गणित कोश

Beauty of Mathematics in Nature

INCLUDES MATHORANJAN

From the Principal's Desk

DEAR STUDENTS,

I am deeply elated and appreciate your passionate and persisting efforts to make your club super active. These efforts are a pathway to hone your 21st-century skills and to make learning joyful.

My special appreciation goes to your fantastic team of Mentors who have provided you this platform in the most challenging times. Once again wishing you all to achieve many more milestones and try to keep challenging yourself to unleash new horizons.

WARMLY
DR. MANISHA SHARMA

Insights

I am exhilarated to release the new edition of 'गणित कोश', the quarterly magazine of ANANT, the Mathematics Club of VIS. This solemnizes the start of a journey that aims to banish the 'Mathphobia' and unravel a newfangled, convivial yet edifying world of Mathematics. Through this magazine, I intend to fabricate a conducive platform that is for everyone, by everyone, and of everyone. The club shall conduct activities pertaining specifically to the mathematical discipline; induce in the members, a spirit of learning, and teach them through active modes of learning. This magazine is an embodiment of our objectives, with disquisitions & discourse on disparate topics, centered on a distinct theme from the world of mathematics. The theme of this inaugural edition is 'Mathematics During The Scientific Revolution', a period not only significant for science but also a giant leap in the sphere of Mathematics. Wherever science sails, mathematics trails. This golden period saw the development of new methods in numerical calculations as a response to the of sudden increase in the practical demands numerical computation. All the branches of mathematics mushroomed, thanks to the efforts of those mathematicians who put in so much time and toil to nurture the growth of Mathematics, giving us the diverse and riveting mathematics that we know today. At last, I'd like to thank the School Management and Principal Ma'am for endowing us with this incredible opportunity to exhibit this embodiment of Mathematics and effectuate the milestones thus far. I'd also like to congratulate and express my profound gratitude to the Mathematics Department, the Founding Team, and fellow columnists without whose coordination & invaluable contributions this wouldn't have been achievable. I hope that you enjoy wading through the newsletter as much as the team did crafting this Math-sterpiece!

Ms. Mamta Rana
HOD, Maths

Foreword

The word '**ANANT**' encompasses the founding ideology of our club: to explore the infinitely vast field of mathematics and discover the innumerable possibilities, by using the infinite pool of talent and knowledge held by the students of Venkateshwar International School.
To make additions of triumph to the legacy of ANANT, we passionately enter with utmost enthusiasm into the session of 2024-25 under the leadership and vision of Dr. Manisha Sharma along with the entire team of mathematics mentors.
We intend to bridge the gap between the theory, understanding and application of this subject. Using this platform that has been built at ANANT, our objective is to develop curiosity to explore, deliberate and generate versatile ideas putting to rest all the intrigue engendered in extraordinary minds. The activities and articles of this magazine will encourage you all to rediscover the rich history of numbers and expand your horizons of mathematical knowledge. We wish the readers the best of luck in their quest for knowledge.

~TEAM ANANT

Prologue

“Wherever there is a number, there is beauty.” Mathematics isn’t a mere subject that is printed in school textbooks, or a hard exam we have to pass. It is so much more than that. It is a pure art, seen in every part of our surroundings. From the radiant sun rising in the east and setting in the sun, just as numbers pass from one end of the number line to the other as their values increase, to the asymmetrical grass lining our Earth; from the hills and slopes in villages to the cubical and cuboidal structures that tower over us and from the ellipses and circles in the phases of the moon to the simple shapes we cut out for a school project—Math is simply everywhere. It is the science and the study of quality and structure, of space and change.

Want to find out how much material you might need for a project? Or how to make optimal use of the space you have? Operations, measurements and proportions- these intricate beauties are weaved into the tapestry of math as well as nature.

Written by:
Riddhi Gupta (VIII-DD)

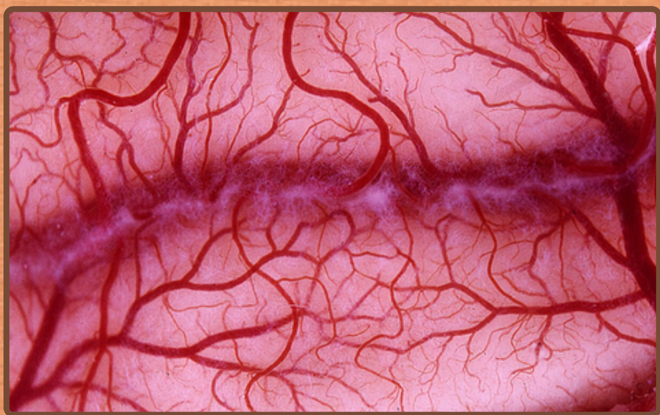
Fractals

A fractal is a never-ending pattern. They are infinitely complex patterns that are **self-similar across different scales**, created by repeating a simple process over and over in an ongoing feedback loop.

Driven by **recursion**, fractals are images of dynamic systems – the pictures of chaos. Also, they appear identical at every scale. No matter how much you zoom in, you continue to see the same pattern repeated over and over again.

Fractals are not merely mathematical curiosities, but they are everywhere in nature. The branching patterns seen in **rivers**, **trees**, and our **blood vessels** are examples of fractals. Fractals can even be observed in the **flight patterns of certain birds and insects**.

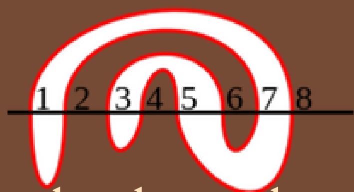
The most famous fractal is perhaps the **Mandelbrot set**, named after the mathematician **Benoit Mandelbrot** who **pioneered the study of fractals**. These geometric patterns, characterized by intricate details and an infinite border, are derived from a simple mathematical equation.



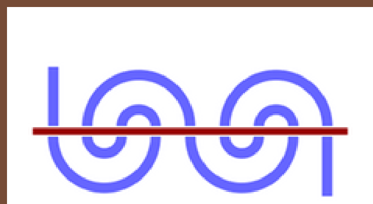
Written by:
Anhad Singh (X-RD)

Meanders

In Mathematics, the term meander refers to a curve which intersects a given line multiple times from one end to the other. The curve may be closed (closed meander) or open (open meander).



closed meander


open meander

One can find numerous meandering patterns in nature. The most visible example is the curves or bends that appear in a river's course as a result of constant erosion by flowing water. These curves are called meanders (the term meander itself has been derived from here). Due to erosion and deposition, the winding path of a river keeps changing; at times the curve of the river becomes so large that it gets cut off from the river and leads to the formation of U-shaped lakes called oxbow lakes at the bend. If considered individually, these oxbow lakes are closed meanders. We can also observe meanders in the tendrils of a plant.

Ever seen how a snake moves? The slithering motion of a snake creates a meandering pattern. As a matter of fact, one can find that many animals and insects leave a meandering trail as they move. Studies suggest that a particular species of rock ants follows a meandering trail apart from a random walk in search of food. They make alternate turns at fixed distances. Meandering helps them to cover a larger area while preventing them from crossing the same area multiple times. This improves the efficacy of the search.

A class of corals called Brain corals form colonies that usually resemble a human brain, hence the name. The grooves present on their surface are in a meandering pattern; this increases the surface area for the intake of nutrients.

These are just some of the countless instances of such meanders in nature. History shows that they have also found their way into our art, architecture, and culture. The Greek meander, for instance, inspired by a river's path is a recurring motif used in Greek architecture and textiles, and symbolizes eternity. Witnessing these instances is perhaps a reminder that both maths and nature aren't devoid of surprises.

Written by-
Aditya Jan (XI-SD)

CHAOS THEORY

Chaos Theory is a fascinating idea in science that changes how we think about order and predictability. It helps us understand the complex and unpredictable aspects of nature. Chaos Theory shows us that even things that seem random or messy can actually have a kind of hidden order. It is often referred to as the Butterfly Effect or Deterministic Chaos.

Chaos Theory, pioneered by mathematicians such as Edward Lorenz and Benoit Mandelbrot in the 20th century, explores the behaviour of dynamic systems that are highly sensitive to initial conditions. These systems, often described as "chaotic", exhibit seemingly random behaviour despite being governed by deterministic laws. This quality has profound implications for understanding the dynamics of natural systems, where seemingly chaotic processes give rise to emergent patterns and structures.

Nature is full of interconnected processes that embody chaos. From the unpredictable flow of rivers to the intricate patterns of clouds, chaos is everywhere in the natural world. For example, weather is a classic example of chaotic behaviour. Even the slightest difference leads to totally different outcomes, which can't be correlated whatsoever. Chaos also shows up in ecological systems, where interactions between species create complex webs of relationships. The butterfly effect, which comes from Chaos Theory, shows how a small change, like a butterfly flapping its wings, can set off a series of events that have big, unpredictable effects on ecosystems.

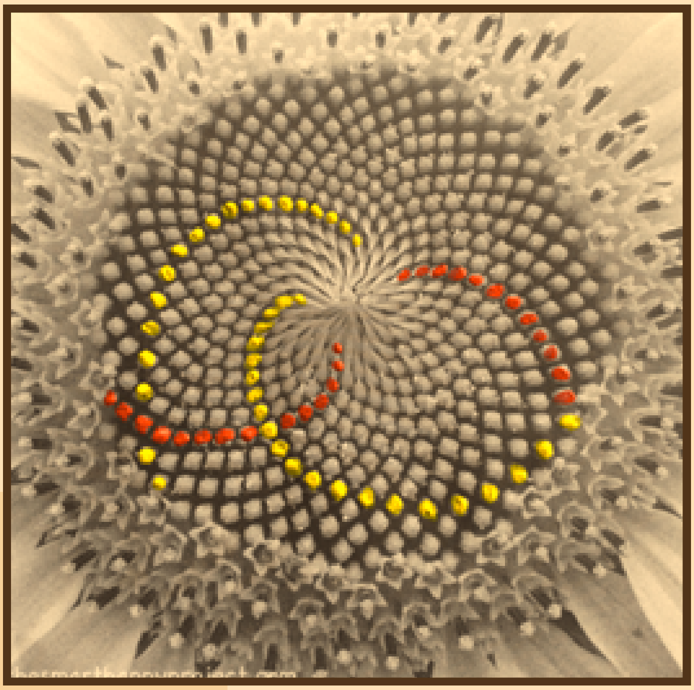
Understanding how ecosystems can be chaotic is really important for conserving them and managing them sustainably. Predicting weather more and more accurately would help for better preparation. Chaos Theory also highlights how all living things are connected. This shows why it's crucial to protect biodiversity, as it helps ecosystems stay strong and able to cope with changes. With human activities putting more and more pressure on the environment, it's vital to understand this balance between order and chaos to protect our planet.

In essence, Chaos Theory serves as a lens through which we can perceive the underlying harmony amidst the apparent disorder of the natural world. By unravelling the intricate dance of chaos and order, we gain a deeper appreciation for the awe-inspiring complexity of nature and the profound interconnectedness that binds all living beings. As we navigate the uncertainties of the future, let us heed the lessons of Chaos Theory, embracing the inherent unpredictability of life while striving to cultivate a more harmonious relationship with the world around us.

Written by-
Gaurav Mishra (XII-SD)

GOLDEN RATIO

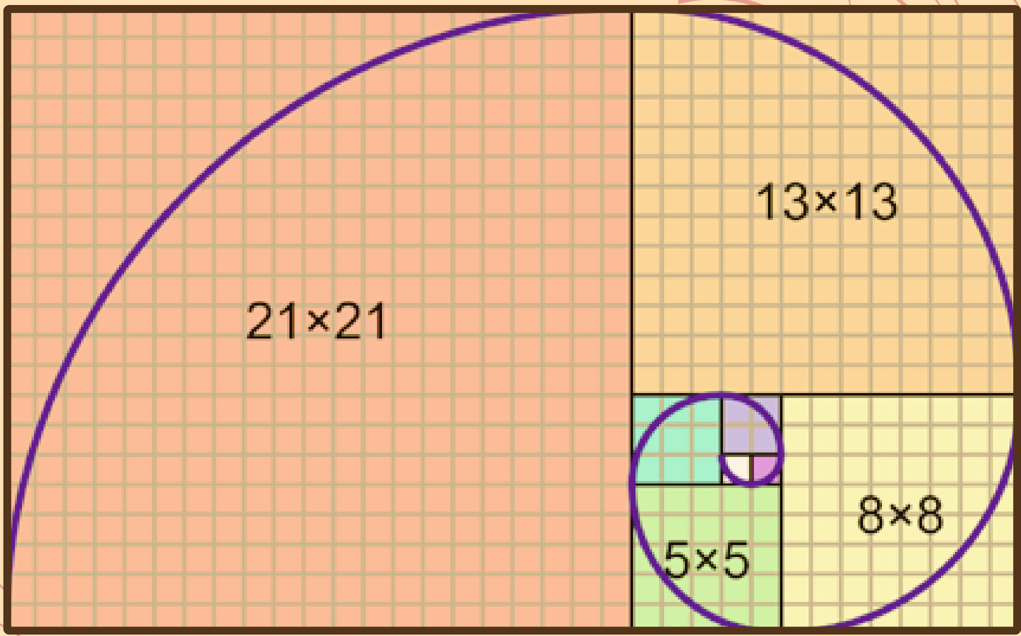
Throughout history, the worlds of mathematics and art have often seemed like distant galaxies, each inhabiting its own unique universe. However, a closer look reveals that these different realms share an intricate and profound relationship. The integration of mathematics in art opened up new vistas of creative expression. It enabled artists to shed light on the underlying order and beauty in art.

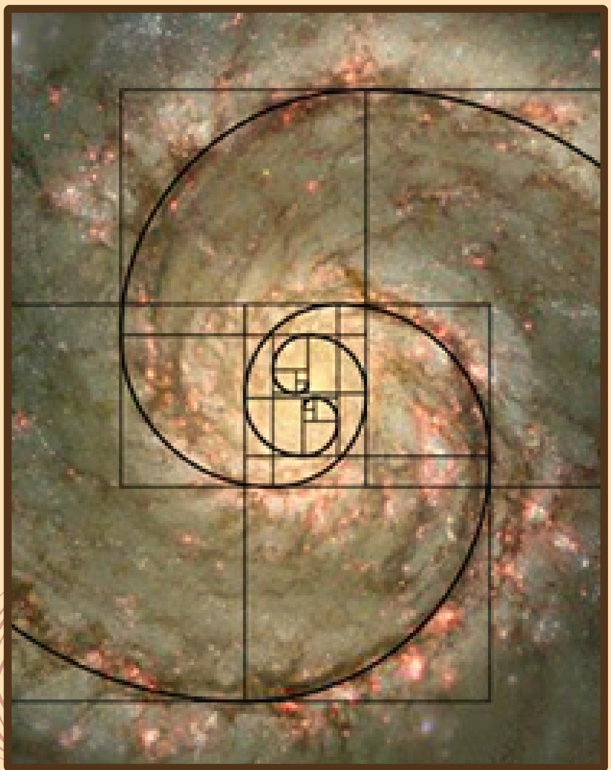


One of the most unknown yet most influential example of mathematics influencing art is "The Golden Ratio".

The Golden Ratio, often denoted by the Greek letter phi (ϕ), is a mathematical constant approximately equal to 1.618. It appears in various aspects of art, architecture, and nature. Let's explore it in detail with some pictures to illustrate its applications.

Mona Lisa: We all have heard of the Mona Lisa, the world-renowned painting painted by Leonardo da Vinci. He used the Golden Ratio in the composition of his works to achieve balance and harmony. In the Mona Lisa, you can observe how the subject's face, along with various elements in the background, conforms to the Golden Ratio.





Fibonacci Sequence: The Golden Ratio is closely related to the Fibonacci Sequence, a series of numbers where each number is the sum of the two preceding ones (starting with 0 and 1). As you add larger Fibonacci numbers, you can create a spiral by drawing quarter-circles whose radii are the lengths of Fibonacci numbers. This spiral often appears in art and nature, from the arrangement of seeds in sunflowers to the shape of shells and galaxies. Here the ratio of the longer side to the shorter side of the rectangle is close to the golden ratio (ratio of two consecutive Fibonacci terms). This forms a spiral shape which is often referred to as the golden spiral.

According to the history of Fibonacci, this sequence was invented by the Italian Leonardo Pisano Bigollo (whose nickname was Fibonacci) (1180-1250), who is known in the mathematical history by several names: Leonardo of Pisa (Pisano means "from Pisa") and Fibonacci (which means "son of Bonacci").

The Golden Ratio's prevalence in art and nature highlights its universal appeal and significance. While it may not be the sole factor in creating beauty, it undeniably contributes to the balance, symmetry, and aesthetic appeal found in various artistic and architectural creations. This harmony between mathematics and art continues to inspire creativity and appreciation in both fields.

Written by-
Agrim Garg (XII-SD)

SYMMETRY

Did you ever look around and marvel at the beauty of nature? From the graceful curve of a seashell to the intricate patterns of a snowflake, nature is full of wonders. But did you know that behind many of these natural marvels lies the elegant language of mathematics?

Mathematics is all about patterns, shapes, and numbers, and nature is no exception. Let's have a deep look at one of such topic of mathematics that is *SYMMETRY*.

Nature is full of symmetry, and symmetry is deeply rooted in mathematical principles. Think about the symmetry of a butterfly's wings or the symmetry of a snowflake. These intricate designs are not just beautiful to look at; they also follow mathematical rules of reflection and rotation.

Butterflies aren't the only ones with symmetrical features. Flowers also exhibit remarkable symmetry in their petals. Look closely at its petals; you'll notice that they are arranged in a perfectly balanced pattern. This symmetry not only enhances the beauty of the flower but also serves a functional purpose. It helps the flower attract pollinators and ensures that each petal receives an equal amount of sunlight.

Symmetry can also be found in the structure of animals and plants. Take the human body, for an example. Our faces are almost symmetrical, with one side mirroring the other. This symmetry contributes to our overall appearance and is often considered a mark of beauty.

In nature, symmetry is not just about aesthetics—it's about efficiency and functionality. From the wings of a bird to the petals of a flower, symmetry plays a crucial role in ensuring that living organisms are well adapted to their natural environments. Many-a-times the objective of symmetry is also to create internal balance supporting mobility.

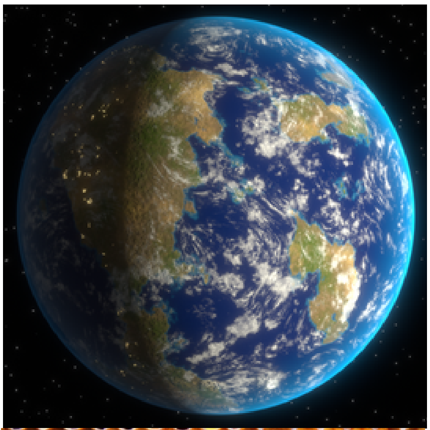
As we explore the wonders of symmetry in nature, we realise the beauty and complexity of the natural world in maintaining its perfect balance and help us appreciate the beauty and order in nature.

Therefore, mathematics help us see why flowers bloom the way they do and why coastlines have those wavy shapes. From the swirls in shells to the shapes of clouds, nature's symmetry is all around us, waiting to be explored and admired. Let’s learn to admire this remarkable and unexplored beauty of mathematics…

Written by-
Saisha Bhatia (IX-RV)

Geometry in Nature

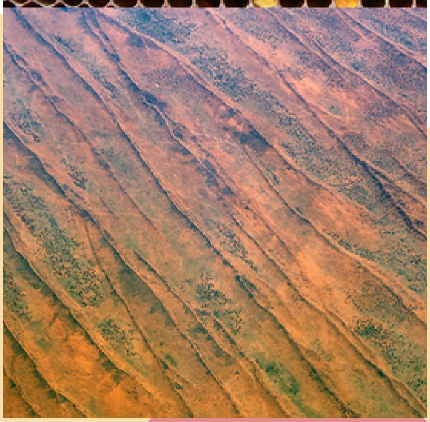
Mathematics is all around us. As we discover more and more about our surroundings we see that nature can be described mathematically too. The beauty of a flower, the majesty of a tree even the rocks upon which we walk can exhibit nature's sense of symmetry. In nature mathematics can exist in various forms. Such as symmetry, geometrical shapes and even the golden ratio. In our article today we too are going to cover such a topic only.



Geometrical shapes; we have observed a lot of landforms of geometrical shapes around us but none of us would ever even try to find the specific reason behind these shapes. Such examples can be the shape of Earth, a beehive and even mountains.

The **Earth** is the shape of a **sphere** which is the perfect shape for it to **minimise the excess pull of gravity** on its outer edges.

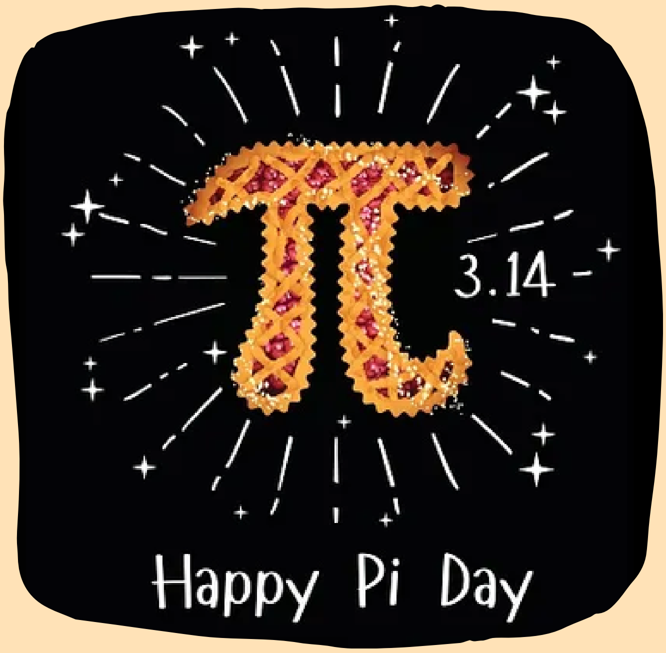
Beehive, close packing is important to **maximise the use of space**. Hexagons fit most closely together without any gaps, so, hexagonal wax cells are what bees create to store their eggs and larvae. Hexagons are six sided polygons, closed, 2 dimensional, many-sided figures with straight edges.



Parallel Lines, In mathematics parallel lines stretch to infinity, neither converging not diverging. The **parallel dunes in the Australian desert** aren't perfect- the world rarely is!

Written by-
Idhika Dixit (IX-RV)

PI DAY



Every year, on **March 14th**, mathematicians and math enthusiasts around the world celebrate Pi Day, commemorating the mathematical constant π (pi). March 14th is chosen as the date because when written in MM/DD format, it shows the starting digits of pi (03-14).

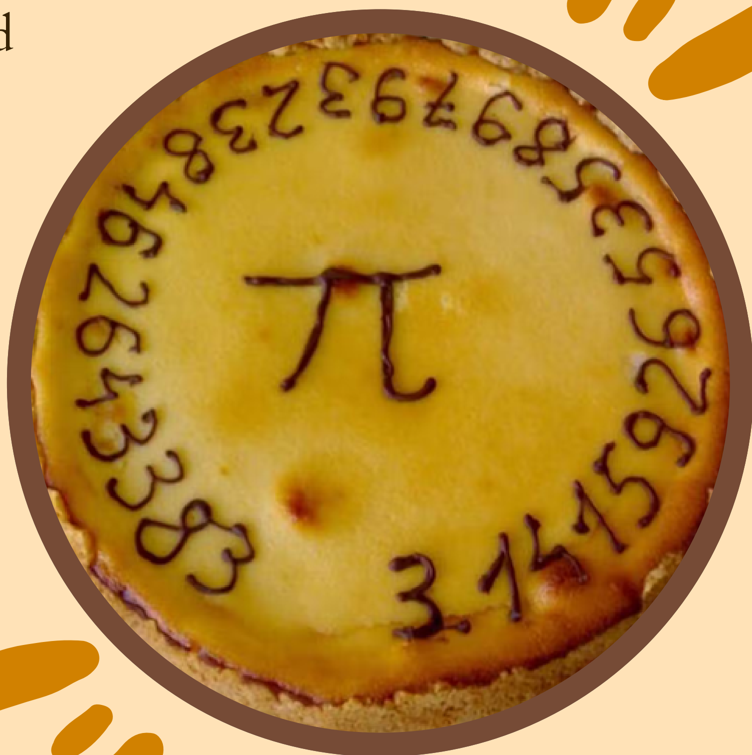
Pi, represented by the symbol π, is the **ratio of a circle's circumference to its diameter**. Its value is approximately **3.14159**, though it is an **irrational number**, meaning it cannot be expressed exactly as a fraction and its decimal representation goes on infinitely without repeating. The concept of pi has been known for thousands of years.

The ancient **Egyptians and Babylonians** approximated the value of pi around 3.125, while the ancient **Greek mathematician Archimedes used inscribed and circumscribed polygons** to approximate pi more accurately. However, the **symbol π** was first used by Welsh mathematician **William Jones** in 1706, and it was later **popularized** by Swiss mathematician **Leonhard Euler** in the 18th century.

The quest for more digits of pi has fascinated mathematicians throughout history. With the advent of computers, **the calculation of pi's digits has reached trillions**, yet its decimal expansion remains infinite and non-repeating, making it a subject of endless fascination and study.

Pi Day is celebrated in various ways, including **reciting digits of pi**, **baking pi-themed pies**, and organizing **math-related activities and competitions.** Schools, museums, and scientific institutions often hold events to promote interest in mathematics and raise awareness about the importance of pi.

Pi Day serves as a reminder of the beauty and complexity of mathematics. The constant π, with its infinite and non-repeating nature, **symbolizes the endless possibilities and mysteries of the universe**, making it a source of wonder and inspiration for generations to come.



Written by:
Agrim Garg (XII-SD)

CARL FREIDRICH GAUSS

In the vast realm of mathematics, there exists a figure shrouded in mystery and bringing — **Carl Friedrich Gauss.** While his name may not ring as loudly as some of history's more vibrant characters, Gauss's contributions to the world of numbers are nothing short of legendary.

Gauss's tale begins in the humble town of **Brunswick**, where he entered the world in 1777. From an early age, Gauss displayed exceptional mathematical talent from a young age. His brilliance quickly gained recognition, leading to his enrollment in the **University of Göttingen** at just 15 years old. Gauss exhibited an insatiable curiosity and an uncanny knack for numbers. Legend has it that as a child, he amazed his teachers by solving complex arithmetic problems in the blink of an eye, earning him the nickname "**The Prince of Mathematics.**"

As Gauss matured, so did his mathematical prowess. He delved into a myriad of mathematical disciplines, from algebra to geometry, from number theory to astronomy, leaving a trail of groundbreaking discoveries in his wake. Gauss was like a mathematical detective, uncovering hidden patterns and unlocking the secrets of the universe with his keen intellect and analytical mind.

One of Gauss's most famous feats was his discovery of the **method for summing arithmetic series**—a problem that had baffled mathematicians for centuries.

But Gauss wasn't content with just solving old puzzles; he blazed new trails, laying the foundation for modern mathematics with his groundbreaking work in **differential geometry**, **probability theory**, and **non-Euclidean geometry**. Another notable achievement is his work on the fundamental theorem of algebra, which states that every non-constant polynomial equation has at least one complex root. This theorem laid the foundation for modern algebra and complex analysis.

Furthermore, Gauss played a pivotal role in the development of differential geometry, contributing to our understanding of **curved surfaces** and the **intrinsic geometry of space**. His insights laid the groundwork for Einstein's theory of general relativity.

Gauss's legacy continues to inspire generations of mathematicians and scientists. His profound insights, innovative methods, and enduring curiosity have left an indelible imprint on the landscape of human knowledge, making him one of the greatest mathematicians in history. So here's to Gauss—the silent sentinel of numbers, the mysterious mathematician who continues to inspire awe and admiration in the hearts of mathematicians and math enthusiasts alike.

Written by:
Mahi Sheoran (XII-SD)

Achiever's Arena

1. Report on Mental Maths Olympiad

Mind Power Education LLP was formed in 2008 and has been imparting brain development programs across multiple schools. iNAVMO & iMMO International Abacus, Vedic and Mental Maths Olympiad is organised every year to give students competition at the international level. It gives us immense pleasure to share with you all that the students of VIS have performed very well at the national and international level. We are feeling proud to share with you name and classes of the winners.

National Results and Awards				
SN	**Name**	**Grade**	**Rank**	**Awards**
1	RYKAA JAIN	UKG	2	Champion's Champion Trophy
2	AVYAAN JAIN	3rd	3	Champion's Champion Trophy
3	AHARSHI SARKAR	4th	3	Champion's Champion Trophy
4	PULKIT CHUGH	5th	4	National Champion Trophy
5	AKSHAT GOYAL	5th	2	Champion's Champion Trophy
6	PULKIT CHUGH	5th	1	Champion's Champion Trophy
7	AKSHAT GOYAL	5th	7	National Champion Trophy
8	ANIRVAN KARN	5th	6	National Champion Trophy
9	HARSHIT GARG	10th	1	Champion's Champion Trophy

School Results Based on Semifinals			
SN	Name	Grade	Awards
1	RYKAA JAIN	UKG	Gold Medal
2	AARYAMANN SAXENA	2nd	Bronze Medal
3	AYESHA NASEEM SIDDIQUI	3rd	Gold Medal
4	AVYAAN JAIN	3rd	Gold Medal
5	NIHARIKA GUPTA	3rd	Silver Medal
6	AHARSHI SARKAR	4th	Silver Medal
7	NAVIKA GUPTA	5th	Gold Medal
8	AKSHAT GOYAL	5th	Gold Medal
9	AKSHAT GOYAL	5th	Gold Medal
10	PULKIT CHUGH	5th	Gold Medal
11	NAVIKA GUPTA	5th	Gold Medal
12	AKSHAT GOYAL	5th	Gold Medal
13	PULKIT CHUGH	5th	Silver Medal
14	GURANSH GAMBHIR	5th	Silver Medal
15	HARVANSH SINGH	5th	Bronze Medal
16	ANIRVAN KARN	5th	Bronze Medal
17	HARSHIT GARG	10th	Gold Medal
18	HARSHIT CHANDNANI	11th	Silver Medal

2. Recognising Ramanujan Maths Competition

VIS is extremely proud on the performance of a student named Sanvi Kansal of VI-Daisydale who scored National Rank 4 in Recognising Ramanujan Maths Competition 2023 conducted by Mathematical Sciences Foundation and countingwell. As an award, she received a certificate of merit and an Amazon Pay gift card worth Rs5000. Heartiest congratulations to Sanvi, well done!

Fun Fact

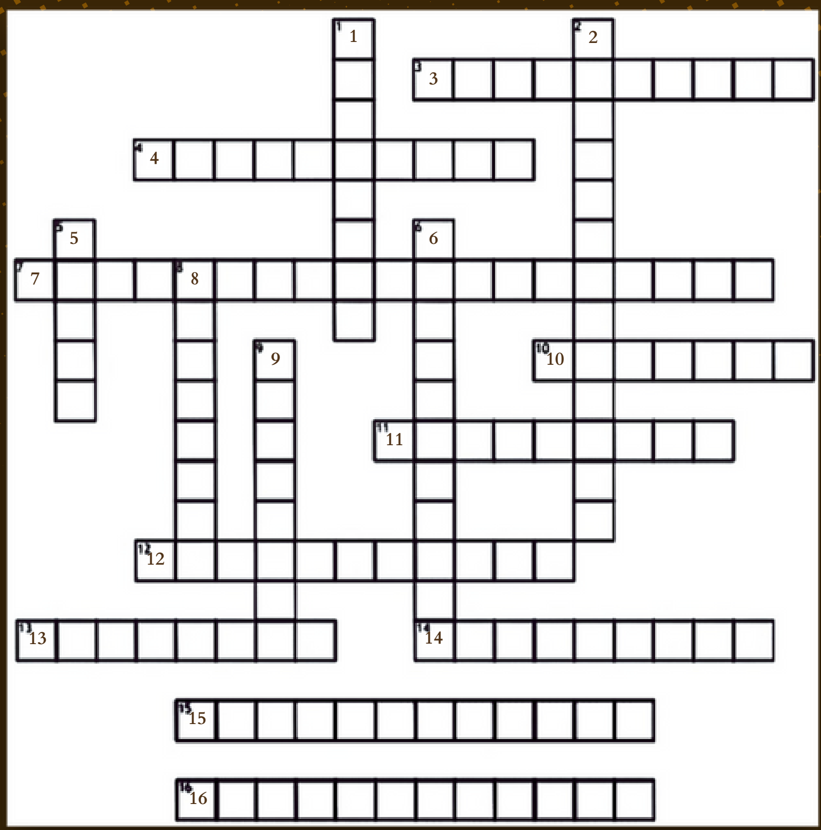
Binary systems, which rely on only two digits (0 and 1), are prevalent in nature. In the cellular processes of DNA, genetic information is encoded using a binary system, where combinations of four nucleotides form the basis of life's blueprint.

By- Bhavik Chawla (IX-RV)

Mathoranjan

Where Maths meets Fun

CROSSWORD



ACROSS

3. A mathematical phrase with operators connecting numbers and variables is an ________.

4. A ______ is an algebraic expression made by adding or subtracting terms.

7. The degree of the term with the greatest degree is the ____ __ __ ____.

10. Numbers or variables that form a product are _____.

11. Terms that have the same variable(s) raised to the same exponent(s) are ___ ___.

12. Terms with different variables, or the same variables raised to different exponents are ____ ____.

13. A letter representing a number or value that can change or vary is a ________.

14. A three-termed polynomial is a ________.

15. A term with no variables, that's value remains the same is a ____ ____.

16. When the terms of a polynomial are ordered from highest to lowest degree it's known as ____ ____.

DOWN

1. A one-termed polynomial is a ___.

2. In a term, the sum of the exponents on the variables is the ___ __ __ ____.

5. Numbers, variables, and the products of numbers and variables are all ___.

6. The number that a variable is being multiplied with is called the _____.

8. An _____ is a mathematical statement that says two expressions are equal.

9. A two-termed polynomial is a ____.

Made by:
Aaryan Khattar (XII-SD)

ANSWERS

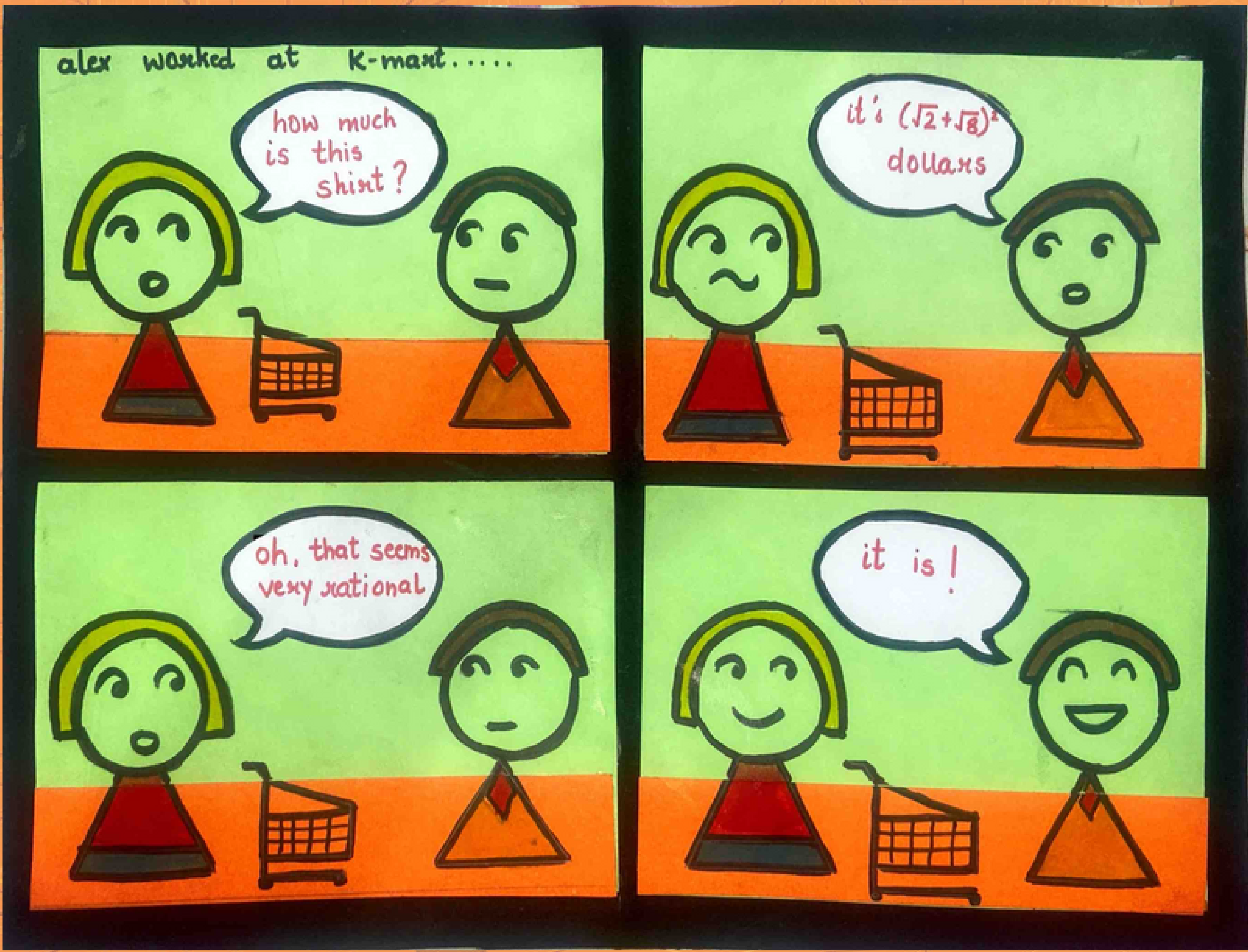
ACROSS

3. Expression
4. Polynomial
7. Degree of a Polynomial
10. Factors
11. Like Terms
12. Unlike Terms
13. Variable
14. Trinomial
15. Constant Term
16. Standard Form

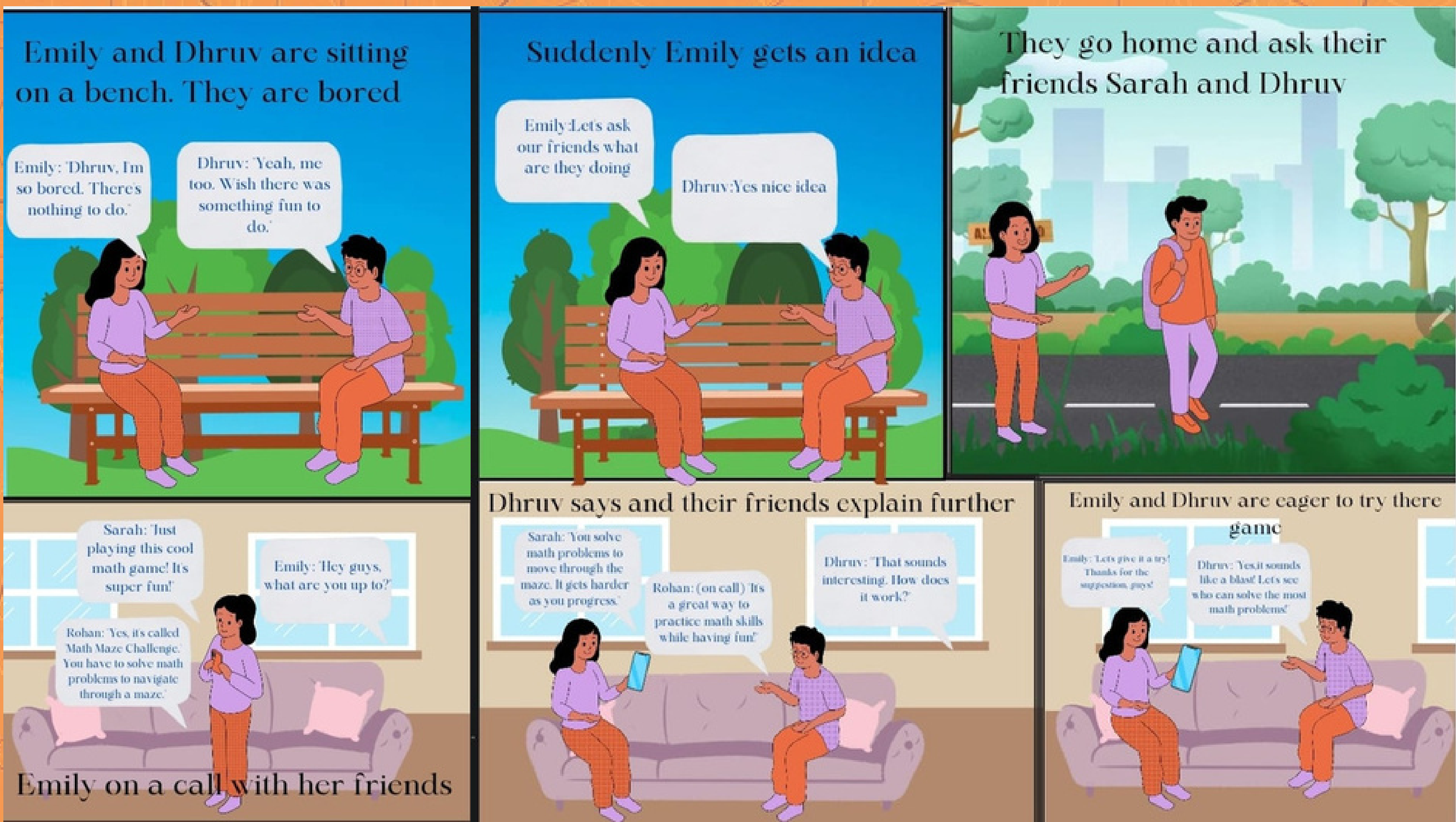
DOWN

1. Monomial
2. Degree of a Term
5. Terms
6. Coefficient
8. Equation
9. Binomial

Comic Strip



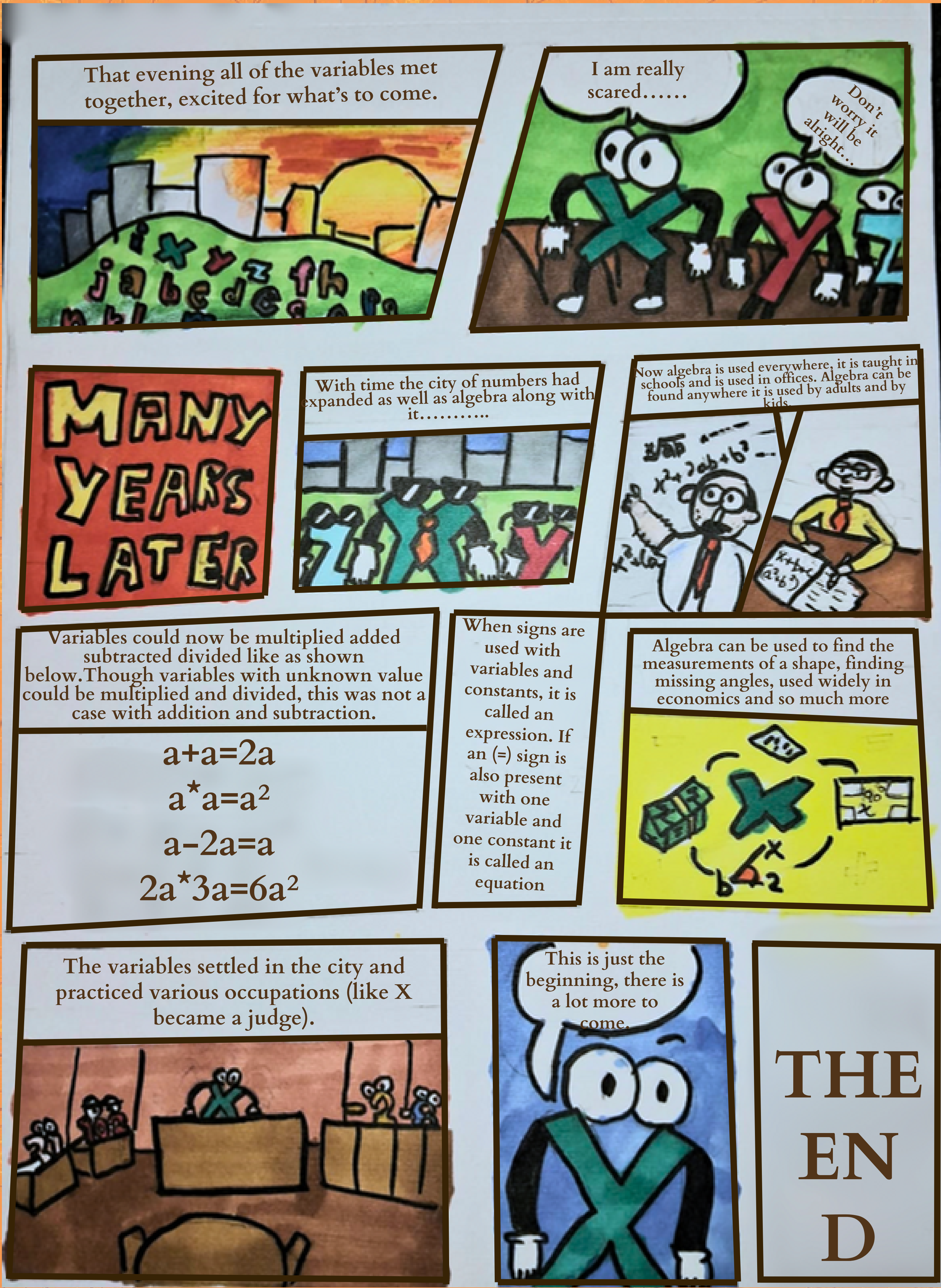
Made by- Rishit Kapoor (VIII-RV)



Made by- Hardik Khatri (VIII-DD)


In the world of numbers, everyone was happy and enjoying and were about their business, until….
What's that!!
Looks like an asteroid is going to land there
BOOM
A few numbers went to check the crater that the asteroid created…
Thank God no one is hurt
But Inside…..
What's there?
After examining the box, they found out
We have found movements of some live creature inside the box
They used cranes to open the big box….
Don't worry the security has it under control
But what came out was unexpected
…and the alphabets came out!
Hello!
Put all weapons down and don't move!!!
Whoa! We come in peace!

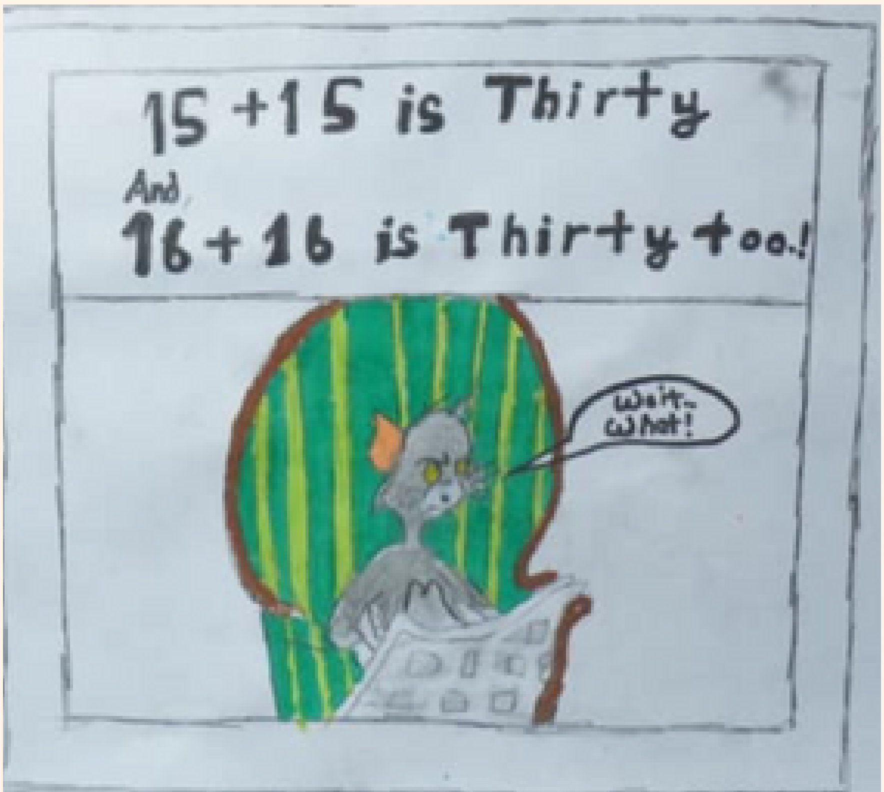
General I think we must arrest them
No! I will hear what they want to say
We are variables and have been sent to help the numbers
Sir, I believe this alphabet has come to ruin maths. Let's not trust him
Stay quiet, 7!!
I was sent to this place by Diophantus and Muhammad ibn Musa al-Khwarizmi. They introduced English letters to mathematics and used them for properties like addition, subtraction, multiplication, division etc.
xyjz abcp kdq en
We are not a fixed value, so we can change into any number
Impossible!!!
Oh really? Well watch this.......
What...?!
The variable changed to -1!!!
How do I look?
Us variables can be used with different signs to form expressions or equations. This can be also termed as ALGEBRA
Well, I must admit your story is much believable but we have to present you to the court before making any further decisions.
The variables were presented in the court and upon listening to their story the judges came to the conclusion......
These variables have been sent to us by two great mathematicians. They have come for the good of maths. They must be made part of our society for our good only. I thereby acquit them
Yay!!!



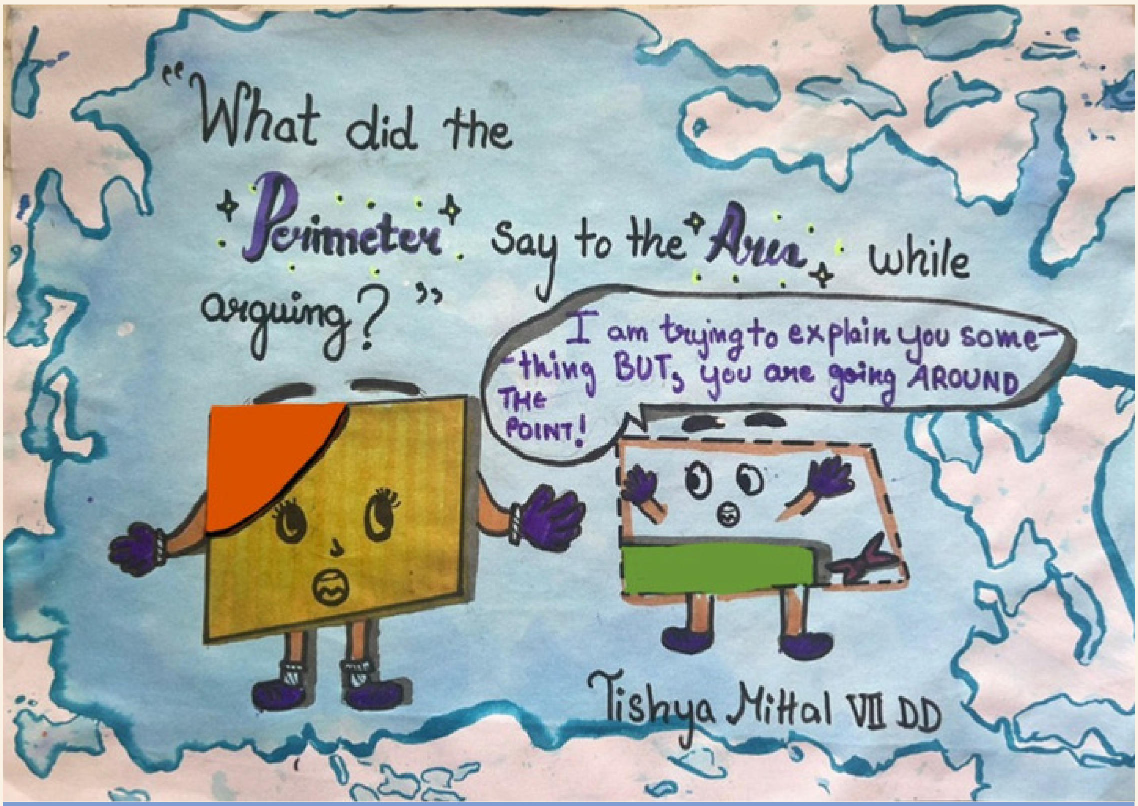
MADE BY- ADEEB SINGH (IX-RV)

MEMES

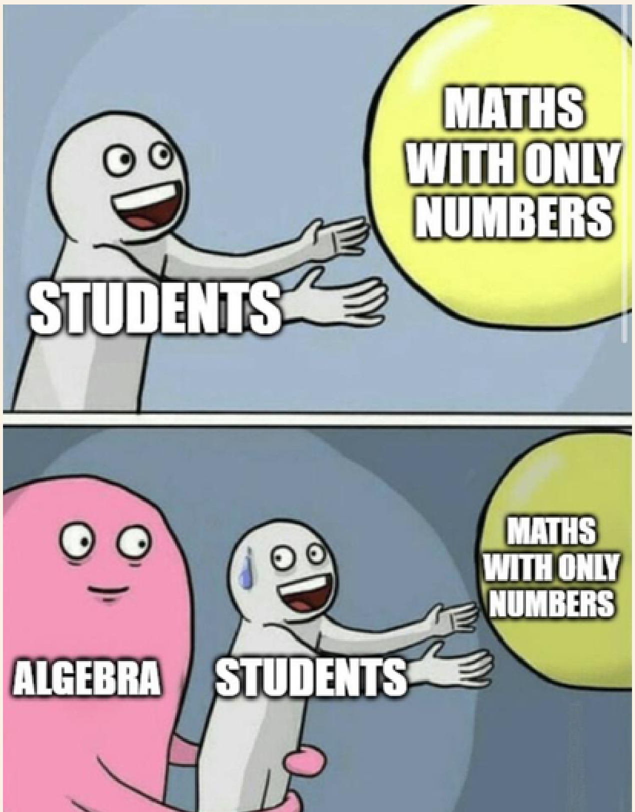
By- Tishya Mittal (VII-DD)



By- Vivaan Singh (VII-RD)



By- Tishya Mittal (VII-DD)



By- Anant Dalmia

By- Vivaan Singh (VII-RD)

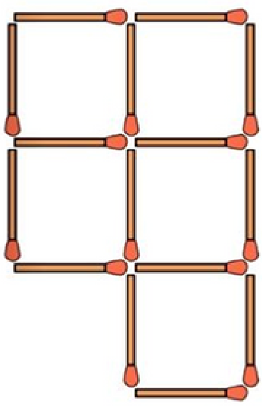
PUZZLES

1 The Indeginous Milkman

A milkman has only a 5L jug and a 3L jug to measure out milk for his customers from a milk churn. How can he measure 1L without wasting any milk?

2 Matchstick Squares

1. *Remove three matches from the fifteen in the arrangement shown so that only three squares are left.*
2. *Now try removing two matches from the arrangement shown to leave three squares. (This time the squares need not be of the same size)*



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PUZZLES

ANSWERS:

1

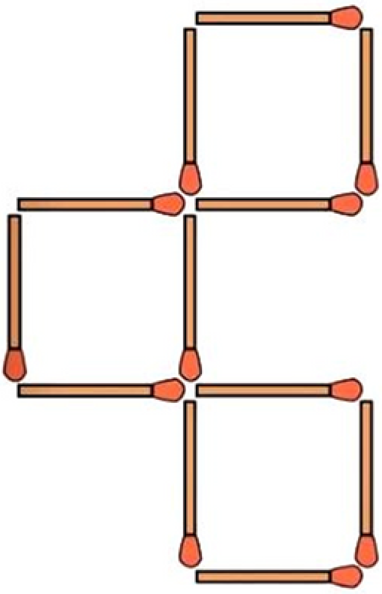
The Indeginous Milkman

First fill the 3 L jug. Next pour the 3 L from this jug into the 5 L jug. Again fill the 3 L jug and then pour from it into the partially filled 5 L jug until it is full. This leaves exactly 1 L in the 3 L jug.

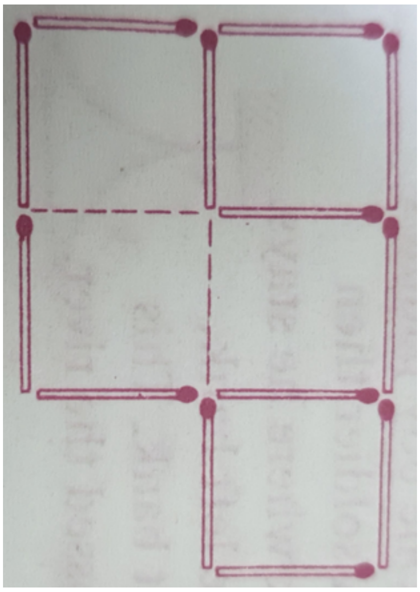
2

Matchstick Squares

ANSWER 1:



ANSWER 2:



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