SUBHARAM GOVT.DEGREE COLLEGE

PUNGANUR

Department of Mathematics

Student Study Project

S. No	Year	Name of the Student	Program	Name of the Mentor	Project Title
1	2020-21	B. Naveen S. Arshad T. Gowtham	III B Sc VI Sem	Kum V. Shilpa	Life History of a Mathematicians
2	2021-22	M. Siva Raju P. Ganesh G. Mohan Kumar B. Charan Kumar A. Bhanu Prakash	III B Sc VI Sem	C. Pavithra	Number Systems
3	2022-23	C. Aswini C. Sowmya M. Maiyarasan P. Muniraja S. Damodara	III B Sc V Sem	C. Pavithra	Applications of Group Theory
4	2023-24	D. Teja N. Mamatha N. Bargavi K. Chandana B. Vishnu Sree	III B Sc V Sem	C. Pavithra	3- Dimensional Geometry

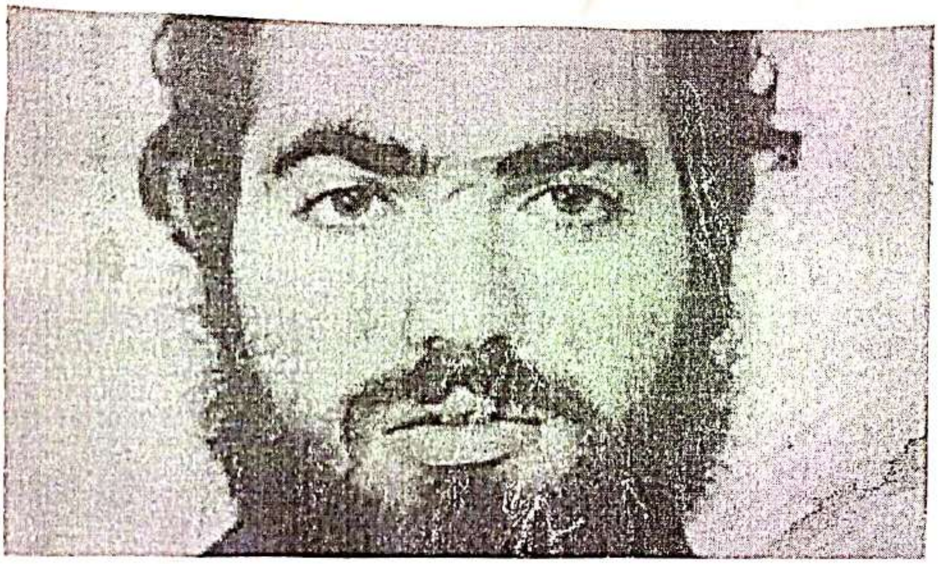
John Horton Conway

The Liverpudlian is best known for the Serious maths that has come from his analyses of games & puzzles. In 1970, he came up with the rules for the Game of Life, a game in which you see how patterns of cells evolve in a grid. Early computer scientists adored playing Life, earning Conway star status. He has made important contributions to many branches of pure maths, such as group theory, number theory & geometry &, with collaborators, has also come up with wonderful-sounding concepts like surreal numbers, the grand antiprism & monstrous moonshine.

Terry Tao (b1975)

An Australian of chinese heritage who lives in the US, Tao also won (and accepted) the fields Medal in 2006. Together with Ben green, he proved an amazing result about prime numbers -- that you can find Sequences of primes of any length in which every number in the sequence is a fixed distance apart. For example, the sequnce 3, 7, 11 has three primes spaced 4 apart. The Sequence 11, 17, 23, 29 has four primes that are 6 apart. While sequences like this of any length exist, no one has found one of more than 25 primes, Since the primes by then are more then 18 digits along

Grigori Perelman (b1966)



Perelman was awarded \$ 1m last month for provqng one of the most famous open quustion in maths, the poincare conjecture. But Russian recluse has refused to accept the cash. He had already turned down maths most prestigious honour, the Fields Medal in 2006. "If the proof is discovery that some infinities were larger than others. The result was mind-blowing unfortunately he suffered mental breakdowns & frequently hospitalised. He also became fixated on proving that the works of Shakespeare were in fact written by Francis Bacon.

NUMBERS

a) **natural numbers**:- The numbers we use for counting are called Natural Numbers, i.e., 1, 2, 3, 4, 5 ---- are called natural (or) counting Numbers.

$\therefore N = \{1, 2, 3, 4, 5 -----\}$

Zero (0) is not in the set of Natural Numbers.

1. **Even Numbers**:- The numbers which are exactly divisible by 2 are called even numbers.

eg:- 2, 4, 6, 8 ------

2. **odd Numbers**:- The number which are not exactly divisible by '2' are called odd Numbers.

eg:- 1, 3, 5, 7, 9 -------

3. The sum or difference of any two even numbers is an even number.

4. If $E = \{2, 4, 6, 8 ----\}$ set of even number, and

$O = \{1, 3, 5, 7 -----\}$ set of odd number then

$N = E \cup O$.

5. The general form of an even number is $2n$, $(n \in N)$

6. The general from of an odd Number is $2n+1$ $(n \in N)$.

7. The product of two odd numbers is an odd number.

i.e., ex: $3 \times 5 = 15$ odd Number. $9 \times 3 = 27$ odd Number.

8. The sum of any two odd numbers is an even number.

9. The sum of an even number and an odd number is odd.

ex:- $6 + 5 = 11$.

10. The difference of an even number and odd number is odd

ex:- $8 - 5 = 3$.

factors (divisors) multiples:-

11. Factors def (1):- A natural number which divides a given number exactly (with remainder zero) is called a factor of the given number. A factor is also called a divisor.

ex:- 1, 3, 5, 15 divides 15 exactly.

∴ the factors (divisors) of 15 are 1, 3, 5, 15.

(or)

12. factor : def (2):- If 'b' divides 'a' leaving zero remainder then the 'b' is called a factor (or) divisor of 'a' and is called a multiple of 'b'.

Notation:- If 'a' is a divisible by 'b' we write b/a read it as 'b' divides 'a' (or) 'a' is divisible by 'b'.

ex:- 6/24 means 6 is factor of 24.

6 is divisor of 24.

6 is a multiple of 24.

13. Multiple :- The products we get when a number is multiplied by the numbers 1,2,3---- are called the multiples of the given number.

ex:- (1) The multiples of 6 are 6, 12, 18, 24 ----- etc.

(2) The multiples of 5 are 5, 10, 15, 20 ----- etc.

14. A mutiple of a number is exactly divisible by the number.

B. WHOLE NUMBERS (W)

Whole Numbers (W) :- when all the Natural numbers and zero put together, we get a new set called the set of whole numbers, denoted by W.

$W = \{N\} \cup \{0\}$

$W = \{0, 1, 2, 3, 4 -----\}$

C. INTEGERS (Z)

1. Integers (Z) :- The set containing the positive numbers, the negative numbers, together with zero is called the set of integers.

$\therefore Z = \{----, -3, -2, -1, 0, 1, 2, 3 ----\}$

$Z = \{0, \pm 1, \pm 2, \pm 3, ----\}$

Applications of group theory

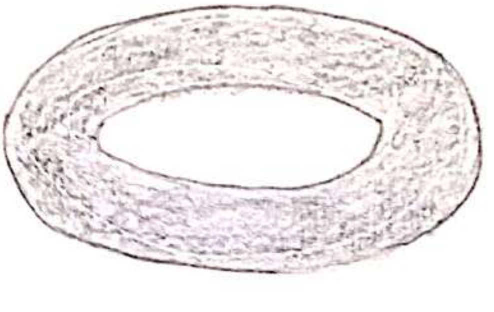
Applications of group theory abound. Allmost all structures in abstract algebra are special cases of groups.

Rings. for example. canbe viewed as abelian groups. (Corresponding to addition) together with a second operation (corresponding to multiplication). Therefore group theoretic arguments underline large parts of the theory of those entities.

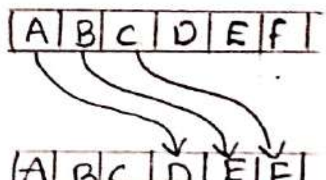
Galois theory uses groups to describe the symmetries of the roots of a polynomial. (or more precisely the automorphism of the algebras generated by these roots). The fundamental theorem of Galois theory provides a link between algebraic field extensions and group theory. It gives an effective criterion for the solvability of polynomial equations in terms of the solvablity of the corresponding Galios group. for example, S_5, the symmetric group in 5 elements. is not solvable which implies that the general quintic equation cannot be solved by radicals in the way equations of lowerdegree can. The theory, being one of the historical roots of group theory. is still faithfully applied to yield new results in areas such as class field theory.

Algebraic topology is another domain which prominently associates groups to the objects the theory is interested in. There, groups are used to describe certain invariants of topological spaces. They are called "invariants".

because they are defined in such a way that they do not change if they space is subjected to some deformation. for Example, the fundamental group "counts" how many paths in the space are essentially different. The poincare conjecture. proved in 2002/2003 by Grigori Paralman is a prominent application of this idea. The influence is not unidirectional, through, for example, algebric topology makes use of Eilenberg machane spaces which are spaces with prescribed homotopy makes use of Elinberg. simillarly algebric k-theory stakes in a crucial way on classifying spaces of groups. finally, the name of the torsion subgroup of an infinite group shows the legacy of topology in group theory.



A torus. Its abelian group structure is induceed from the map $c \longrightarrow c/z + \tau Z$. where τ is a parameter



The cyclic group Z_{26} underlies caesar's cipher. Algebric geometry and cryptography likewise uses group theory in many ways. Abelian varieties have been introduced above. The presence of the group operation yields additinad information which makes these varieties particularly accessible. They also often serve as a test for new conjectures.

Algebric number theory is a special case of group theory, there by following the rules of the latter. for Example, Euler's product formula

$$\sum_{n\geq 1} \frac{1}{n^8} = \prod_{p \text{ prime}} \frac{1}{1-p^{-8}}$$

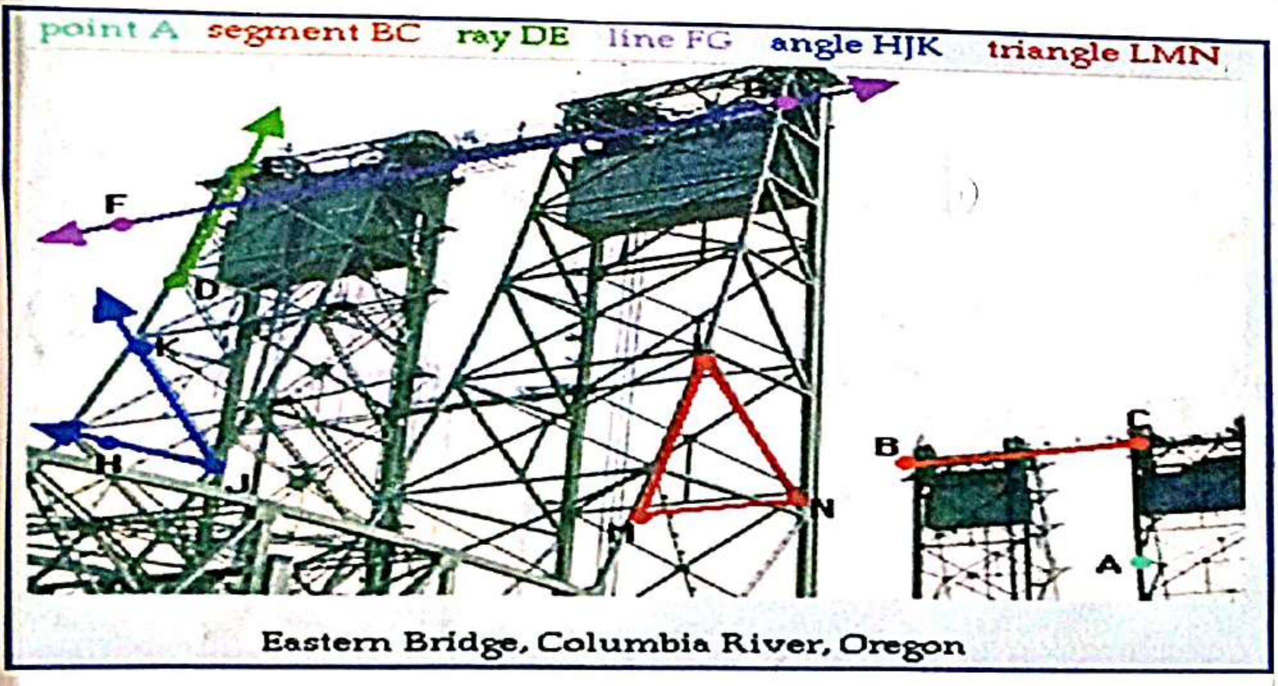
captures the fact that any integer decomposes in a unique way into primes. The failure of this statement for more general rings gives rise to class group and regular primes, which feature in kummer's treatment of Fermat's Last Theorem

- The concept of the Lie group (named after mathmatician sophus Lie) is important in the study of differential Equations and manifolds: they describe the symmetries of continuous geometric and analytical structures. Analysis on these and other groups is called harmonic analysis. Haar measures, that is integrals invariant under the translation in a Lie group, are used for pattern recognition and other image processing techniques.

Geometry, Nature & Architecture.

All of nature evolves out of simple geometric patterns incorporated within the molecular "seed" structure. Each of these basic patterns contains information that enables animals, plants, minerals to develop into complex and beautiful forms, each with an intrinsic awareness of its location in space and time. Being part of nature, we have a relationship with it at the cellular level which is experienced vibrationally, and which is nurturing. When these seed patterns are incorporated into our architecture, a vibrational exchange takes place between the building and its occupants in a way that is similar to the connection we have with nature, and which leads to a sense of well being.

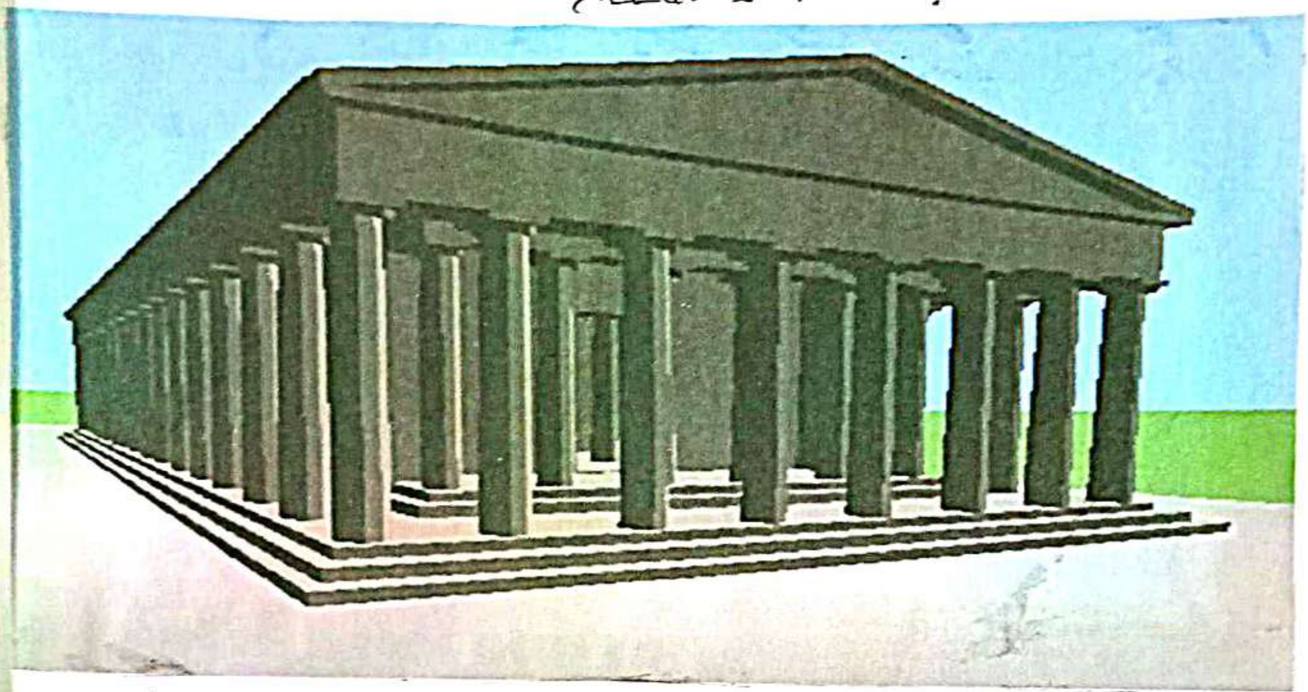
Can you find Geometric shapes in Buildings and Structures?



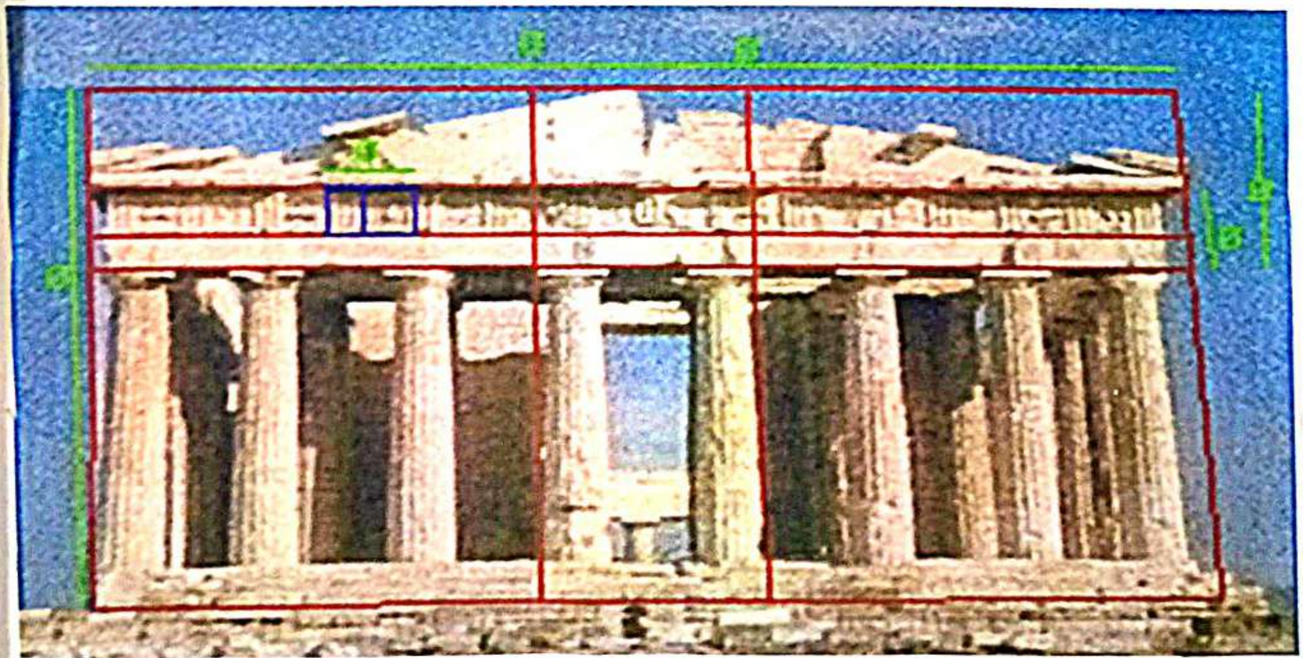
Eastern Bridge, Columbia River, Oregon

In this example, six basic elements of geometry (point, segment, ray, line, angle, and triangle) have been identified within the bridge.

How many three-dimensional shapes (cube, tetrahedron, cylinder, etc.) can you find in this computer graphic of the parthenon? Can you find the "Golden sections" within?

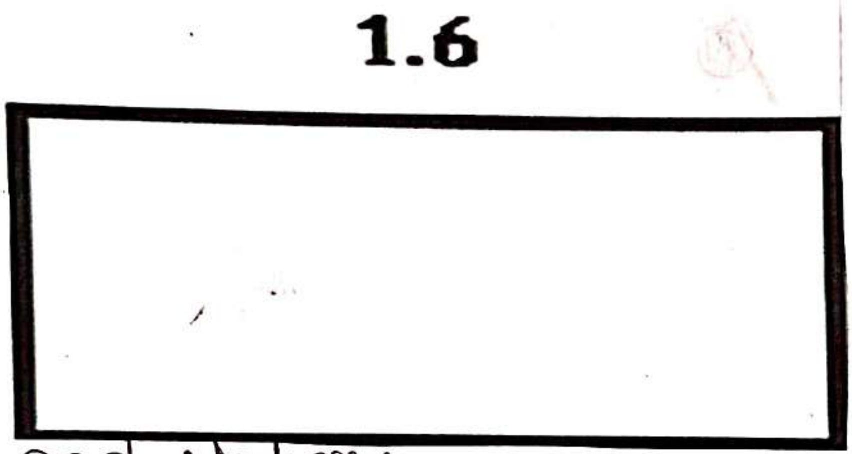


The Golden Section



The Golden section refers to rectangles that have a ratio of 1:1.6. This means that if the width of a rectangle is 1 foot long, the length will be 1.6 feet long. (The number 1.6 is sometimes referred to as "phi", and it looks like the letter O with a line through it (Ø).

The Golden Section (or Golden Ratio or Golden Mean or Golden Rectangle) appears in a lot of ancient Greek architecture and has been analyzed extensively by the famous mathematician Fibonacci. The ratio of 1:1.6 is said to be "pleasing to the eye."



Geometry and Nature:-

In the world of natural phenomena, it is the underlying patterns of geometric form, proportion and associated wave frequencies that give rise to all perceptions and identifications. There in lies our fundamental capacity to relate, to interpret and to know. Most of the interpretations are of a graphic nature.