruit could represent the two aspects of pure and applied mathematics.



BY

C.Dhivya, Alumna

Glossary of Topology



This is glossary of some terms used in the branch of mathematics known as **topology**. Although there is no absolute distinction between different areas of topology, the focus here is on **general topology**.

All spaces in this glossary are assumed to be **topological spaces** unless stated otherwise.

Alexandrov topology - The topology of a space X is an **Alexandrov topology** (or is finitely generated) if arbitrary intersections of open sets in X are open, or equivalently, if arbitrary unions of closed sets are closed, or, again equivalently, if the open sets are the upper sets of a poset.

Baire Space - A space is a **Baire space** if the intersection of any countable collection of dense open sets is dense.

Comeagre - A subset A of a space X is **Comeagre** (Comeager) if its complement X / A is meagre. Otherwise called **residual.**

Digital topology - **Digital topology** deals with properties and features of two-dimensional (2D) or three-dimensional (3D) digital images that correspond to topological properties or topological features of objects.

Exterior - The **exterior** of a set is the interior of its complement.

Fine topology (potential theory) - On Euclidean space $\mathbb{R}^n$, the coarsest topology making all sub harmonic functions continuous.

Homotopic maps - *Two continuous maps* $f, g: X \longrightarrow Y$ *are homotopic (in* Y*) if there is a continuous function* $H: X \times [0,1] \longrightarrow Y$ *such that* $H(x, 0) = f(x)$ *and* $H(x, 1) = g(x)$ *for all* x *in* X. *Hence the function* H *is called a* ***homotopy*** *(in* Y*) between* f *and* g.

Identification space - *The* ***identification space (or Quotient space)*** *consists of all sets with an open preimage under the canonical projection map that maps each element to its equivalence class.*

Jordan Curve - *In topology, a Jordan Curve, sometimes called a plane simple closed curve, is a non - self - intersecting continuous loop in the plane.*

Kuratowski Closure Axioms - *This is a set of axioms satisfied by the function which takes each subset of* X *to its closure :*

- *Isotonicity*
- *Idempotence*
- *Preservation of binary unions*
- *Preservation of nullary unions*

Locally metrizable - *A space is* ***locally metrizable*** *if every point has a metrizable neighbourhood.*

Meagre - *If* X *is a space and* A *is a subset of* X, *then* A *is* ***meagre*** *in* X *(first category) if it is a countable union of nowhere dense sets.*

Net - *A* ***net*** *is a space* X *is a map from a directed set* A *to* X. *A net from* A *to* X *is usually denoted* (X_α) *where* α *is an index variable ranging over* A.

Polish - *A space is* ***polish*** *if it is separable and completely metrizable.*

Quotient Map - *If X and Y are spaces, and if f is a surjection from X to Y, then f is a **quotient map**, if for every subset U of Y, U is open in Y iff $f^{-1}(U)$ is open in X.*

Rin - Compact - *A space is **rin - compact** if it has a base of open sets whose boundaries are compact.*

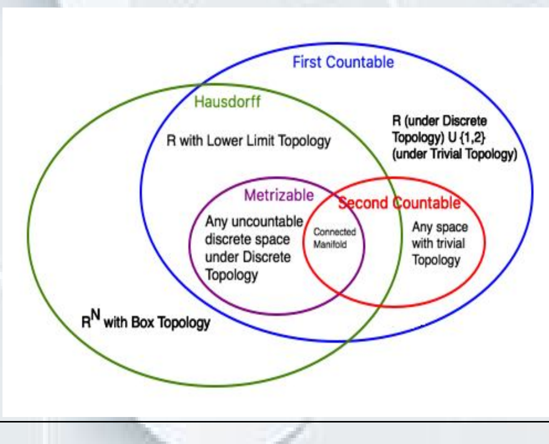
Scattered - *A space X is **scattered** if every nonempty subset A of X contains a point isolated in A.*

Topological invariant - *A **topological invariant** is a property which is preserved under homeomorphism.*

Ultrametric - *A metric is an **ultrametric** if it satisfies the following stronger version of the triangle inequality : for all x, y, z in M, $d(x,z) \leq max(d(x,y), d(y,z))$.*

Weakly hereditary - *A property of spaces is said to be **weakly hereditary** if whenever a space has that property, then so does every closed subspace of it.*

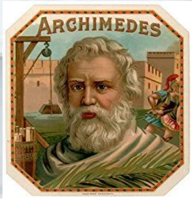
Zero-dimensional - *A space is **Zero-dimensional** if it has a base of clopen sets.*



BY

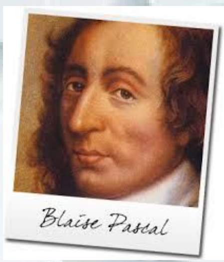
S.V.Vani, Research Scholar

Famous Mathematicians and their Contributions



Archimedes *was a famous Greek Physicist and Mathematician.*
Contribution :- *He invented the principle of lever and gave the concept of density.*

Nicolaus Copernicus *was a famous Astronomer, Mathematician and Physicist of Poland.*
Contribution :- *His contribution in Mathematics is " The Revolution of Celestial Spheres".*



Blasie Pascal *was a French Mathematician and Physicist*
Contribution :- *He invented the first calculating machine, which used gear wheels. Also he discovered that the sum of interior angles of a triangle is always* 180°.

Rene Descartes *was a French Mathematician.*
Contribution :- *He developed the Co-ordinate system for representing points in a plane and space. He was the first person to have used letters of the alphabet to represent numbers.*

Johann Gauss *was a German Mathematician.*
Contribution :- *He advocated the use of decimal numbers in Mathematics.*

John Napier *was a Scottish Mathematician*
Contribution : - *He originated the concept of logarithms as a mathematical device to aid in calculations.*

By G.Suganya, Research Scholar

Ramanujan's Magic Square

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Though looking like a normal magic square, the above magic square designed by Srinivasa Ramanujam, the great Indian Mathematician has more special features.

What is so great in it ?

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of number of any row is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of numbers of the corner is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of numbers of any column is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of numbers of any diagonals is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of identical coloured boxes is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of identical coloured boxes is also 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of central squares is also 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Sum of same coloured boxes is 139

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

Its Interesting too ....?

Now See The CLIMAX

Do you know the Date of Birth of Srinivasa Ramanujam ?

It is 22 Dec 1887

22	12	18	87
88	17	9	25
10	24	89	16
19	86	23	11

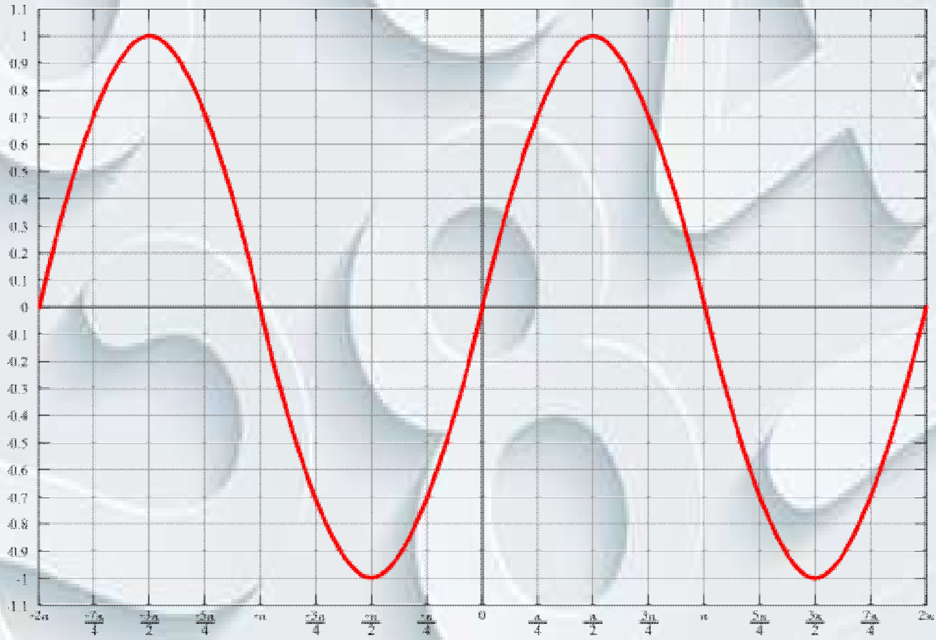
Yes, It is 22.12.1887

BY

J.Niranjana Pon Shepha, I B.sc

Life is a Sine Function

The average of sine function is always zero. <sin θ > = 0.



There will be ups (1) and downs (-1). If someday you feel like ending the cycle in the middle due to something harsh, someone did to you, remember this :

Then, the average of sine function is always zero.

Life = 0.

L + i Fe = 0

L is the momentum (angular because we are moving in an orbit : P) we have in our lives which defines how much we will impact other's lives.

i denotes the complex part (which is mathematically equal to the square root of -1).

Fe is the chemical symbol for Iron.

The whole thing equal to 0 signifies the end result, death. We leave empty handed. Nobody escapes alive.

(i.e) L + i Fe = 0.

BY

K.Mumtha, M.Phil Scholar

Application of Mathematics in Internet and Phones

Both Internet and Phone lines from a gigantic network allows users to exchange data whether websites or calls. All users have been connected by countless links which have a certain capacity.

When you make a phone call or request a website, network operators have to find a way to connect sender and receiver, without exceeding the capacity of any indiviual link.

Without the mathematics of queueing theory, it would be impossible to guarantee a reliable service. Mathematical models using poisson processes all but guarantee that you will hear a dial tone when making a phone call.

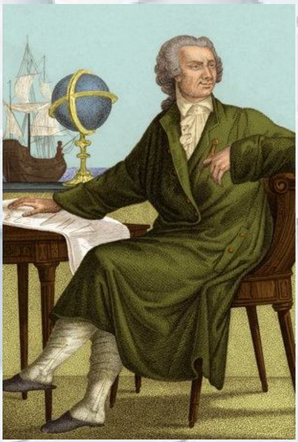
Routing internet connections is much more difficult - requests arrive at an unpredictable rate and have a more variable duration. This led to the development of packet - switching : all data (websites, emails or files) is spilt into small "Packets" which are transmitted independently. This makes the network more efficient and robust, but occasionally routers became overloaded with too many packets and the connection fails.

Some believe that the mathematics of Fractals can help to create a much more reliable internet service in the future.

BY

C.Ulagammal, M.Phil Scholar

The Equation That Changed The World



The **Square Root** of **Minus one** $i = \sqrt{-1}$

$e^{ix} = \cos x + i \sin x$

Leonhard Euler Mathematician

Period : 15 April 1707 - 18 September 1783

Why is that important ?

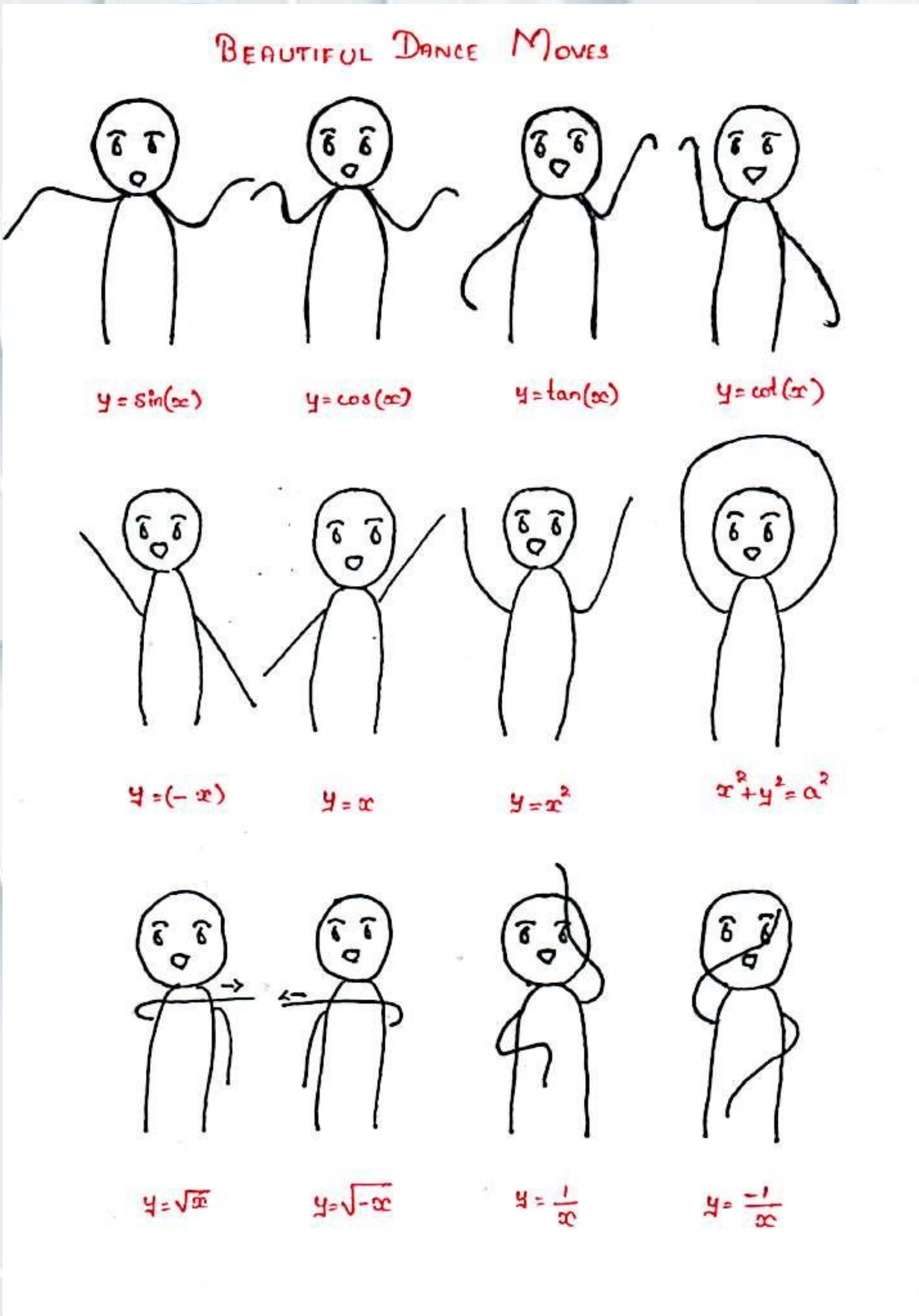
It led to the creation of complex numbers, which in turn led to complex analysis, one of the most powerful areas of Mathematics.

What did it led to ?

Improved methods to calculate trigonometric tables. Generalizations of almost all mathematics to the complex realm. More powerful method to understand **waves, heat, electricity and Magnetism.**

BY

A.Benasir, V.Selvapriya,
R.Sweetlin Hetzy &A.Vinitha
II B.Sc



BY S.R.Veronica Valli, III B.Sc

Application of Graph Labeling in Communication Networks

*The field of **Graph Theory** plays a vital role in various fields. This article gives an overview of labeling of graphs in heterogeneous fields to some extent but mainly focuses on the communication networks. The communication network has two types : " **Wired Communication** " and " **Wireless Communication**" . Various papers based on graph labeling have been observed and identified for its usage towards communication networks. Here is one such example.*

Fast Communication in sensor networks using Radio Labeling

*Given a set of transmitters each station is assigned a channel (" a positive integer ") such that interference can be avoided. The smaller the distance between the stations is, the stronger the interference becomes and hence the difference in channel assignment has to be greater. Here, each vertex represents a transmitter and any pair of vertices connected through an edge corresponds to neighbouring transmitters. Here, the kind of labeling used is **Radio Labeling** which is defined as,*

Let $G = (V(G), E(G))$ *be a connected graph and let* $d(u, v)$ *denote the distance between any two vertices in* G. *The maximum distance between any pair of vertices is called the " **diameter of G** " denoted by* $diam(G)$.

A radio labeling (or multilevel distance labeling) for G *is an injective function* $f: V(G) \rightarrow N \cup \{0\}$ *such that for vertices* u *and* v, $|f(u) - f(v)| \geq diam\ (G) - d(u, v) + 1$

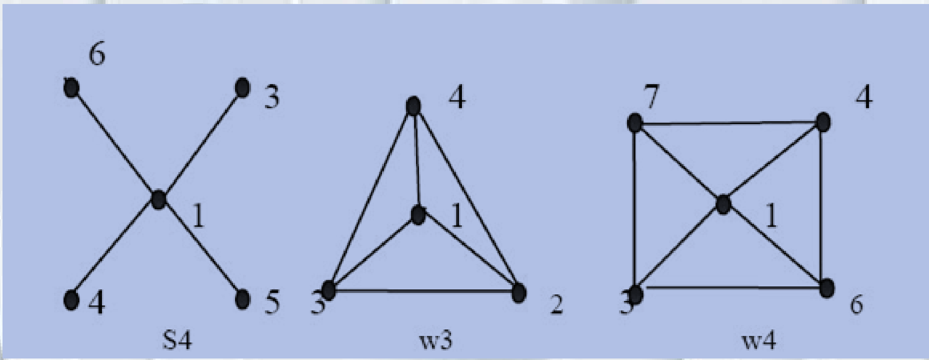


Fig 1. Radio Labeling on different Graphs

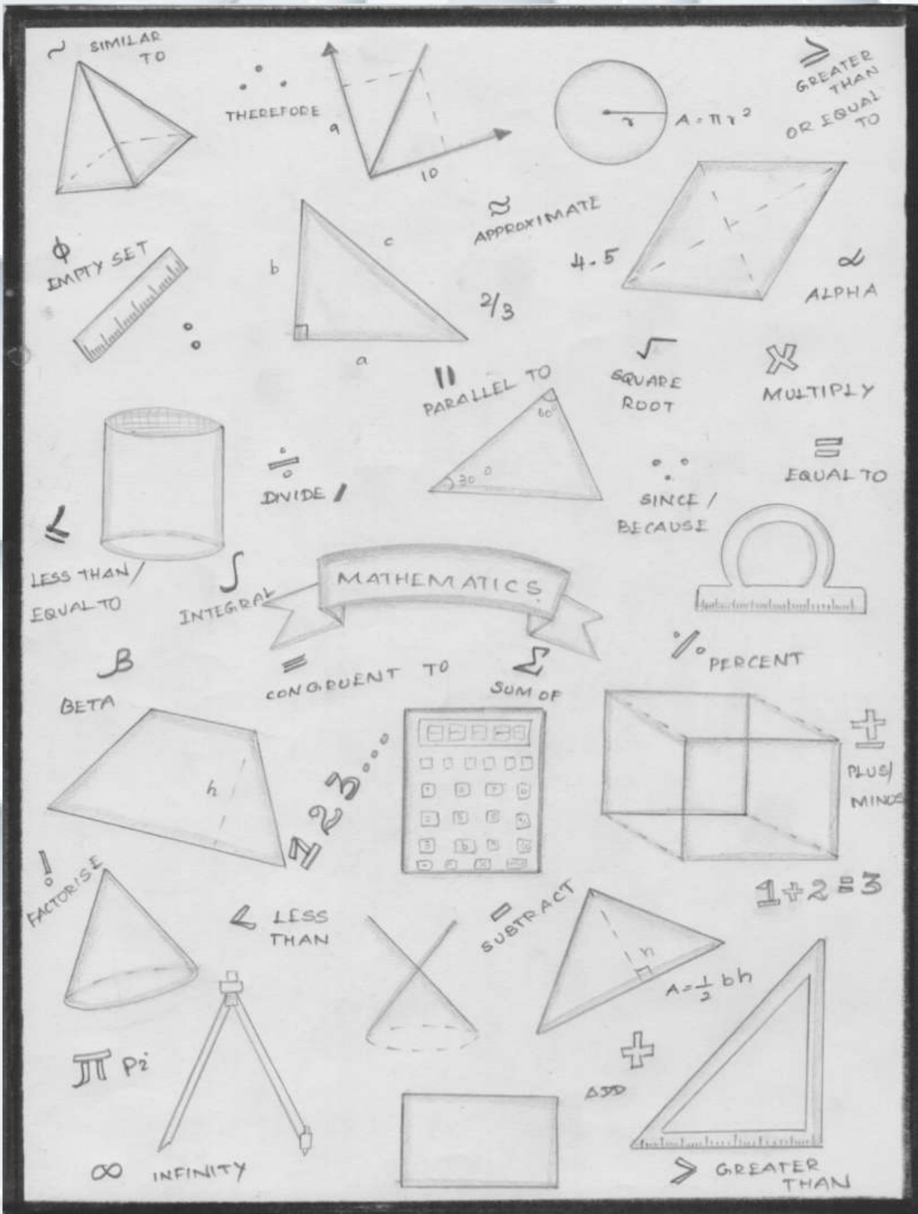
For any application, applied radio labeling process proved as an efficient way of determining the time of communication for sensor networks.

Here, the network is considered as a chain graph in which every sensor planted in the network is a vertex communicating at time ' t ' where 't' is radio channel assignment. It was found that if there is any random dump of junk in the network then the radio labeling has the property of having " consecutive " channel assignments close time frames far away from each other. The channel later can be used to determine the time at which the sensor communicates.

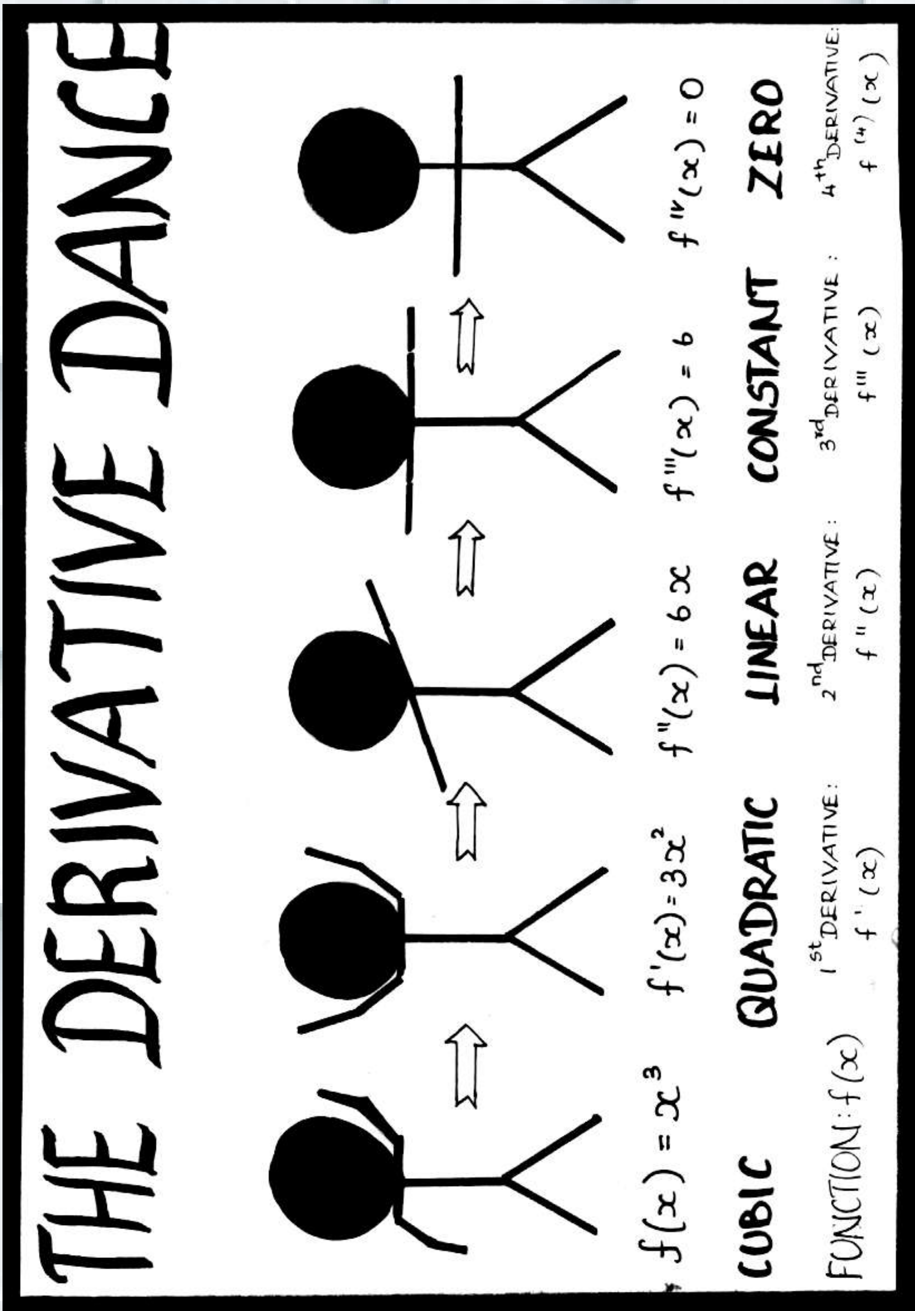
BY

B.SivaRanjani, M.Phil Scholar

Colloquium of Mathematical Symbols



BY M.Aswini, I B.Sc



BY E.Lincy, I B.Sc

Graph Matching Applications

Graph is a powerful and versatile tool useful in various subfields of science and engineering. In many applications, like pattern recognition and computer vision, it is required to measure the similarity of objects. When the graphs are used for the representation of structured objects, then the problem of measuring object similarity turns into the problem of computing the similarity of graphs which is also known as graph matching. More recently, graph matching has been applied to case - based reasoning, machine learning, planning, sementic networks, conceptual graph and monitoring of computer networks. Furthermore, it was used in the text of visual languages and programming by graph transformation, recognition of graphical symbols, charater recognition, shape analysis, three dimensional object recognition and others.

The system under consideration is based on indexing by qualitative spatial relationship. Any object of interest in an image is represented by its bounded box which is described, in turn, by a node in the underlying graph representation. There are 13 relations in both the X and Y direction resulting in a total of 169 possible relations between two different objects in an image. In each graph representation an image is fully connected. The transformation of the images in the databases into their graph representation is accomplished in a semi automatic fashion, where only the first frame of a video clip needs full manual processing. Once all objects of interest have been manually extracted and labaled in the first image an automatic tracking procedure is started, which is based on the assumption that objects change only slightly from one image to the next. Retrivel of images from the database is by pictorial example.

Given the graph representation of the query and the images in the database, the task of image retrieval is cast as a graph matching problem. In the context of the considered application the maximum common subgraph *between the query Q and an image I in the database is particularly interesting as it represents the largest collection of objects present in Q and I that have compactible labels and maintain the same spatial relations to each other in both images.*

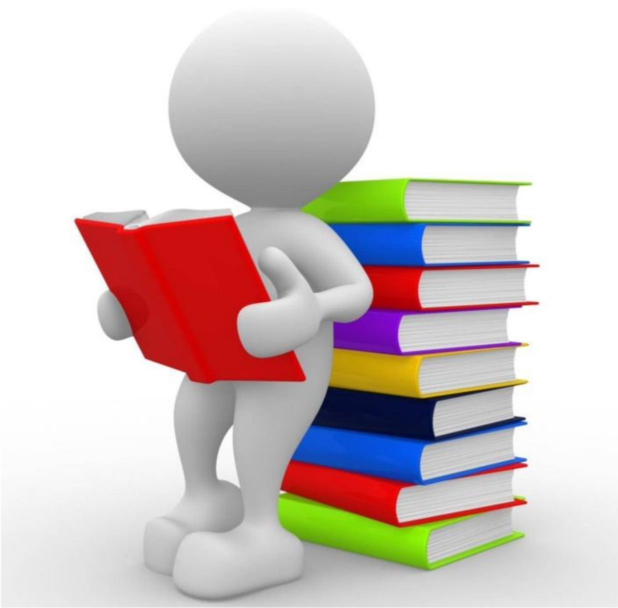
The proposed graph matching procedures have been tested on real video database. The clips in this database vary in length from 4 to 20 seconds and contain between 12 and 19 objects each. The shortest clip contains 71 changes to object relationships, while the longest has 402 changes. This is done by Ullman's algorithm. On the other hand we must remember the large space requirements of the method. Other promising area of future research include the automatic inference of edit costs from a set of sample graphs and the combination of optimal and approximate graph matching methods.

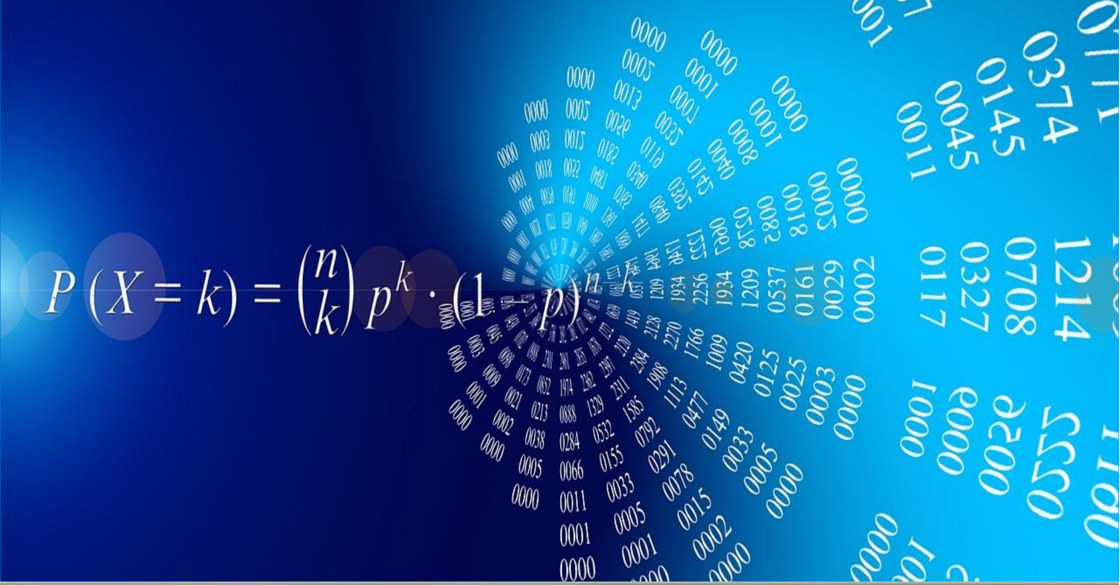
BY

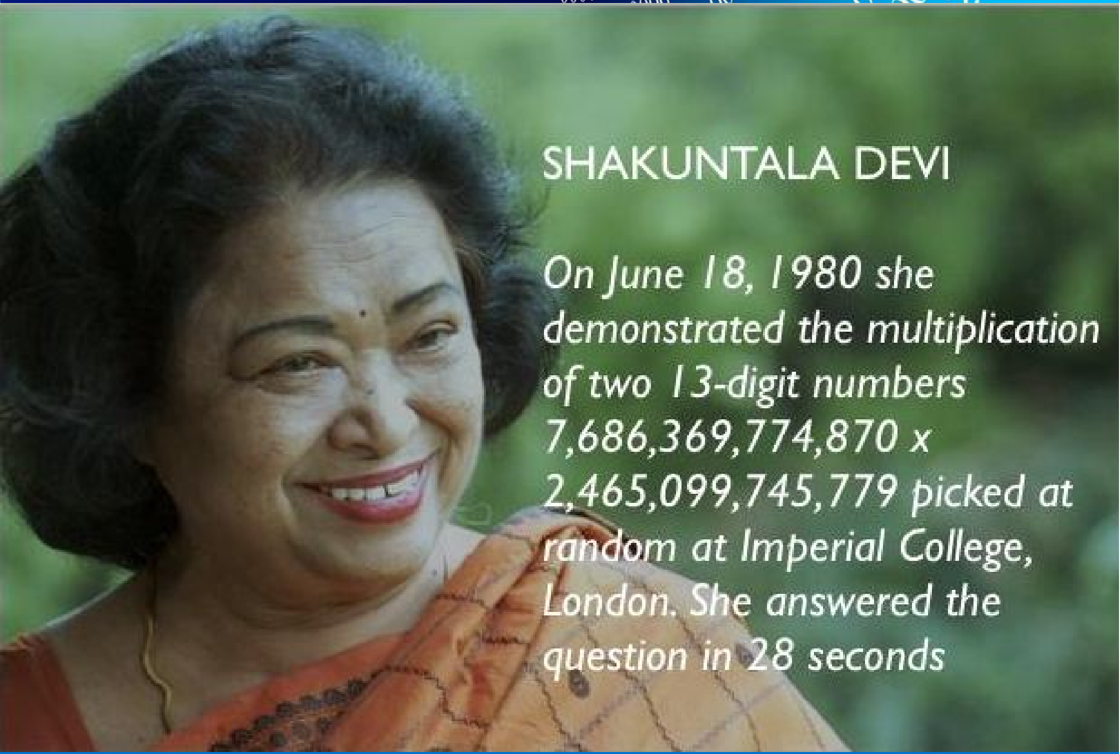
S.Shipiya Raj Shree, M.Phil Scholar

"It's not the end of the book ,

It's just the beginning of a new chapter."







In 1970, she was invited by an institute in Germany where she bet a computer in calculation. Impressed by her performance, the institute gifted her a Mercedes Benz.