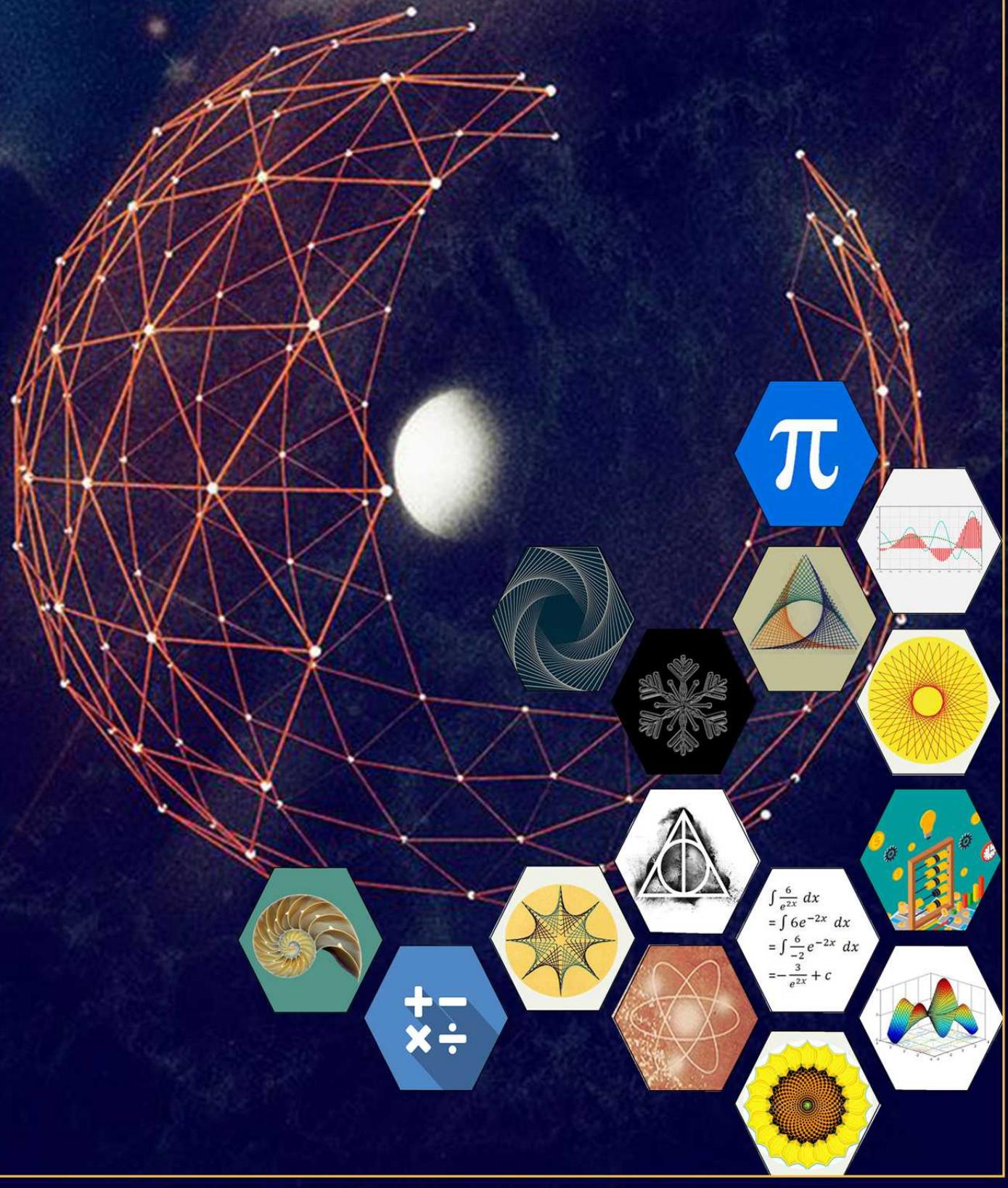
Mathologic

2018



From the Principal's desk

I am delighted to know that department of Mathematics is releasing the first issue of their magazine "Mathologic". We, at Gargi emphasize on the acquisition of knowledge, useful skills ,critical thinking and problem solving abilities and believe that every student is unique and special. As educators we are committed to nurture and develop every student to her maximum potential in a caring environment. The primary objective is to encourage students to think and write critically about relevant issues. Departmental periodicals are one such endeavour in this direction.

The department of Mathematics has been performing remarkably well in both academics as well as extra curricular activities. The department has played a vital role in organizing Scintillation 2018,the annual science festival ,successfully. Such endeavours empower our students with a strong sense of responsibility and wellbeing.

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

–Dr. Promila Kumar

Faculty advisor's Message

The Mathematics Association, "Mathema" is delighted to release its first issue of "Mathologic" during the golden jubilee year of Gargi College.

At a time when the world is going through a massive disruption brought on by data analytics, artificial intelligence, robotics and the internet-of- things, Mathematics is playing an important role in providing a logic and rationale to these developments. Hence, we chose "Mathologic" as the name of this magazine.

The team has worked enthusiastically to make this publication a reality over a short period of time. Through this issue, we also recognize the efforts of all those who have supported us on this project from different "angles". Our Principal, Dr. Promila Kumar has been a continuous inspiration for the team.

As Mathematics is the backbone of most disciplines, we hope for active participation from all groups of students in our annual publication. The magazine would be an ideal platform for them to express their creativity, analytical skills, knowledge and understanding on diverse topics in the domain of Mathematics.

We look forward to your suggestions to help in strengthening our future publications.

Happy Reading!!

-Ms. Arshmeet Kaur

Editor's Angle

A thought that becomes real is truly an interesting and exciting experience. This newsletter was one such thought, which due to the constant support of our teachers and fellow students, has developed into print reality. Our very first newsletter would be a snapshot of the various activities and advancements throughout the year, in academic and co-curricular fields. These are not only memories to cherish, but also a load of amazing experiences from organizing events to performing in them. A glimpse of Maths fest and Scintillations'18 would take all Gargians down the memory lane, giving a chance to relive them again.

We hope you would enjoy reading this edition and solving the fun crossword as well.

Wish you all best luck!

-Arnima Chauhan

Our Faculty

- Dr. Promila Kumar
- Ms. Arshmeet Kaur
- Ms. Bhawna Kapoor
- Ms. Bharti Talwar
- Ms. Pooja Gupta
- Mr. Narender Kumar
- Mr. Ramakant Prasad
- Ms. Sapna Malhotra
- Ms Megha Bansal
- Ms. Manpreet Kaur
- Ms. Anshika Agrawal
- Mr. Vidya Sagar
- Ms. Bharti Sharma
- Ms. Deepika Dhall
- Ms. Mukta Garg

The Union

Faculty Advisors: Ms. Arshmeet Kaur
Ms. Bhawna Kapoor
President: Tanya Agrawal
Vice President: Arnima Chauhan
Gen. Secretary: Mahima Yadav
Treasurer: Tanya Kalra
Proctor: Anjalika Dubey, Nikita Hans
I.T. Co-Ordinator: Sadhvi Mehra, Mohini
Creative Head: Tanisha Negi

The Golden Ratio and it's significance

The golden ratio, also known as the golden proportion, golden mean, golden section, golden number, and divine proportion is the division of a given unit of length into two parts such that the ratio of the shorter to the longer equals the ratio of the longer part to the whole or, when a line is divided such that the ratio of the longer part of the line to the whole is exactly the same ratio as the shorter part of the line is to the longer part.

Figure 1: A line segment AC is divided in the golden section point B

$$\Phi = \frac{p}{q} = \frac{p+q}{p} = 1.618033988749895 \text{ (approx)}$$

It is a number often encountered when taking the ratios of distances in simple geometric figures, such as the pentagon, pentagram, decagon and dodecahedron. It is a ratio or proportion defined by the number Φ = 1.618033988749895... It is an irrational number, meaning it is a number that cannot be written as a simple fraction - the decimal goes on forever without repeating. Phi, like Pi, is a ratio defined by a geometric construction.

A rectangle is called a golden rectangle if the ratio of the sides of the rectangle is equal to Φ , like the one shown below.

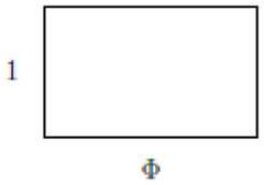


Figure 2: Golden Rectangle

The front of the Parthenon can be comfortably framed with a Golden Rectangle. Additional classic subdivisions of the rectangle align perfectly with major architectural features of the structure.

The Golden Rectangle can be used to create a spiral, the Golden Spiral. Starting with one Golden Rectangle, a second Golden Rectangle can be attached to the first using the longest side of the rectangle, side A as the shortest side B of the next rectangle. To this end the second rectangle is constructed 90 degrees perpendicular to the first rectangle. If this process is continued, called the spiraling of the Golden Rectangle, a curved line can be drawn through the corners of the rectangles creating the Golden Mean spiral. The spiraling of the Golden Mean spiral continues indefinitely in inward and outward directions, getting smaller and smaller spiraling inwards and getting bigger and bigger spiraling outwards.

The Golden Ratio and it's significance

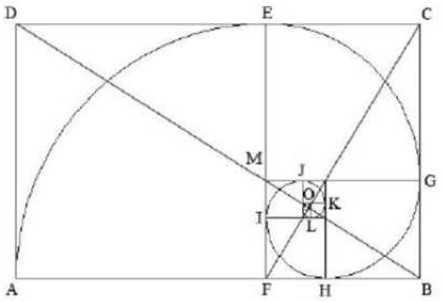


Figure 3: Golden rectangle ABCD and golden spiral AEGHIJKLO

Another connection of the Golden Ratio to partial symmetries in nature is through the Fibonacci Numbers. This is a number series where each member is simply the sum of the previous two numbers. Fibonacci spirals and Golden Mean ratios appear everywhere in the universe. The spiral is the natural flow form of water when it is going down the drain. It is also the natural flow form of air in tornadoes and hurricanes.

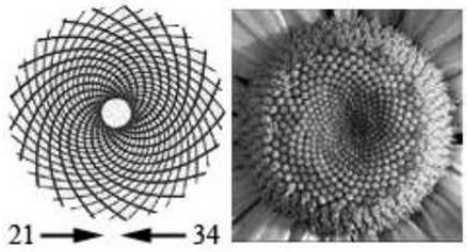


Figure 4: Spiral arrangement of the seed florets of a Sunflower

The relationship of golden section is also observed on the design of the human body shape and structure.

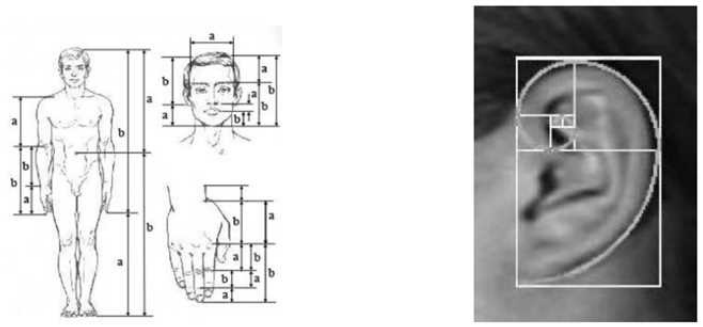


Figure 5: Golden Proportion on Human body parts

-Shivanshi Mishra
1st Year

Mathematical Connections

I have always been mesmerized by the connection of mathematics with disciplines such as science, computer, art, music etc. and with the real world.

Mathematics in Physics

Mathematics is the backbone of physics. There are so many applications of mathematics in physics. For example - With the perfection in conversion between exponential, factor and standard form, we can apply this knowledge to find out the distance between the sun and each planet using scientific notation.
We can use differential equations to find velocity, acceleration and can solve a variety of problems.

Mathematics in Chemistry

Although chemistry is full of reactions, elements and compounds, there is also a major role of differential equations to measure the half –life of certain radioactive elements or the size of bacteria and viruses. To measure the rate of change in freezing point, boiling point, melting point and many more, mathematics proves to be useful once again.
We can use Matrix : Gauss-Jordan method and also other methods to balance chemical equations.

Mathematics in Biology

A sub-field of biological science is the field of biostatistics, a field in which statistics are used to describe and explain life sciences. The purpose of statistical analysis is to find correlations between variables against each other. Mathematical models are also used to investigate situations that are not amenable to experiments.

Mathematics in Music

From the vibrations in the strings and the harmony they create to the digitized music we listen to ,mathematics is abundantly used in music. For example, in the tone system the frequencies of two notes that have an octave difference bear the ratio 1:2. Thus, if the frequency of Shadja (the tonic note) in the middle octave is equal to n vibrations per second, then frequency of the higher Shadja would be 2n, that of the next higher would be 4n and so on. Thus the frequency relationships of the octaves proceed in geometrical progression as, 1, 2, 4, 8, 16 and so on.
Pythagoras used numerical terms to express intervals between notes and derived musical tones from geometrical patterns.

Mathematics in Arts

Mathematics and Art have a long historical relationship. Artist have used mathematics since the fourth century. Persistent popular claims have been made for the use of Golden Ratio in ancient art and architecture. Da Vinci made use of the idea of the golden ratio in some of his paintings and drawings like the Last Supper and the Mona Lisa.

He used the mathematical principles of linear perspective in his works. The three elements needed for linear perspective are parallel lines, the horizon line, and a vanishing point. He was able to make it seem as if objects were farther away from the viewer and was able to create the illusion of depth on a flat surface such as a painting or a drawing.

Mathematics in Computer Science

Computer programmes, applications, software and different languages without mathematics are impossible to operate and follow.Computer sciences heavily rely on algorithms, which relies heavily on mathematics. 'Theoretical computer science' strongly involves discrete mathematics. Discrete mathematics is basically the study of mathematical structures that are discrete rather than continuous, and so this 'theoretical' branch of computer sciences involves a lot of mathematics, in the form of graphs, algorithms, computational geometry, quantum computation, algebra and computational number theory.

Mathematics in Economics

Mathematics is an integral part of economics. Economists use mathematical models to predict everything from demand for a good to the unemployment rate to whether or not an individual will get married. These models are typically designed as functions. For example, demand for a good is a function of the price of the good, the price of substitute goods, and income. Because of the extensive use of functions in economics, linear algebra and calculus are the primary mathematical tools used by economists. In addition, economists use statistics to test those models. In fact, there is an entire field within economics called "econometrics" which deals exclusively with the statistics related to economics.

Mathematics has become an integral part of our day to day life as it makes our life orderly. Certain qualities that are nurtured by mathematics are power of reasoning, creativity and problem-solving ability. It is the cradle of all creations without which the world cannot move an inch. Be it a cook, farmer, carpenter, mechanic, shopkeeper, doctor etc... There are countless examples of mathematical patterns in nature's fabric. Anyone can be a mathematician if one is given proper training and guidance in the formative period of one's life.

-Mansi Verma
1st year

Big Data

-Turning information overload into big sales.

When you browse online for a new pair of shoes, pick a movie to stream on Netflix or apply for a car loan, an algorithm likely has its word to say on the outcome.

Analyzing large account of data, streaming data and unstructured data are the typical characteristics of BIG DATA, all of which have their roots connected to Mathematics and Statistics.

The complex mathematical formulas are playing a growing role in all walks of life-from detecting skin cancer to suggesting new online friends, who gets insurance at what rate, who is a lemon in the second hand car market, or how police resources are deployed. These are being used to write news articles from raw data, while Donald Trump's presidential campaign was helped by behavioral marketers who used a mathematical algorithm to locate the highest concentrations of voters. Companies have been making sense out of data from a group of business analysts, data analysts, statisticians, business consultants, technologists and business subject matter experts, to collectively solve problems and provide solutions.

Such use of data by converting it into mathematical algorithms is useful in certain contexts such as helping medical professionals diagnose a variety of diseases. For datasets of copious amount of data collected, using algorithms is the only way to operate for tasks. Bank approvals, job matches and more all run on similar principles- "The algorithm is the god from the machine powering them all".

From all of the above examples, the importance of mathematics and the algorithms generated from it have no bound in their multi-uses. Hence, it is righteously said by Mike Hockney- "Perfection resides in only one place: the God Equation. Mathematics, not God, is eternal perfection".

-Arnima Chauhan
2nd year

The Famous Number 1729

One of the greatest mathematician Srinivasa Ramanujan was born on 22nd December 1887 in a small village of Madras. His dedication towards Mathematics was commendable. He had no proper training in Pure Mathematics but his efforts were unstoppable and he continued his self study. He initially developed his own mathematical research in isolation and it was quickly recognized by Indian Mathematicians.

He sent a set of 120 theorems to professor Hardy of Cambridge because of which he was invited to England. During his short life, Ramanujan showed that any big number can be written as sum of not more than four prime numbers. Also, he discovered how to divide a number into two or more squares or cubes. Ramanujan's work primarily involved fields less known even amongst other pure mathematicians.

The number 1729 is known as the Hardy–Ramanujan number after a famous visit by Hardy to see Ramanujan at a hospital in a taxi number 1729. Ramanujan said that 1729 is the smallest number which can be written in the form of sum of cubes of two numbers in two ways. Those two different ways are:

$1729 = 1^3 + 12^3 = 9^3 + 10^3$.

Generalizations of this idea have created the notion of taxicab numbers.

Srinivasa Ramanujan was discovered by the Cambridge mathematician Hardy, whose great mathematical findings were beginning to be appreciated from 1915 to 1919. His achievements were to be fully understood much later, well after his untimely death in 1920. G.H. Hardy said that Ramanujan's discoveries are unusually rich and that there is often more to them than initially meets the eye. As a byproduct of his work, new directions of research were opened up.

-Nidhi Saran
2nd Year

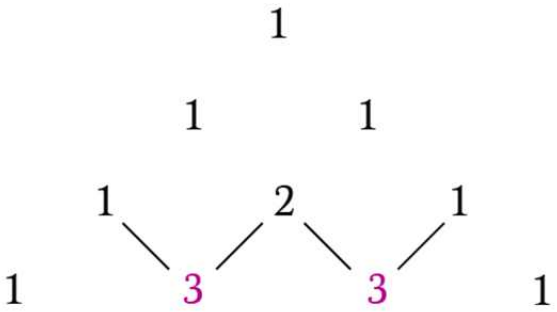
Pascal's Triangle

First 6 rows of Pascal's triangles

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

The Pascal's triangle ,also known as 'The staircase of Mount Meru' in India, 'Khayyan triangle' in Iran and 'Yang Hui's Triangle' in China may look like just a stack of numbers but is actually a mathematical treasure trove.

To build a Pascal's triangle start with 1 at the top imagining two invisible 0s on both its sides. Add them together to generate the next row and do this again and again to form a triangle.



Each row corresponds to what's called the coefficients of the binomial expansion $(x+y)^n$.

For example the coefficients of $(x+y)^2=1*x^2+2*x*y+1.y^2$ are same as the numbers in the third row of the triangle. On adding the numbers of each row ,we get powers of base

1

1 + 1 = 2

1 + 2 + 1 = 4

1 + 3 + 3 + 1 = 8

1 + 4 + 6 + 4 + 1 = 16

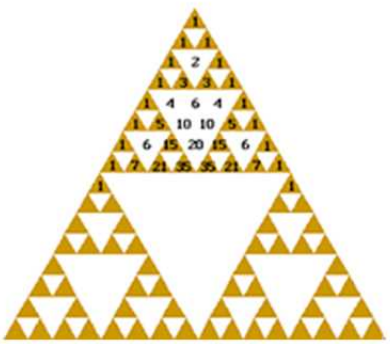
1 + 5 + 10 + 10 + 5 + 1 = 32

1 + 6 + 15 + 20 + 15 + 6 + 1 = 64

2.The diagonals of the triangle have geometric applications.

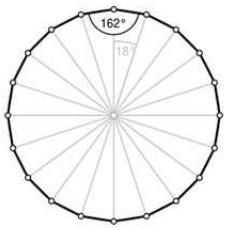
The first diagonal is composed of all 1's.The second diagonal is composed of all positive integers or the natural numbers. The third of diagonal is composed of numbers which are called triangular numbers, because if we take that many dots, we can stack them into equilateral triangles. The fourth diagonal has the tetrahedral numbers ,because we can stack that many spheres into regular tetrahedrals.

If we shade all the odd numbers , we will get the Sierpinski's triangle ,which is usedin probability and calculations in the domain of combinations.



-Divya Khurana
1st Year

Facts



Icosagon

1. Among all the shapes with the same perimeter a circle has the largest area.

2. An “icosagon” is a shape with 20 sides.

3. The largest known prime number is e277,232,917− 1, a number with 23,249,425 digits.

4. Notches (cuts or indentation) on animal bones prove that humans have been doing mathematics since around 30,000 BC.

5. Different names for the number 0 include zero, nought, naught, nil, zilch and zip.

6. Zero is the only number which cannot be represented by roman numerals.

7. The name “zero” derives from the Arabic word “sifr” which also gave us the english word “cipher” meaning a secret way of writing.

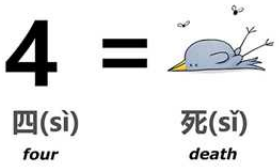
8. The “=” sign was invented by 16th century Welsh mathematician Robert Recorde, who was fed up with writing “is equal to” in his equations.

Googol

9. Googol (meaning and origin of google) is the term used for a number 1 followed by 100 zeros and that it was used by a nine year old, Milton Sirotta in 1940.

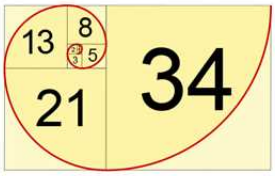
10. Plus (+) and minus (-) sign symbols were used as early as 1489 AD.

11. In working out mathematical equations, the Greek mathematician, Pythagoras used little rocks to represent numbers. Hence the name “calculus” was born which means pebbles in Greek.



12. In 1995 in Taipei, citizens were allowed to remove “4” from street numbers because it sounded like “death” in Chinese. Many Chinese hospitals do not have a fourth floor.

13. 40 when written “forty” is the only number with letters in alphabetical order, while “one” is the only one with letters in reverse order.



14. A “jiffy” is an actual unit of time for 1/100th of a second.

15. The spiral shapes of sunflowers follow a Fibonacci sequence.

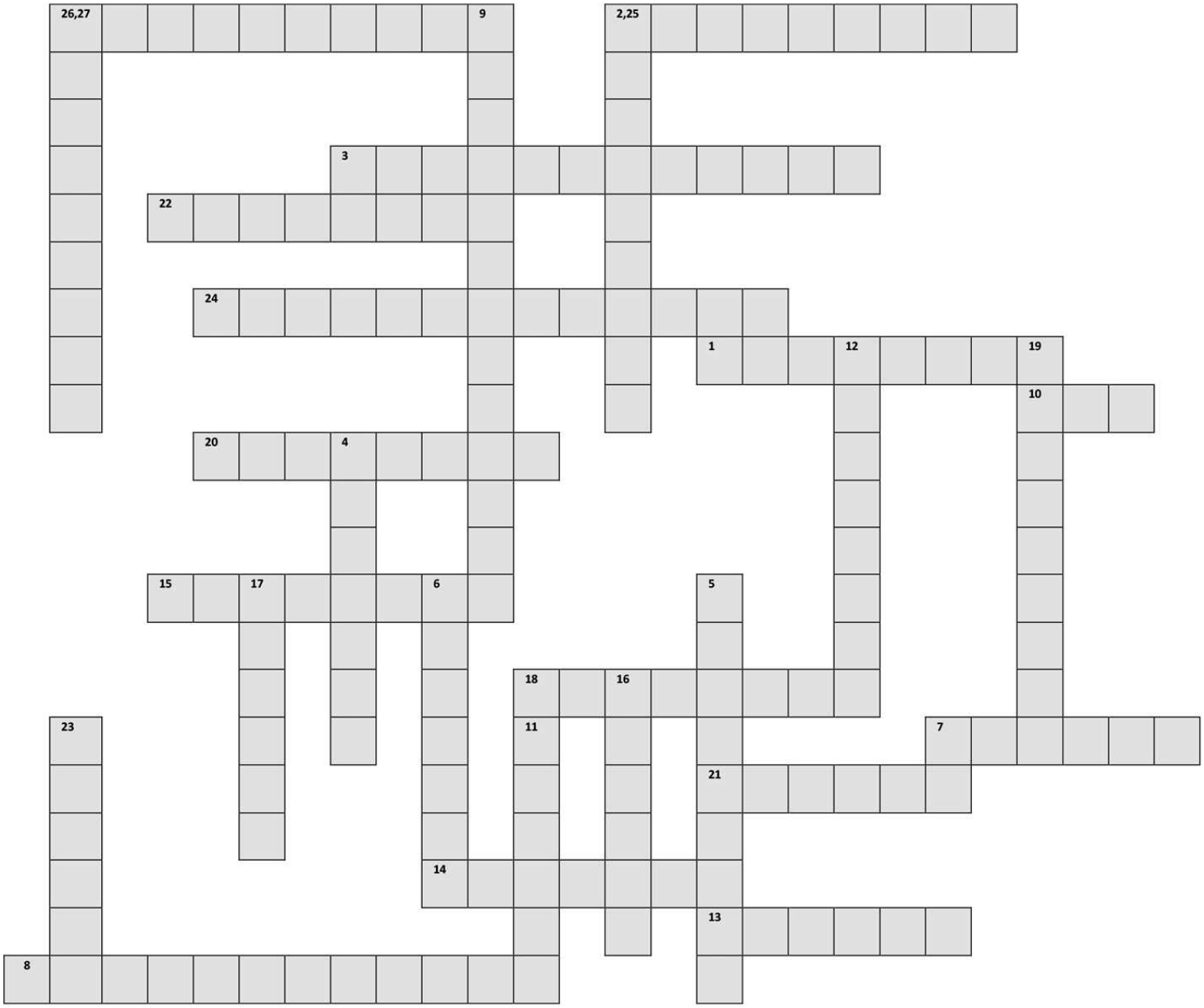
16. The fibonacci sequence is encoded in the number 1/89.

17. In NASA the radius and area of our observable universe was calculated accurate to the size of a hydrogen atom, by using pi, correct to just 15 places.

Source:

https:// www.careerindia.com/news/ 20-interesting-amazingfacts-aboutmaths-015921.html
https://www.buzzfeed.com/ kellyoakes/maths-factsyoull-probably-never-needto-use http:// pcmpedia.blogspot.com/ 2014/12/maths-facts.html

CROSSWORD



ACROSS:-

1) Angle that measures 180 degree.
3) Two lines that form a right angle where they intersect.
7) Collection of all inputs.
8) Where lines cross over at a common point.
12) Two angles which are next to each other.
14) A straight path that has a beginning and an ending.
15) When a figure is folded in half and 2 halves match perfectly.
18) The middle point.
20) Never ending
21) An angle that measures less than 90 degree and more than 0 degree.
22) Line that goes from straight up and down.
24) Two angles whose sum is 180.
25) The longest side of a right-angled triangle, opposite the right angle.
26) Circles, arcs, or other shapes which share the same centre.

DOWN:-

2) Line that runs from left to right.
4) Zero, a negative or a positive whole number.
5) Mathematics tool used for measuring or drawing angles.
6) Quadrilateral whose four sides have same length.
9) Two angles whose sum is 90 degree.
10) A straight line that has a beginning but no ending.
11) A point labeled zero.
16) A unit of measurement of angles.
17) A collection of numbers arranged into a fixed number of rows and columns.
19) Quadrilateral with one pair of side parallel.
23) The middle value in the list of numbers.
27) Lying on the same line.

ANSWERS:-

1) STRAIGHT
2) HORIZONTAL
3) PERPENDICULAR
4) INTEGER
5) PROTACTOR
6) RHOMBUS
7) DOMAIN
8) INTERSECTION
9) COMPLEMENTORY
10) RAY
11) ORIGIN
12) ADJACENT
13) OBTUSE
14) SENGMENT
15) SYMMETRY
16) DEGREE
17) MATRIX
18) MIDPOINT
19) TRAPEZIUM
20) INFINTY
21) ACUTE
22) VERTICAL
23) MEDIAN
24) SUPPLEMENTORY
25) HYPOTENUSE
26) CONCENTRIC
27) COLLINEAR.

-Himani Bhagat
2nd Year

Our Achievers

Namrata Mongia

B.Sc. (Hons.)
Mathematics , 2017
1st position- First Year
3rd position- DU South Campus
5th position- Delhi University

Mansi, Rabina, Sonika & Ritu

Matheletics
Gargi college
1st position
27th september 2017

Manishma

Sudoku Competition
Gargi college
1st position
27th september 2017

Shivanshi Mishra

Bharat Ram sports meet - Lady Shri Ram college - 3rd position - 25th feb 2018
Inter college archery tournament -Hansraj college - 7th position - 27th feb 2018

Nandini Dwivedi

Bharat Ram sports meet - Lady Shri Ram college - 3rd position (Archery – Indian round) and 3rd position (Archery – Recurve round) – 25th feb 2018
Intercollege Archery tournament - Hansraj college - 7th position - 27th feb 2018

Priti

NCC Run
1500 metres
Kirorimal college
2nd position
10th feb 2018

Smriti Magon

Poster Making competition
(Topic – Where revolution is leading us now?)
Gargi college
4th position


MATHEMATICS
Welcome