

## MATH MYST ( Bi Annual E-Magazine )



### V.O.Chidambaram College

Reaccredited by NAAC with 'A' Grade  
(CGPA of 3.31 out of 4.0)(3rd Cycle)

68th Rank in NIRF

Department of Mathematics and Research Centre

Thoothukkudi-628008

### MATH – MYST

( Bi Annual E-Magazine )

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### MATH ISN'T TAUGHT, IT'S CAUGHT

Mathematics has been the building block for everything in our daily lives, including mobile devices, art, architecture etc. Discovery in Mathematics has been at the forefront of every civilized society. The needs of math arose based on the wants of society. The more complex a society is, the more complex the mathematical needs. Math such as applied mathematics is not only relevant, but crucial. Sometimes to my amazement, I find students neglecting the mathematical theories but offer red carpeted attention to application of the theories. Without theoretical base, no one could have the knowledge of application. Pure and applied Mathematics are not mutually exclusive, but they are rooted in different areas of math and problem solving. The Universal Turing Machine theorized by Alan Turing in 1937, later paved its path for the development of the modern computer. Pure mathematics is abstract and based on theory, and is thus not constrained by the limitations of the physical world. It'd be better to give prime importance to the core theories which would automatically drive its way to constructive applications.

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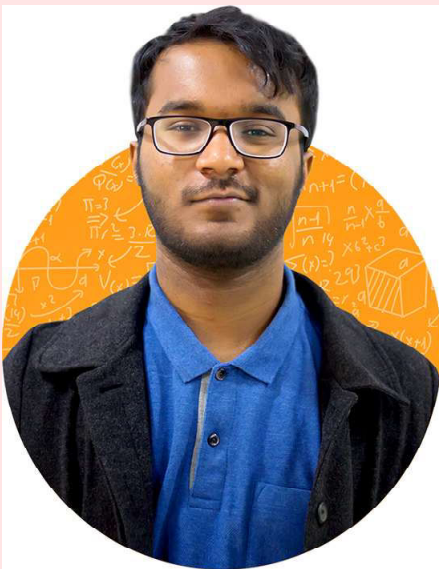
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## ASPIRE TO INSPIRE

Mathematics has been playing a predominant role in human life since ages. Despite several advancements in mathematics there are many unsolved problems and conjectures. Ordinary people with extraordinary skills took mathematics to the next level.

After the well-known Mathematical Genius Shakuntala Devi, 20 year old Indian, Neelakantha Bhanu Prakash stands as a living example of being the next 'Fastest Human Calculator'.



He has been awarded with the gold medal at the Mind Sports Olympiad - 2020 (MSO) held at London. This annual international multi-disciplined event was first started in England in 1997 with the motive of honouring one's cognitive skills and talents.

Twenty nine contestants within 10 to 57 years of age from 13 countries participated in this 2020 math fest. They were asked to solve the given equations with a minimum of 65 points. Amazed by Prakash's spontaneous answers, the judges challenged him to solve cubic root equations. Prakash proved them correct and made India win her first gold.

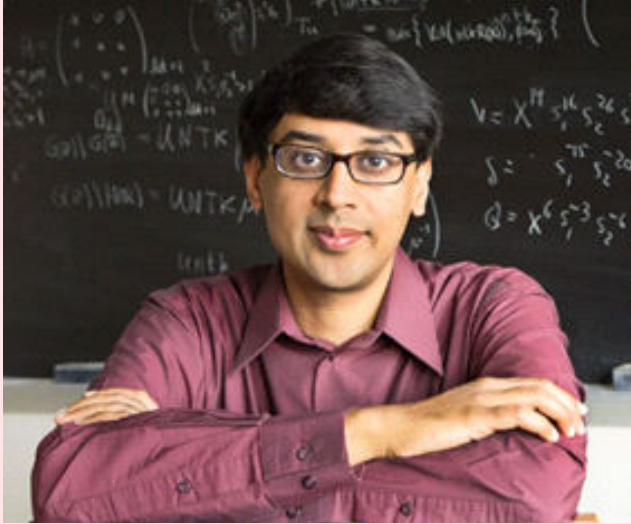
His achievements cannot be confined to this event alone. In 2005, he happened to meet with an accident. During this time his parents came to know about his intelligence in solving sudokus and mathematical puzzles. Sooner he began developing his own skills by taking part and succeeding in various challenging events.

Neelakantha Prakash has so far made 50 national and 4 international achievements. He won over Scott Flansberg in the year 2016 and got entitled as the world's 'Fastest Human Calculator' and is holding it till date. Everyone happens to come across a crucial stage in their lives where one has to decide whether to wait or proceed. To achieve, you should dare to take a leap is the biggest lesson that Prakash teaches all of us.

**-S.Pratiksha**

**II M.Sc. Mathematics**

## NUMBER THEORIST MANJUL BHARGAVA WINS FIELDS MEDAL



The mathematician of Indian origin, **Manjul Bhargava** is one among the eight winners of the prestigious award of the International Mathematical Union (IMU) that was announced at the inaugural of the 9-day International Congress of Mathematicians (ICM) at Seoul, Republic of Korea.

Manjul Bhargava, Canadian-American number theorist from Princeton University, has been chosen for the highest award in Mathematics, the Fields Medal, which is given once every four years by the IMU during the quadrennial International Congress of Mathematicians (ICM).

Fields Medal is awarded in recognition of “*outstanding mathematical achievement for existing work and for the promise of future achievement*”. It is being given to

mathematicians of age less than 40 on January 1 of the year of the Congress. Bhargava, who turned 40 just last week, could not have hoped for a better birthday gift.

“Bhargava”, says the IMU citation, has been awarded the Fields Medal “*for developing powerful new methods in the geometry of numbers, which he applied to count rings of small rank and to bound the average rank of elliptic curves*”.

A large body of work in number theory relates to the study of how prime numbers, are distributed among the entire set of integrals.

Bhargava developed novel techniques to count objects in algebraic number theory. His work has completely revolutionized the way in which fundamental arithmetic objects in algebraic number theory, such as number fields and elliptic curves, are now understood and studied, and this has given rise to wonderful applications.

- **L. Abinaya Darshini**

**II B.Sc. Mathematics**

*“Math is the only place where truth and beauty mean the same thing.”*

— *Danica McKellar*

## MATH FACTS ARENA

1. “Forty” is the only number that is spelt with letters arranged in alphabetical order. Conversely, “one” is the only number that is spelt with letters arranged in descending order.
2. “Eleven plus two” is an anagram of “twelve plus one” which is pretty fitting as the answer to both equations is 13. (anagram –a word formed by rearranging the letters of another such as *spar*, formed from *rasp*)
3. The symbol for division (i.e.,  $\div$ ) is called an obelus.
4. The number on opposite sides of a dice always add up to seven.
5. The Square Root of Two (1.41) is called “Pythagoras Constant.” It’s also the very first irrational number ever to be discovered.
6. Minus 40 degrees, or “40 below,” is the only temperature that is the same in both Fahrenheit and Celsius.
7. Multiplying ones always gives you palindrome numbers. If you multiply  $111,111,111 \times 111,111,111$  you get 12,345,678,987,654,321.

- G . Kalai Selvi  
III B.Sc. Mathematics

## KAPREKAR’S CONSTANT

Starting with any four digit number (that has atleast two different digits) just follow the following steps:

- a) Arrange the digits of the four digits number in descending / ascending order to make the largest and smallest numbers possible.
- b) Subtract the smaller number from the large one.
- c) Take the answer and repeat the process.



Eventually you’ll end up at 6174 or ‘Kaprekar’s Constant’.

Picking a number at random , let’s try 4551, for instance

Stage 1:  $5541 - 1455 = 4086$

Stage 2:  $8640 - 0468 = 8172$

Stage 3:  $8721 - 1278 = 7443$

Stage 4:  $7443 - 3447 = 3996$

Stage 5:  $9963 - 3699 = 6264$

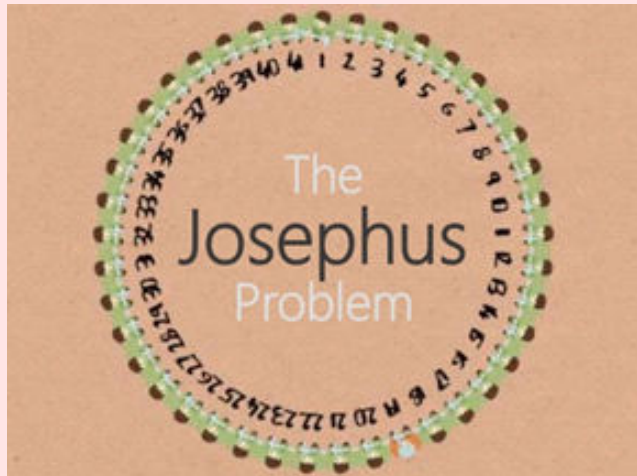
Stage 6:  $6642 - 2466 = 4176$

Stage 7:  $7641 - 1467 = 6174$

# THE JOSEPHUS PROBLEM

## History

The problem is named after Flavius Josephus, a Jewish historian living in the 1<sup>st</sup> century. According to Josephus' account of the siege of Yodfat, he and his 40 soldiers were trapped in a cave by Roman soldiers. They chose suicide over capture, and settled on a serial method of committing suicide by drawing lots. Josephus states that by luck or possibly by the hand of God, he and another man remained until the end and surrendered to the Romans rather than killing themselves.



## Problem

Determine where the last survivor stands if there are  $n$  people to start and every second person ( $k=2$ ) is eliminated.

## Solution

In the following,  $n$  denotes the number of people in the initial circle and  $k$  denotes the count for each step, that is  $k - 1$  people are skipped and the  $k^{\text{th}}$  is executed. The people in circle are numbered from 1 to  $n$ .

$$k=2$$

We explicitly solve the problem when every second person will be killed.

Let  $f(n)$  denote the position of the survivor when there are initially  $n$  people. The first time around the circle, all of the even-numbered people die. The second time around the circle, the new 2<sup>nd</sup> person dies, then the new 4<sup>th</sup> person, etc., it's as though there were no first time around the circle.

If the initial number of people was even, then the person in position  $x$  during the second time around the circle was originally in position  $2x - 1$  (for every choice of  $x$ ). Let  $n=2j$ . The person at  $f(j)$  who will now survive was originally in position  $2f(j) - 1$ . This gives us recurrence.

$$f(2j) = 2f(j) - 1.$$

If the initial number of people was odd, then we think of person 1 as dying at the end of the first time around the circle. Again, during the second time around the circle, the new 2<sup>nd</sup> person dies, then the new 4<sup>th</sup> person, etc., In this case, the person in position  $x$  was originally in position  $2x+1$ . This gives us the recurrence

$$f(2j + 1) = 2f(j) + 1.$$

When we tabulate the values of  $n$  and  $f(n)$  we see a pattern as in Table 1.

This suggests that  $f(n)$  is an increasing odd sequence that restarts with  $f(n) = 1$ . Whenever the index  $n$  is a power of 2. Therefore, if we choose  $m$  an  $l$  so that  $n = 2^m + l$  and  $0 \leq l < 2^m$ , then  $f(n) = 2.l + 1$ .

<b>n</b>	<b>f(n)</b>
1	1
2	1
3	3
4	1
5	3
6	5
7	7
8	1
9	3
10	5
11	7
12	9
13	11
14	13
15	15
16	1

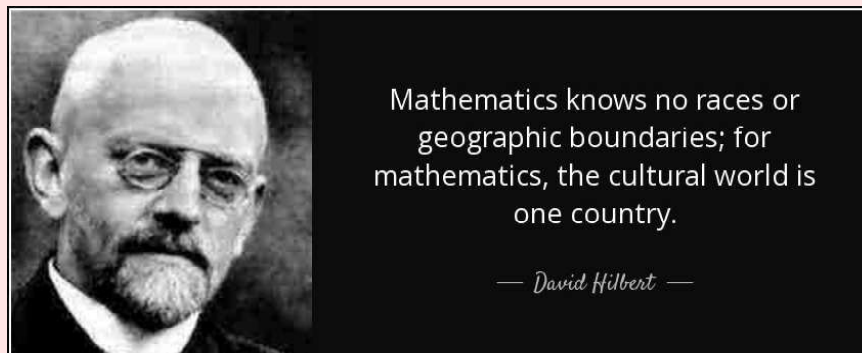
It is clear that values in the table satisfy this equation. Or we can think that after  $l$  people are dead there are only  $2^m$  people and we go to the  $(2l + 1)^{th}$  person. He must be the survivor.

So  $f(n) = 2l + 1$ .

Hence the solution.

- **M.Sreevarsha**

**II M.Sc. Mathematics**



# REMEMBRING CS SESHADRI: AN INTELLECTUAL STALWART AND BRILLIANT MATHEMATICIAN

## EARLY LIFE AND EDUCATION

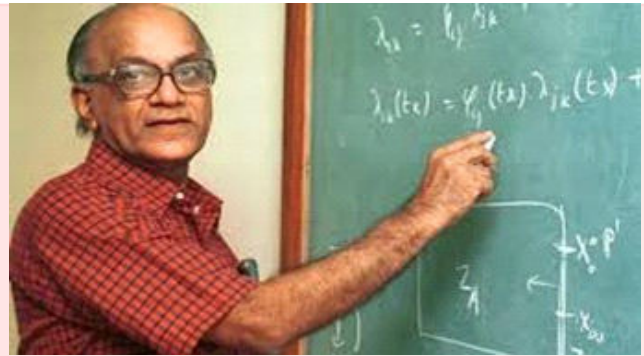
Eminent mathematician professor CS Seshadri, was born at Kanchipuram on 29 February 1932. He receives his B.A (Hons) degree from Madras University. He completed his PhD from Bombay University.

## BEGINNING OF HIS CAREER

Seshadri began his career at the TATA Institute of Fundamental Research (TIFR) as one of the first batch of graduate students. Along with illustrious colleagues such as M.S. Narasimhan, S. Ramanan and M.S. Raghunathan, he helped establish the school of Mathematics in TIFR as one of the leading centers for mathematics research in the world.

## FORMATION OF CMI

He moved to Chennai in 1984, to the Institute of Mathematical Science. In 1989, he got an opportunity to start the school of Mathematics as part of the SPIC science Foundation, which has evolved into the Chennai Mathematical Institute (CMI).



## RESEARCH WORK

Seshadri's main work was in algebraic geometry. His work with M S Narasimhan on unitary vector bundles and the Narasimhan-Seshadri theorem has influenced the field. His work on Geometric Invariant Theorem and on Schubert varieties, in particular his introduction of Standard Monomial Theorem, is widely recognized. Seshadri' is also known for Seshadri's constant.

## AWARDS AND FELLOWSHIP

C S Seshadri was recognized around the world with awards ranging from Shanthi Swarup Bhatnagar Award and Padma Bhushan, the third highest civilian award in India by the government of India. He was elected fellow of the Royal Society in 1988 and a Foreign Associate of the National Academy of Science, U.S., in 2010

## THE COUNTING DAYS

The loss in October 2019 of his wife Sundari was a great blow to him. Over the past decade, Seshadri grappled with serious health problem and died of Parkinson's on 17 July 2020 in Chennai. He was 88.

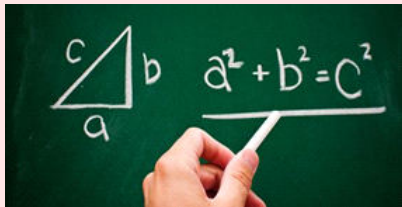
- V.Kasini Venda Perumal  
I B.Sc. Mathematics

# DAYS TO VENERATE MATHEMATICS

Mathematics is a critical part of life and essential in our daily activities. Just like every other aspect of our lives we hold dear, we can also celebrate special days in this fantastic field.

### Pythagorean Theorem day:

Pythagorean Theorem Day is celebrated on days that align with the formula.



Example: The last Pythagorean theorem day was on the 15<sup>th</sup> of August, 2017.

$8^2+15^2=17^2$  or  $15^2+8^2=17^2$ . Next

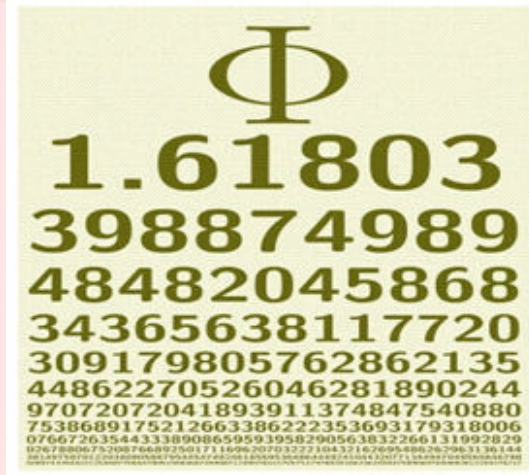
Pythagorean Theorem Days:

- December 16,2020 (12+/16/20 or 16/12/20): $12^2+16^2=20^2$
- July 24, 2025 (7/24/25 or 24/7/25) :  $7^2+24^2=25^2$ .

### Phi Day (Φ):

Phi (Φ) is the ratio of the line segments that result when a line is divided in one very special and unique way.

Phi day was last celebrated on 6 Jan 2018 (1/6/18). The next date that aligns is not for another hundred years, on 6 Jan 2118 .



### Square Root Day:

Square Root Day is when both the day of the month and the month are the square root of the last two digits of the year. For example, the last Square Root Day was April 4,2016 (4/4/16), and the next Square Root Day will be May 5,2025 (5/5/25).

### Palindrome Day

A Palindrome Day happens when the day's date can be read the same way backward as well as forward.

### Palindrome Days in 2020-2021

*mm-dd-yyyy:*

February 2, 2020 (02-02-2020)

December 2,2021 (12-02-2021)

*dd-mm-yyyy:*

02 February,2020 (02-02-2020)

12 February,2021 (12-02-2021)

*mm-dd-yyyy:*

February 11,2020 (02-11-20)

February 22,2020 (02-22-20)

December11, 2021 (12-11-21) December

22,2021 (12-22-21)

**B.Viveka , III B.Sc. Mathematics**



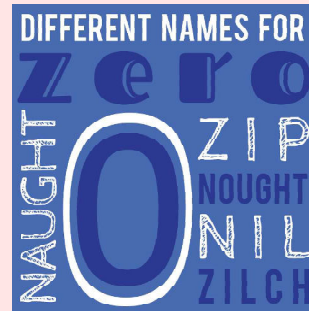
## ROLE OF 0 (ZERO) IN MATHEMATICS

**0 (zero)** is a number and the numerical digit used to represent that number in numerals. It acts as the additive identity of the integers, real numbers, and many other algebraic structures. As a digit, 0 is used as a placeholder in place value systems. Names for the number 0 in English include **zero**, **nought**, **naught**, **nil**, or—in contexts where at least one adjacent digit distinguishes it from the letter “O”—**oh** or **o**. Informal terms for zero include **zilch** and **zip**. *Ought*, *ought*, and *cipher*, have also been used historically.

**Cardinal** zero, nought, naught, nil  
**Ordinal** Zeroth, noughth

Binary	$0_2$
Ternary	$0_3$
Quaternary	$0_4$
Quinary	$0_5$
Senary	$0_6$
Octal	$0_8$
Duodecimal	$0_{12}$
Hexadecimal	$0_{16}$
Vigesimal	$0_{20}$

- F.Kevin Mariya Christy Rex  
II B.Sc. Mathematics



## ENTHRALLING FACTS

- ZERO is the only number that can't be represented in ROMAN numerals.
- Every Odd number has E in it.
- Plus( + ) and Minus( - ) sign symbols were used as early as 1489A.D .
- Why 6 is the smallest perfect number? In number theory, a perfect number is a positive integer that is equal to the sum of its positive divisors .  
 $1 + 2 + 3 = 6$
- Why 9 is considered as “Magic” Number?  
 $8 \times 9 = 72$   $7+2 = 9$   
 $4 \times 9 = 36$   $3+6 = 9$
- Six Weeks = 10! Seconds  
 $10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 3,628,800$  seconds = 60,480 minutes = 1,008 hours = 42 days = 6 weeks.
- A pizza has a radius “z” and height “a” has volume  $\text{Pi} \times z \times z \times a$ .

Meenakshi Sundari  
I B.Sc. Mathematics

## MATHS QUIZ



1. Can you solve this math puzzle?

$$2+4+6 = 19$$

$$3+6+9 = 43$$

$$4+6+8 = 53$$

$$\text{Then } 9+5+3 = ?$$

2.

3	4
8	6
12	16
?	24

3. The digit in the unit place of the product

$$(2464)^{1793} \times (615)^{317} \times (131)^{491} \text{ is } \underline{\hspace{2cm}}$$

4. What two numbers fit in the blanks?

$$5, 8, 12, 18, \_, \_, 36, 42, 52, 60$$

5. Use four 9s in a math equation that equals 100.

## Key to the Quiz

1) **64**

Correct equation for this puzzle is  
 $x+y+z = x[y + [z-1]] + 1$   
 $4'' 9+5+13 = 9[5 + [8-9]] + 1 = 64$

2) **32**

REASON:  $3 \times 2 = 6$      $4 \times 2 = 8$   
 $6 \times 2 = 12$      $8 \times 2 = 16$   
 $12 \times 2 = 24$      $16 \times 2 = 32$

3) **0**

REASON:  $(4)^{2m}$  gives 6 at unit digit  
 $(4)^{2m+1}$  gives 4 at unit digit  
 $(5)^n$  gives 5 at unit digit

The same is the case with 1.

Required digit = units digit in the product of  
 $4 \times 5 \times 1 = 0$

4) **24, 30**

REASON:

Each number is addition of two prime numbers.

The two primes are consecutives and are ascending.

$$5 = 2+3; 8 = 3+5; \dots$$

$$24 = 11+13;$$

$$30 = 13+17$$

5)  **$99 + (9 \div 9) = 100$**

*“Mathematics is the most beautiful and most powerful creation of the human spirit.”*

*-Stefan Banach*

*“Life is good for only two things, discovering mathematics and teaching mathematics.”*

*-Simeon Poisson*

# FACTS ABOUT PASCAL'S TRIANGLE

## BLAISE PASCAL

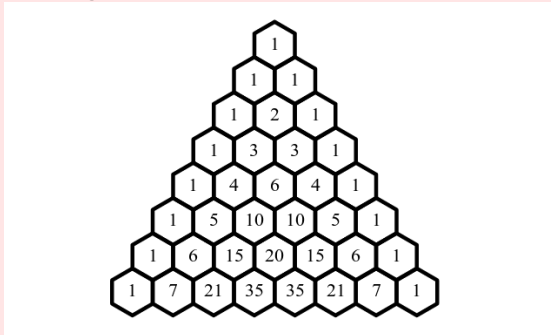
Blaise Pascal was born in 19 June 1623. He was a french mathematician writer, physician and inventor.

## PASCAL'S TRIANGLE

Pascal's Triangle is simple, yet rich mathematically. (named after Blaise Pascal)

### How to build Pascal's Triangle

- At the top centre write the number "1".
- On the next row write two 1's, forming a triangle.
- On each subsequent row start and end with 1's and compute each interior term by summing the two numbers above it.



### Power Of Two

If we sum each row, we obtain powers of base two, beginning with  $2^0 = 1$ .

$$\begin{aligned}
 1 &= 2^0 \\
 1 + 1 &= 2 = 2^1 \\
 1 + 2 + 1 &= 4 = 2^2 \\
 1 + 3 + 3 + 1 &= 8 = 2^3 \\
 1 + 4 + 6 + 4 + 1 &= 16 = 2^4 \\
 1 + 5 + 10 + 10 + 5 + 1 &= 32 = 2^5
 \end{aligned}$$

### Power Of Eleven

The triangle also reveals powers of base 11.

$$\begin{aligned}
 1 &= 11^0 \\
 11 &= 11^1 \\
 121 &= 11^2 \\
 1331 &= 11^3 \\
 14641 &= 11^4
 \end{aligned}$$

### Expanding Binomials

Do you know how will we use this Pascal's triangle in the Binomial Theorem?

Let see how,

$$(a+b)^2 = 1a^2 + 2ab + 1b^2$$

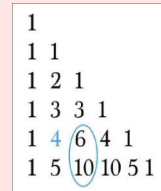
Here the power of the binomial is 2 and the coefficients are 1,2,1 and these are the numbers in the second row. Similarly

$$(a+b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$$

Here the power is 3 and the coefficients are 1,3,3,1 and these are the numbers in the third row.

### Perfect Square

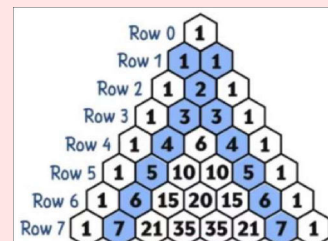
We can locate the **perfect squares** of the natural numbers in column two by summing the number to the right with the number below the number to the right. For example,  $4^2$  is  $6+10 = 16$ .



### Patterns

In the triangle we see that the starting and ending numbers are always 1 in each row.

Now if we look here, the diagonals are Natural Numbers.



G.Ananda Valli , I B.Sc Mathematics.

## DEPARTMENT EVENTS

Our Department has organized the following National and International webinars during the pandemic period.

1. National webinar on 20.05.2020 with the theme **MIND YOUR MINDS DURING LOCKDOWN** (To counter stress). Dr.D.Radhika, Head and Associate Professor, Department of Zoology, V.O.Chidambaram College was the resource person.
2. National webinar on 7.6.2020 , with the theme **APPLICATIONS OF GRAPH THEORY**. Dr.G.Mahadevan, Assistant Professor of Mathematics, Gandhigram Rural Institute, Dindigul was the resource person.
3. National webinar on 10.6.2020, with the theme **CATALAN NUMBERS AND IT'S APPLICATIONS** . Dr.K.Nagarajan, Head and Associate Professor (Retd), Department of Mathematics, Sri SRNM College, Sattur was the resource person.
4. International Webinar on 25.06.2020 with the theme **RECENT TRENDS ON DOMINATION IN GRAPHS**. Dr.C.Sivagnanam , Assistant Professor of Mathematics, Sur College of Applied Sciences,Minstry of Higher Education, Sultanate of Oman was the resource person.
5. National webinar on 30.6.2020, on the theme **PROBLEM SOLVING TECHNIQUES IN ANALYSIS**,with Dr.M.Marudhai, Honorary Professor, Department of Mathematics, Bharathidasan University as the resource person.

6. National webinar on 08.07.2020, with the theme **GRAPH COLORING PROBLEMS**. Dr.I.Sahul Hamid, Assistant Professor of Mathematics, The Madura College,Madurai was the resource person.

7. National Webinar on 03.08.2020 with the theme **A FUNDAMENTAL OBJECT OF ALGEBRAIC TOPOLOGY**. Dr.M.Gilbert Rani,Assistant Professor of Mathematics,Arul Anandhar College(Autonomous), Karumathur was the resource person.

**Dr.A.Nagarajan** was the convener , **Dr.S.Jackson** was the organizer and **Dr.L.Meenakshi Sundaram** was the co-organizer for the above programme.

**Dr.S.Jackson** served as a resource person for the following webinars.

1. Capacity Building Programme on the theme **Time To Lead** organized by V.O.Chidambaram College of Education, Thoothukudi, on 16.06.2020.
2. National Webinar on **Soft Sets and its Applications** organized by Department of Mathematics , Hindustan College of Arts and Science (Autonomous), Coimbatore on 29.06.2020.
3. Two days virtual workshop on **Real Analysis** from 11.08.2020 to 12.08.2020, organized by Ganitha Association , Department of Mathematics(SF),PSGR Krishnambal College,Coimbatore.
4. Webinar on **New Trends of Statistical Applications** organized by Department of Statistics , G. Venkatasamy Naidu College(Autonomous), Kovilpatti on 15.10.2020.





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**Editor's Desk.....**

The word “Mathematics” has interesting literal definitions in two ancient languages. In Greek, it is “learning.” In Hebrew, it's root is “thinking.” A solid foundation in mathematics develops and hones the skills of posing hypotheses, analyzing data, solving problems and seeking absolutes, while being open to new information. Teaching methods used today stress memorization and the use of calculators. Students are taught by rote instead of analyzing and understanding, with the primary focus placed on test scores. Having fun and building confidence while learning the key principles of mathematics develops the love of learning, missing so terribly in today's education system. New and innovative learning programs need to be implemented in order to boost their creativity, imagination and confidence. Being Digital natives, they can do wonders if they have a clear Mathematical Knowledge.

**Edited and Compiled by**

**Dr.S.Jackson**

Assistant Professor

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# Fascinating Fractals

## Fractals in nature

### What's a fractal?

A fractal is defined as a mathematical structure that exhibits some sort of “*self-similarity*”, meaning that if you zoom in on one, the same type of structure will keep appearing. It is “a rough or fragmented geometric shape that can be subdivided in parts, each of which is a reduced/size copy of the whole”. The term was coined by Benoît Mandelbrot in 1975 and was derived from the Latin word “*fractus*” meaning broken or fractured.

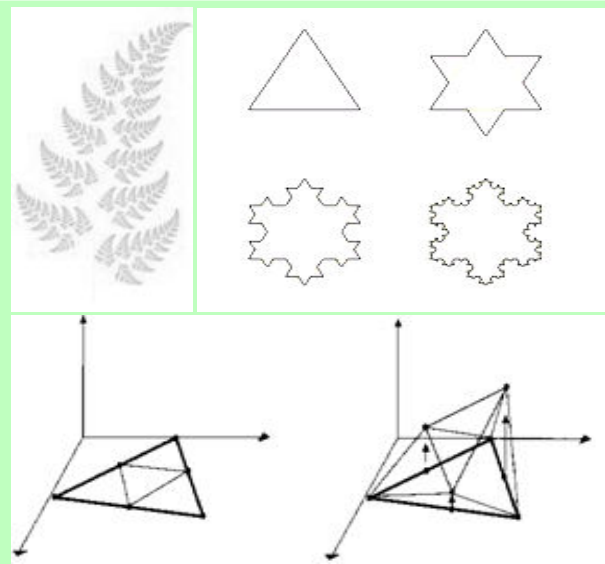
### A fractal as a geometric object generally has the following features:

- Fine structure at arbitrarily small scales.
- It is too irregular to be easily described in traditional Euclidean geometric language.
- It is self-similar.
- It has a simple and recursive definition.

Due to them appearing similar at all levels of magnification, fractals are often considered to be ‘*infinitely complex*’. Obvious examples include clouds, mountain ranges and lightning bolts.

However, not all self-similar objects are fractals — for example, the real line (a straight Euclidean line) is formally self-similar but fails to have other fractal characteristics.

- 1) Trees and ferns are fractal in nature and can be modeled on a computer by using a recursive algorithm. A branch from a tree or a frond from a fern is a miniature replica of the whole: not identical, but similar in nature. (Fig. 1)
- 2) The surface of a mountain can be modeled on a computer by using a fractal: Start with a triangle in 3D space and connect the central points of each side by line segments, resulting in 4 triangles. The central points are then randomly moved up or down, within a defined range. The process is repeated, decreasing at each iteration the range by half. The recursive nature of the algorithm guarantees that the whole is statistically similar to each. (Fig. 2)
- 3) A Koch snowflake is the limit of an infinite construction that starts with a triangle and recursively replaces each line segment with a series of four line segments that form a triangular “bump”. Each time new triangles are added (an iteration), the perimeter of this shape grows by a factor of  $\frac{4}{3}$  and thus diverges to infinity with the number of iterations. The length of the Koch snowflake’s boundary is therefore infinite, while its area remains finite. For this reason, the Koch snowflake and similar constructions were sometimes called “monster curves.” (Fig. 3)



### Applications

- Classification of histopathology slides in medicine.
- Generation of new music.
- Generation of various art forms.
- Signal and image compression.
- Seismology.
- Computer and video game designing.
- Fractography and fracture mechanics
- Generation of patterns for camouflage, such as MARPAT.

**S.Pratiksha**

**I-M.Sc.Mathematics**

*God does arithmetic.*

— *Carl Friedrich Gauss*

### Puzzle Corner

Solve:

$$2+4+6 = 19$$

$$3+6+9 = 43$$

$$4+6+8 = 53$$

$$9+5+13 =$$

Ans: 64

$$\{x+y+z = x[y + [z-1]] + 1\}$$

**Rosita Sahaya Mary.G**

**I M.Sc Maths**

### FIELDS MEDAL



Akshay Venkatesh, a professor of mathematics at Stanford University, has won the 2018 Fields Medal, the highest honor in math. The award recognizes Venkatesh's synthesis of analytic number theory, homogeneous dynamics, topology and representation theory, which has resolved long-standing problems in areas such as the equidistribution of arithmetic objects.

- **S.Sheeba, I-M.Sc. Mathematics**

## Vedic Mathematics

Vedic Mathematics is a collection of Techniques/Sutras to solve mathematical arithmetic in easy and faster way. It consists of 16 Sutras (Formulae) and 13 sub-sutras (Sub Formulae) which can be used for problems involved in arithmetic, algebra, geometry, calculus, conics.

Vedic Mathematics is a system of mathematics which was discovered by Indian mathematician **Jagadguru Shri Bharathi Krishna Tirthaji** in the period between A.D. 1911 and 1918 and published his findings in a Vedic Mathematics Book by Tirthaji Maharaj. Veda is a Sanskrit word which means '**Knowledge**'.

Using regular mathematical steps, solving problems sometimes are complex and time consuming. But using Vedic Mathematic's General Techniques calculations can be done very fast.

Shri Bharathi Krishna Tirthaji Maharaj was born in March 1884 in the Puri village of Orissa state. He was very good in subjects like mathematics, science, humanities and was excellent in Sanskrit language. His interests were also in

spiritualism and mediation. In fact when he was practicing meditation in the forest near Sringeri, he rediscovered the Vedic sutras. He claims that these sutras/techniques he learnt from the Vedas especially 'Rig-Veda' directly or indirectly and he intuitively rediscovered them when he was practicing meditation for 8 years.

Later he wrote the sutras on the manuscripts but were lost. Finally in year 1957, he wrote introductory volume of 16 sutras which is called as Vedic Mathematics and planned to write other sutras later. But soon he developed cataract in both of his eyes and passed away in year 1960.

## The Advantages of Vedic Mathematics

Lets take 1 example to see the Power of Vedic Mathematics.  $1/19$  is a Rational Number which forms a recurring decimal number and which recurs the sequence after every 18 digits. How much time will you take to divide  $1/19$ . Using *Ekadhikena Purvena Sutra of Vedic Mathematics*, It would take just 7-8 seconds to calculate exact decimal number in just 1 line.



**The Use of Vedic Mathematics.**

More than 1700% times faster than normal Math: this makes it the World's Fastest.

• Eradicates fear of Math completely. So If your child has Math-Phobia High Speed Vedic Math is a Fun-Filled way to do Math and arises interest in your child.

• Much Improved Academic Performance in School and Instant Results. Just see the first exercise and believe it for yourself. Go over the examples given in the tutorials you would be amazed.

• Sharpens your mind, increases mental agility and intelligence.

• Increases your speed and accuracy.

Become a Mental Calculator yourself.

• Improves memory and boosts self confidence.

• Cultivates an Interest in your for numbers.

• Develops your left and right sides of your brain hence using intuition and innovation. It has been noted that Geniuses have been using the right side of the brain to achieve exceptional results. • Easy to master and apply. You just need the knowledge of tables to learn this.

Vedic Maths Techniques/Sutras have the maths tricks for fast calculation and can be used in exams like CAT, CET, SAT, Banking Exams, etc.

**-L.Pavithra Devi**

**II B.Sc Maths**

**Puzzle Corner:** The digit in the unit place of the product

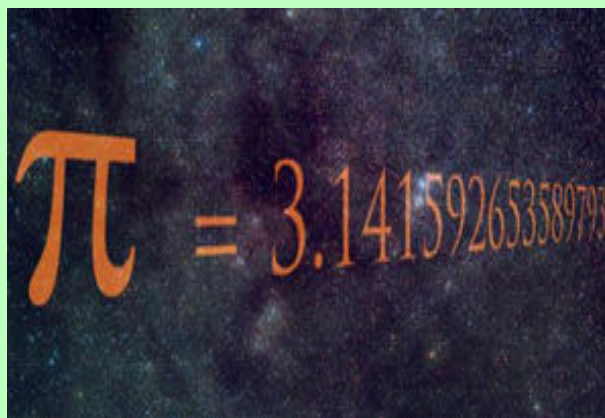
$$(2464)^{1793} \times (615)^{317} \times (131)^{491} \text{ is}$$

Answer:0       $(4)^{2m}$  gives 6 at unit digit,  $(4)^{2m+1}$  gives 4 at unit digit

$(5)^n$  gives 5 at unit digit, The same is the case with 1

Required digit = units digit in the product of  $4 \times 5 \times 1 = 0$ .

## HOW WAS THE VALUE OF PI ( $\pi$ ) FOUND?

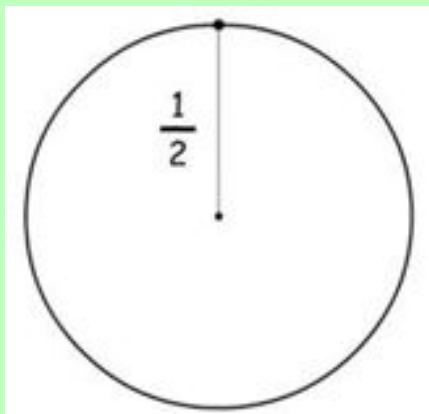


We all know Circle as “a set of points equidistant from a single point”.

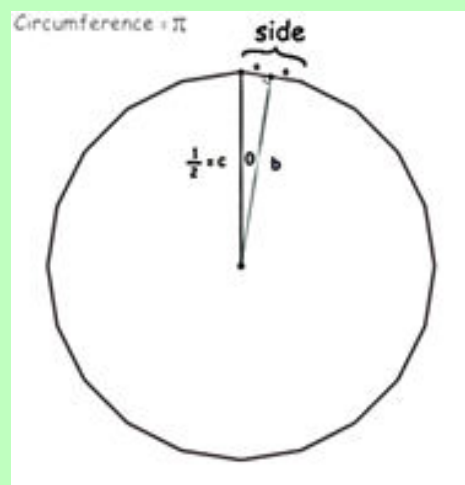
A circle is a special figure because the circumference of a circle divided by its diameter gives a constant and this constant remains the same for a circle of any size. The constant is none other than  $\pi$ . There are various methods for finding the value of  $\pi$ .

Let's discuss the method **Archimedes** used to find  $\pi$ .

Create a circle with radius  $\frac{1}{2}$ .



- The circumference of the circle is  $2\pi r = 2\pi * 1/2 = \pi$ .
- Inside the circle inscribe a polygon and increase the no. of sides repeatedly. (The more the sides of a polygon is increased the more it resembles the circle).
- $\therefore$  The perimeter of the polygon approximates the circumference of the circle.
- Now, let's derive the formula to calculate the perimeter of the inscribed polygon with arbitrary number of sides.



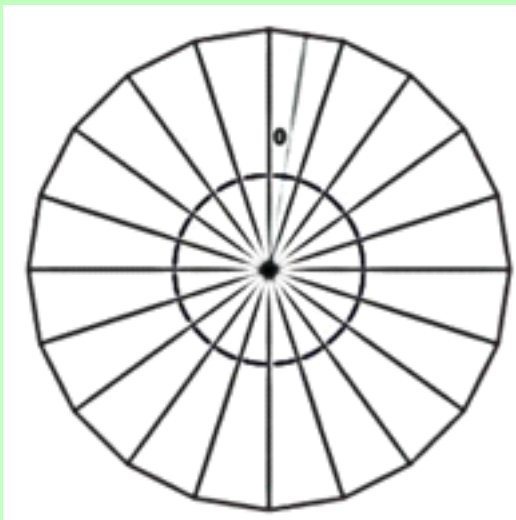
- W.k.t., the radius is  $\frac{1}{2}$ . Denote the centre of the polygon A, with points B and C as two vertices. With line BC and centre A we construct line AD such that it is perpendicular to line BC and incidentally point D bisects the line BC.
- $\therefore$  The triangle ABC is a right triangle with sides a, b and c and angle  $\theta$ .

- To find the perimeter of the equilateral polygon, the length of one of its sides should be found.
- Using trigonometry w.k.t.,  

$$\sin\theta = \text{opposite/hypotenuse}$$

$$= a / (1/2) = 2a$$

$$\sin\theta = 2a$$
- Also w.k.t, each side of the polygon =  $2a$ .  $\therefore$  each side =  $\sin\theta$
- The perimeter of an equilateral polygon is defined by the number of sides times the length of a side.  
 $\therefore$  Perimeter = Number of sides  $\times$  length of one side  
 $\therefore$  Perimeter =  $n \times \sin\theta$
- The individual angle of the polygon is  $360/n$  and  $\theta$  is  $1/2$  of one of those angles.
- $\therefore \theta = 180/n$
- $\therefore$  The Perimeter of the polygon  
 $= n \times \sin (180/n)$ .



- Since, the perimeter of the inscribed polygon with more sides accurates the circumference of the circle, increasing the value of  $n$  in the perimeter approximates the value of  $\pi$ .
- When  $n = 12, 24, 96, 576, 100000$ , the values of  $\pi$  are 3.1058, 3.1326, 3.1410, 3.14159 respectively.
- The higher the value we input for  $n$ , the closer we get to  $\pi$ .

- Infanta Jasmine Rushmitha.T

I M.Sc. Mathematics

*'Obvious' is the most dangerous word in mathematics*

*- E. T. Bell*

# 144

1. 144 is the twelfth Fibonacci number, and the largest one to also be a square, as the square of 12 (which is also its index in the Fibonacci sequence), following 89 and preceding 233.
2. 144 is the smallest number with exactly 15 divisors, but it is not highly composite since the smaller number 120 has 16 divisors.
3. 144 is divisible by the value of its  $\phi$  function, which returns 48 in this case. Also, there are 21 solutions to the equation  $\phi(x) = 144$ , more than any integer below 144, making it a highly totient number.
4. The maximum determinant in a 9 by 9 matrix of zeroes and ones is 144.
5. 144 is in base 10 a sum-product number, as well as a Harshad number. 144 is the sum of a twin prime pair (71 + 73).
6. The central idea is that for those of us who are in embodiment on earth, there are 144 different levels of consciousness available to us. When fully understood, this teaching can explain a lot about the spiritual path and your interaction with other people.
7. In English and related languages, several terms involving the words “great” or “gross” (possibly, from French: grosse thick) relate to numbers involving a multiple of exponents of twelve (dozen): A gross refers to a group of 144 items (a dozen dozen or a square dozen,  $12^2$ ).
8. The number 144 is used only once in the Bible.
9. The traditional horoscope is summarized essentially with the 12 signs of the zodiac, but with the ascending, we obtain 144 possible divisions.

**-S.Muthu Maheshwari**

**III B.Sc Maths**

## Department Events:

### Ph.D. Awarded

- S. Davasuba has been awarded Ph.D. in Mathematics for her thesis titled “Some Labeling Problems in Graphs and its Related Area” by Manonmaniam Sundaranar University on 27.09.2019. The research was carried out under the guidance of Dr. A. Nagarajan, Associate Professor, PG and Research Department of Mathematics.

- V. Ramalakshmi has been awarded Ph.D. in Mathematics for her thesis titled “An Investigation Into The Application of Wavelets for Compression, Denoising and Copyright Protection of Audio and Video Signals” by Manonmaniam Sundaranar University on 04.10.2019. The research was carried out under the guidance & Co-guidance of Dr. T. Balasubramanian, Associate Professor of Mathematics, Kamaraj College, & Dr. A. Nagarajan, PG and Research Department of Mathematics, V.O.Chidambaram College, Thoothukudi.

- S. Thilaga Leelavathi has been awarded Ph.D. in Mathematics for her thesis titled “Contribution to Generalized Sets in Topological Spaces and in Bitopological Spaces” by Manonmaniam Sundaranar University on 10.10.2019. The research was carried out under the guidance of Dr. M. Mariasingam, Head and Associate Professor(Rtd), PG and Research Department of Mathematics.

- Mrs. R. Krishnaveni has been awarded Ph.D. in Mathematics for her thesis titled “Contributions to a New class of nearly Open Sets in Topological Spaces” by Manonmaniam Sundaranar University on 22.11.2019. The research was carried out under the guidance of Dr.S.Pious Missier, Associate Professor, PG and Research Department of Mathematics.

### Faculty Participation in Seminars and Conferences

1. Dr. A. Nagarajan participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.

2. Dr. R.Balakrishnan participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.

3. Dr. A. Nagarajan participated in the International Conference on “Values and Spirituality for Overcoming Challenges” organized by Rajyoga Education and Research Foundation(Education Wing), Brahma Kumaris, Mount Abu on June 8th and 9th, 2019 at Shastri Hall. Administrative Building, Annamalai University, Annamali Nagar, Tamil Nadu.

4. Dr. C. Deva Manoharan participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
5. Dr. L.Meenakshi Sundaram participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
6. Dr. S.Jackson participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
7. Dr. P.Mariappan participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
8. Dr. L.Pandiselvi participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
9. Prof. V. Brishni participated in the seminar on “The Role of Faculty in Institutional Development” organized by Internal Quality Assurance Cell (IQAC) held at V.O.Chidambaram College, Thoothukudi on 17th August, 2019.
10. Dr. L. Pandiselvi participated in the two days International Workshop on “Writing Quality Research Papers – Publishing in Scopus and Care Approved Journals” held on 19th and 20th July, 2019 in the Department of Commerce, Manonmaniam Sundaranar University, Tirunelveli.
11. Prof. V. Brishni participated in the two days International Workshop on “Writing Quality Research Papers – Publishing in Scopus and Care Approved Journals” held on 19th and 20th July, 2019 in the Department of Commerce, Manonmaniam Sundaranar University, Tirunelveli.
12. Dr.A.Nagarajan delivered a lecture on “Motivational Talk on Becoming a Research Fellow” in the PG and Research Department of Mathematics A.P.C. Mahalaxmi College for Women , Thoothukudi, on 9th Aug 2019
13. Dr.A.Nagarajan inaugurated & delivered a lecture on “Graphoidal Covers” in the PG Mathematics Association Inaugural function of PG and Research Department of Mathematics Aditanar College of Arts and Science, Thoothukudi, held on 19th July 2019.

14. Dr.A.Nagarajan delivered a lecture on "Contribution of Euler towards Mathematics" in the Association Meeting of PG and Research Department of Mathematics , G.Venkataswamy Naidu College,Kovilpatti , on 22nd Aug 2019.

### Department Events

- S.S.Pillai Annual Endowment Research oriented lecture was organized by PG and Research Department of Mathematics, 27th Sep 2019. Dr.K.Nagarajan,Professor, Department of Mathematics, Kalasalingam University, Srivilliputhur delivered a lecture on "Happy Numbers" held at Golden Jubilee hall ,V.O.Chidambaram College. Also E-Magazine of our Mathematics Department called "MATH- MYST" released by Dr.C.Veerabahu, Our Principal.

- S.S.Pillai Annual Endowment Research oriented lecture was organized by PG and Research Department of Mathematics, on 10th Oct 2019 and Dr.M.Marudai, Honorary Professor, Department of Mathematics, Bharathidasan University,Trichy ,delivered a lecture on "Problems Solving Technique in Real Analysis" held at TPM hall ,V.O.Chidambaram College .

- National Mathematics Day was celebrated by Department of Mathematics and organized by PG and Research Department of Mathematics, held at Golden Jubilee hall ,V.O.Chidambaram College. Also Dr.A.Nagarajan delivered

a lecture on "Srinivasan Ramanujan's life History and his Contribution on Mathematics" held at Golden Jubilee hall ,V.O.Chidambaram College.

- S.S.Pillai Annual Endowment Research oriented lecture was organized by PG and Research Department of Mathematics, on 11th February 2020 and Dr.A.Nagarajan, Head and Associate Professor, delivered a lecture on "Motivation for Research in Graph Theory" held at TPM hall ,V.O.Chidambaram College.

One day State Level Seminar on Labelling Problems in Graphs organized by PG and Research Department of Mathematics

### Students Participation in Competition:

- S.Muthu Maheswari ,III B.Sc Mathematics participated in the "Fusion Dance" competition of ACFEST 2019 on 27th sep 2019 and she won 2nd prize and it was organized Annammal college of education for women ,Thoothukudi.

- S.Roshini ,III B.Sc Mathematics participated in the "Fusion Dance" competition of ACFEST 2019 on 27th sep 2019 and she won 2nd prize and it was organized Annammal college of education for women ,Thoothukudi.

- S.Muthu Maheswari ,III B.Sc Mathematics participated in the "Western Dance" competition of APCian Fiesta 2019 on 21st sep 2019 and she won 1st prize and it was organized by A.P.C. Mahalaxmi College for Women ,Thoothukudi.

- S. Roshini, III B.Sc Mathematics participated in the “Western Dance” competition of APCian Fiesta 2019 on 21st sep 2019 and she won 1st prize and it was organized by A.P.C. Mahalaxmi College for Women ,Thoothukudi.
- S.Muthu Maheswari , III B.Sc Mathematics participated in the “Best out of Waste” competition of APCian Fiesta 2019 on 21st sep 2019 and she won 2nd prize and it was organized by A.P.C. Mahalaxmi College for Women ,Thoothukudi.
- S.Muthu Maheswari , III B.Sc Mathematics participated in the “Movie Spoof” competition of APCian Fiesta 2019 on 21st sep 2019 and she won 1st prize and it was organized by A.P.C. Mahalaxmi College for Women ,Thoothukudi.
- Kanaga Rathinam , III B.Sc Mathematics participated in the “Verse Writing” competition for “International Day Against Drug Abuse and Illicit Trafficking” on 26th jun 2019 and she won 1st prize by Tamilnadu Police at Thoothukudi.
- S.Buvaneswari , III B.Sc Mathematics participated in the “Classical Dance” competition of SMAC- Cultural Fest 2019 on 8th Dec 2019 and she won 3rd prize and it was organized by Spic Nourishing growth, Southern Petrochemical Industries Corporation Ltd, Spic Nagar ,Thoothukudi.
- A.Ashika , II B.Sc Mathematics participated in the “Ball Badminton” tournament held at Sri Parasakthi College for women from 19.09.2019 to 21.09.2019 and secured Fourth Position.

