Algorithm

Hello Readers!

Welcome to the 14th edition of Algorithm where mathematics moves beyond formulas and becomes a way of seeing the world. This edition explores the deep connection between patterns beauty and design showing how mathematics shapes not only what we calculate but also what we perceive and appreciate.

Mathematics is often considered precise and structured yet it quietly exists in some of the most creative and beautiful aspects of life. It appears in the symmetry of art the proportions of architecture and the patterns found in nature. From the elegance of the Golden Ratio to the fascinating world of tessellations and optical illusions mathematics reveals a hidden order that surrounds us.

Through this issue we invite you to look at mathematics from a new perspective. Each article uncovers how patterns influence the way we see and understand the world whether through natural spirals artistic balance or visual illusions that challenge our perception. These ideas remind us that mathematics is not limited to textbooks but is a living presence in everyday experiences.

As you move through these pages we hope you discover a sense of curiosity and wonder. This edition encourages you to notice the patterns you may have once overlooked and to appreciate the role mathematics plays in shaping beauty and meaning.
Happy Reading!

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Editor's Note

Looking at mathematics through the lens of art might be one of those things that, if considered, would change the way you see. As you, our curious reader, flip through the pages of this edition, I would like you to explore the ideas behind various patterns and shapes that we often come across but do not pause to give much thought.

As this marks my final edition as the Editor-in-Chief for the 2025–26 session, I'm thankful to have been a part of such a creative, passionate, and talented team. My sincere thanks to our writers, designers, and especially our Sub-Editor-in-Chief, Srishti, for their constant support and creativity.

May these pages inspire you to see mathematics not just as logic, but as art.

Shruti Sachdeva
Editor-in-Chief

"Mathematics, rightly viewed, possesses not only truth, but supreme beauty."

Welcome to Edition 14.0 of Algorithm where we invite you to step away from the formulas and into the gallery, where equations serve as the invisible architect of art and nature. From the impossible perspectives of M.C. Escher to the geometric precision of the world's greatest structures, we aim to show that math isn't just a subject to be solved ,it's a visual masterpiece to be experienced. I hope these pages inspire you to see the hidden code in everything around you.

My sincere gratitude goes to our Editor in Chief ,Shruti Sachdeva, for her invaluable guidance, as well as to our dedicated Content and Design teams, whose collective efforts and creative vision were essential in bringing this edition to life.

Let the symmetry inspire you!

Srishti Dey
Sub Editor – in – Chief

THE HIDDEN CODE OF BEAUTY : DECODING THE GOLDEN RATIO

BY - SUHANI & ZAINAB

Does beauty really lie in the eyes of the beholder, or is there a hidden pattern that guides what we find attractive?



Does beauty really lie in the eyes of the beholder, or is there a hidden pattern that guides what we find attractive? Many philosophers and artists have been obsessed with this question since centuries. From the curve of the leaf to the structure of the face, there lies a pattern; a code; a symmetry that our eyes instinctively recognize. At the centre of this mystery lies the "Golden Ratio", denoted by the Greek alphabet φ (phi) which approximately equals 1.618. It was first introduced in ancient Greece by mathematician Pythagoras and the "Father of Geometry", Euclid.

In the realm of facial aesthetics, the Golden Ratio serves as a theoretical framework for assessing the proportions and symmetry of different facial features. This theory suggests that faces that loosely adhere to the Golden Ratio are perceived as more attractive.

This ratio explains that the face is considered aesthetically pleasing when the length of the face is about 1.6 times its width. Similarly, the distance from the top of the head to the eyes compared to the distance from the eyes to the chin approximately often follows a 1:1.6 relationship. The width of the mouth compared to the width of the nose, and the distance between the pupils relative to the width of the face are also believed to align with this ratio in beautiful faces.

But beauty is not just about perfection; it is about coherence as well.

This is where facial symmetry comes into play. A face tends to be more in harmony when both halves of it are relatively balanced. Then comes the rule of thirds, a principle borrowed from art and photography. Imagine that the face is divided into three horizontal sections - hairline to eyebrows, eyebrows to the base of the nose, and nose to the chin. The face is seen as attractive and harmonious when these sections are in proportion with each other.

However, these ideas are not new. The connection between mathematics and beauty was deeply explored during the renaissance period. During that period, the artists believed that art should reflect the harmony of the universe. For example, during the renaissance time, painters like Leonardo da Vinci and Michelangelo Buonarroti showed the use of golden ratio in the composition of paintings and the structure of figure sculptures.

For centuries, people have tried to understand why certain things look beautiful while others don't. During the Renaissance, this curiosity took a more structured form, and thinkers began linking beauty with logic and proportion.

Among them, Leonardo da Vinci stands out for the way he blended observation with creativity. He didn't just create art for visual appeal, he studied the human body, nature, and geometry to uncover patterns behind what we find attractive. His well-known sketch, the Vitruvian Man, is a perfect example of this. It shows how the human body can fit into both a circle and a square, suggesting that our proportions follow a kind of natural order.

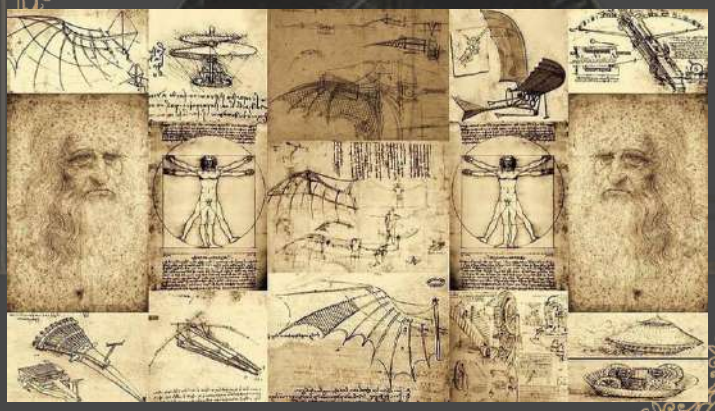
This idea of hidden structure is also visible in spirals found throughout nature. From seashells to galaxies, these spirals often follow a pattern linked to the Golden Ratio. What makes them so appealing is their sense of balance, they expand smoothly without becoming irregular. There's a certain rhythm to them that feels natural and easy on the eyes. Unlike rigid shapes, spirals have movement, which makes them more engaging and visually pleasing.

Our response to these patterns says a lot about how we perceive beauty. Even without understanding the mathematics behind it, we tend to prefer things that are symmetrical and well proportioned. Faces, objects, and even spaces that follow these patterns often appear more attractive because they feel balanced. This shows that aesthetic perception is not entirely subjective, there is a shared human tendency to appreciate harmony. At the same time, slight imperfections play an important role. They make things feel more genuine and less mechanical, adding character and individuality.

Today, these concepts are still widely used, especially in design. The mathematics of beauty continues to guide how things are created, whether it's in architecture, digital interfaces, or product design. Designers often use proportions inspired by the Golden Ratio to create layouts that are both functional and visually appealing. For example, the way content is arranged on a website or the proportions of a logo often follow these principles, even if we don't consciously notice it.

Photography and fashion also rely on similar ideas. Techniques like the rule of thirds help create balanced compositions that naturally draw attention. In many cases, designers and artists use spiral patterns to guide the viewer's eye across an image, creating a smooth visual flow.

In conclusion, the connection between mathematics and beauty is more present in our lives than we realize. Through his work, Leonardo da Vinci showed that beauty is not just about what we see on the surface, but also about the structure beneath it. Understanding these patterns allows us to look at art, nature, and even everyday objects with a deeper sense of appreciation, revealing that what feels beautiful often follows a quiet and consistent logic.





Breaking News:

Op Art Storms Back Into the Spotlight, Blurring the Line Between Reality and Illusion

By Disha | March 30, 2026

In a striking and almost surreal comeback, Op Art (Optical Art) is once again capturing global attention, sweeping across gallery walls, social media feeds, and digital screens with its hypnotic patterns and mind-bending visuals. Once a groundbreaking movement of the 1960s, Op Art has returned with renewed energy, finding fresh relevance in today's fast-paced, image-saturated world.

Characterized by bold geometric forms, high contrast, and precise repetition, Op Art creates powerful visual illusions that appear to move, vibrate, or shift—even though they are completely static. These effects both intrigue and disorient viewers, challenging the brain's ability to distinguish between reality and perception. In an age dominated by augmented reality (AR), virtual reality (VR), and AI-generated imagery, this artistic exploration of perception feels more timely than ever.



Experts suggest that the resurgence of Op Art is deeply connected to our current visual culture. With attention spans shrinking and digital content competing fiercely for engagement, the striking immediacy of optical illusions offers a compelling way to capture and hold viewers' focus. From fashion runways to advertising campaigns, these dynamic patterns are being widely adopted to stand out in an increasingly crowded visual landscape.

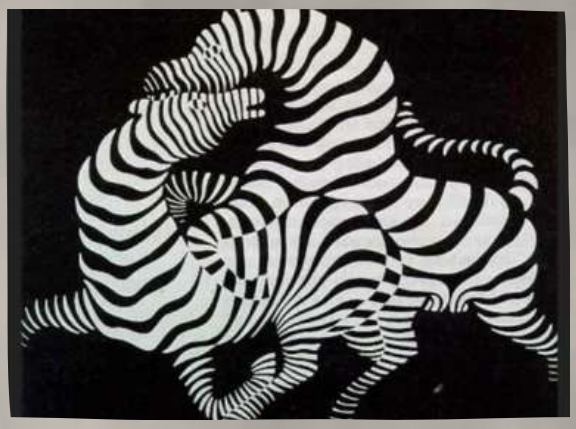
However, this revival has also sparked debate within the art world. Early pioneers like Bridget Riley and Victor Vasarely used optical effects not just for visual impact, but as a serious investigation into how humans perceive space, movement, and form. Their works were rooted in visual psychology and aimed to expand the boundaries of artistic experience.

Today, critics argue that Op Art risks losing that depth. As its techniques are increasingly used in branding, marketing, and digital media, some believe the movement is being reduced to a purely commercial tool—designed to attract attention rather than provoke thought. The same illusions that once challenged perception are now often used to simply stand out in a scroll-heavy digital environment.

Despite these concerns, the influence of Op Art remains undeniable. Its ability to engage, unsettle, and captivate audiences has made it a powerful force in contemporary visual culture. Yet, as these intense visuals become more widespread, there is growing concern about "visual overload." Constant exposure to such stimulating imagery may further blur the already delicate boundary between reality and illusion

As Op Art continues its dramatic resurgence, one key question remains: is this a meaningful artistic revival that reexamines perception in a digital age, or merely a reflection of a world increasingly driven by illusion and surface-level engagement?







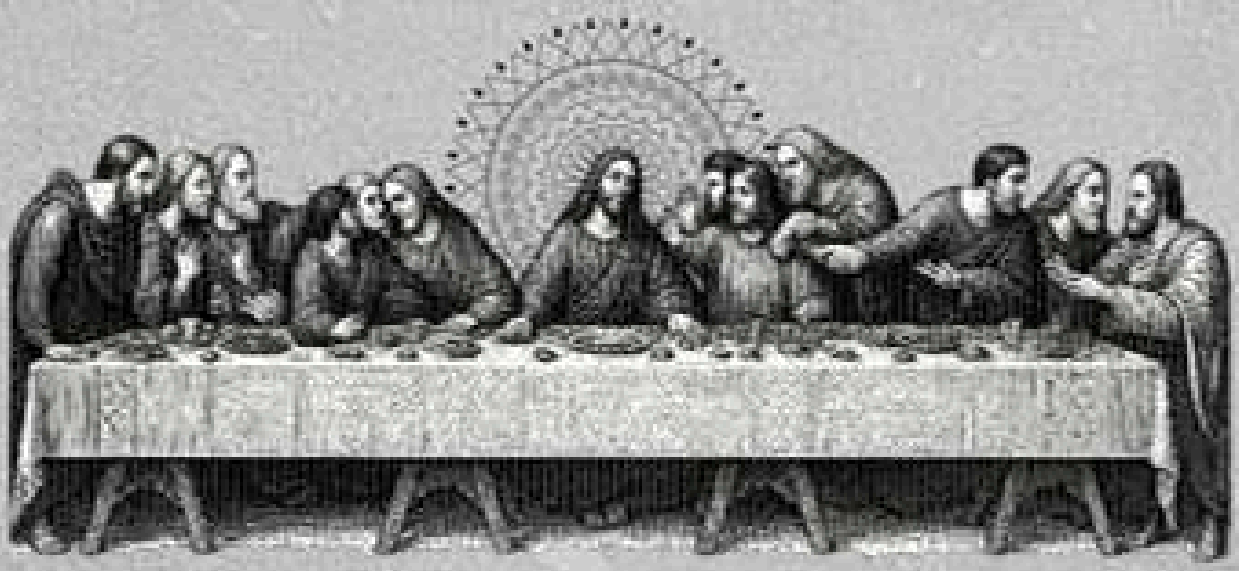


Glossary

- Op Art (Optical Art): Art that creates visual illusions of movement or depth.
- Perception: How the brain interprets what we see.
- Contrast: Difference between colors (e.g., black and white) to enhance visuals.
- Repetition: Repeated patterns used to create optical effects.
- AR (Augmented Reality): Digital elements added to the real world.
- VR (Virtual Reality): A completely immersive digital environment.

Balance and Beauty: ThePowerofSymmetry in Arts

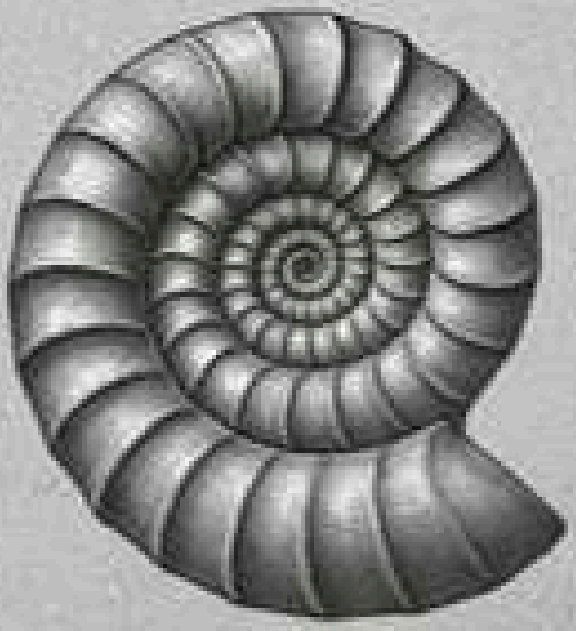
When welook at a masterpiece, we oftendon'tthink aboutthe equations hidden behind the brushstrokes. Yet, by exploring the aesthetics and logic behind, it becomes clear that what we call beauty is often just our brain's way of recognizing mathematical order for which symmetry acts as an incredible bridge to the natural world and human creation, providing a sense of visual rest that we are naturally wired to seek.



Whether it's the reflectional symmetry of a Renaissance portrait or the complex rotational patterns in a South Asian mandala, there is an inherent comfort in balance. From a mathematical perspective, we are looking at invariants. Elements that remain unchanged under transformations. In works like Leonardo da Vinci's 'The Last Supper', the balance isn't just a stylistic choice. Every figure on one side of the central axis is perfectly countered by the visual weight of another, converging on a singular vanishing point giving the whole art the perfect balance.

Nature is the best at using symmetry to shape how things work. Say Snowflake, a classic example of six-fold radial symmetry. As water vapor freezes, it naturally crystallizes into a hexagonal lattice because of the 104.5° angle of the water molecule, ensuring the arms grow in a perfectly balanced 60° spread. We see a similar logic in the Honeycomb. Interestingly, bees don't just prefer hexagons, they are solving the ‘Honeycomb Conjecture’, which proves that a hexagonal grid is the most efficient way to divide space using the least amount of wax!

In the animal kingdom, this math becomes even more visible. The Peacock’s train uses bilateral symmetry to create mirrored symmetry and careful spacing. Each eye on the feathers is placed so that when the fan opens, they don't just overlap in a mess, they form a perfect, curved arc. It’s essentially a biological coordinate system where every feather has its exact place. Starfish shows off Pentamerism or five-fold rotational symmetry.

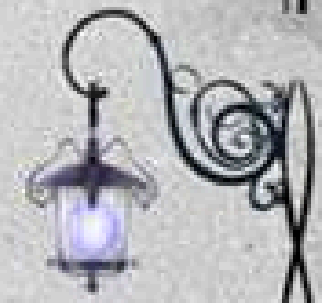


By arranging its body in 72° intervals, it can move and sense food from any direction equally. Even the Nautilus shell follows the math of a logarithmic spiral. As the shell grows, it stays the same shape, just larger, maintaining a perfect proportional balance known as self-similarity.

A Dutch artist M.C. Escher also translated these natural laws into his art. Tessellations which are patterns that fill a plane with no gaps are a direct visualization of mathematical ways a pattern can repeat in two dimensions. Similar to the honeycombs, the interlocking figures in his art use geometric constraints to create visually appealing images.

Symmetry shows us that mathematics is not just some set of rules but it is the very building blocks of our creative expression and the structural blueprint of the world around us. Every time we find ourselves drawn to a patterned textile, the veins of a leaf or maybe growing patterns of petals on flowers, we are subconsciously solving a puzzle. A puzzle of proportions. Art proves that symmetry and balance isn't just a property of Geometry but something that connects the logic of our mind to the intuition of our eyes.

Glossary:



Mathematical Properties-

i.)Invariance: Theproperty ofa mathematical object that remains unchanged after a specific transformation (like rotation or reflection) is applied.

ii.) Tessellation: A pattern of shapes that fits together on a flat surface with no gaps or overlaps, essentially "tiling" the plane.

iii.) Self-Similarity: A geometric feature where a part of an object is structurally identical to the whole, regardless of scale.

Biological Geometry-

iv.) Logarithmic Spiral:A spiral that widens at a constant rate; famously seen in the Nautilus shell, it allows the organism to grow without changing its shape.

v.) Pentamerism: A specific type of five-fold symmetry (72° intervals) common in echinoderms like starfish.

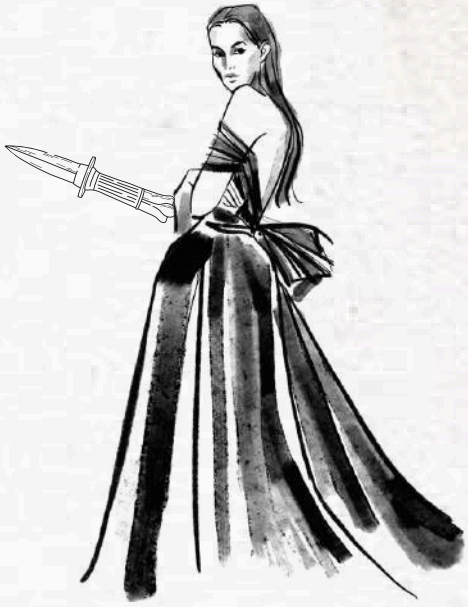
vi.) Hexagonal Lattice: The most space-efficient 2D grid; the mathematical solution to the Honeycomb Conjecture for using the least material to divide space.

Structural Mechanics-

vii.) Bilateral Symmetry:The "mirroring" of two sides across a central axis, often used in portraits to convey stability or "visual rest."

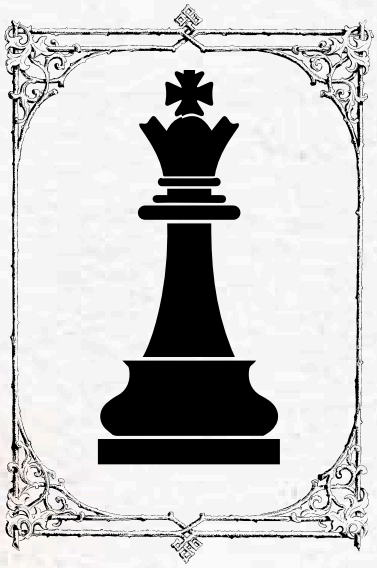
viii.) Radial Symmetry: A balance where parts are arranged regularly around a central point, like the six-fold spread of a snowflake's arms.

Inside the Mind of M.C. Escher: A Conversation Beyond Reality



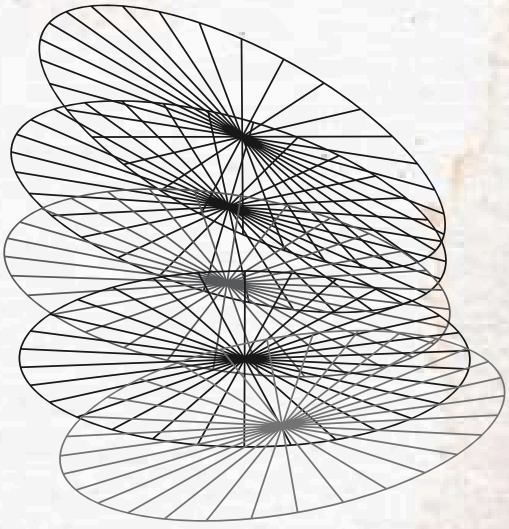
Interviewer: Today we go outside of reality to interview the great artist, M.C. Escher, who makes art that's mathematically marvelous. Welcome, Mr. Escher. Your drawings are sort of impossible. What do you call your artwork?

Escher:Thank you. My work is often known as mathematical art because I use geometry, symmetry, and logic to construct images that explore and challenge the eyes and the mind. I am intrigued by the border between illusion vs. reality. I am trying to demonstrate that the surface we see is not always the real thing.



Interviewer: Your impossible figure drawings are iconic, especially the shapes that are impossible to create in the real world. What inspired those?

Escher: I have always been fascinated with perspective distortion and the confusion that comes with changing viewpoints. The brain is trying to perceive something that doesn't exist when the rules of perspective are broken. This results in paradoxical shapes like the Penrose triangle, which must make sense but can't be built in 3D space. These paradox structures are a way for me to play with the limits of human perception.



Interviewer: Many people talk about your tessellations, Too. They are like puzzles that repeat ad infinitum.

Escher: Yes, tessellations are very important to my work. They are geometry in art, where shapes fit together perfectly with no gaps. By repeating forms over and over again I try to illustrate infinity. Mathematics says that patterns can go on forever, and I like to make that concept into a visual form.

Interviewer: Your drawings seem to be contained within themselves over and over again. Like a picture within a picture. Is this recursion?



Escher: Exactly. Recursion is a beautiful mathematical concept of a form that contains a smaller version of itself that contains another and so on forever. In art, it is a form of infinite depth. Through recursion, I want to demonstrate that reality has no discernible beginning or end.

Interviewer: Your works also feature the transformation of objects into other objects. What are your thoughts about transformation?



Escher: Transformation beautifully connects art and mathematics. A shape can be rotated, reflected, or altered into another shape, gradually. These transformations have rules, like equations, except they are beautiful. That is why I think mathematics is both logical and beautiful.

Interviewer: So would you claim that your art demonstrates that mathematics itself is art?

Escher: Definitely. Numbers, symmetry, infinity and more are not just for scientists. When we look at them visually we realize mathematics is one of the greatest art forms, because it shows us the hidden structure of reality.



Glossary

1.M.C. Escher- Dutch artist known for artworks based on mathematics, illusions, and impossible structures.

2.Tessellations- Repeating patterns of shapes that fit together perfectly without gaps.

3.Recursion- When an image repeats inside itself again and again.

4.Penrose Triangle- A famous impossible triangle that cannot exist in three-dimensional space.



When Pictures Prove: Understanding Math Without Words

A classroom. A blackboard, some chalk. The entire class is in the football ground for an upcoming tournament. But Aarav and Meera are inside the class, staring at the blackboard, their faces blank. Ms. Sara taught them a new concept, called pythagoras theorem. They also learnt a new property. But somehow, everything went over their head.



Aarav (staring at the board): I don't get it. Why are there so many formulas? Can't math just... make a little bit more sense?

Meera (laughs): Same. I just memorize and hope for the best. My mother tells me rote learning doesn't work in maths. But I don't understand mathematics at all. It's just so difficult.

Ms. Lata (enters the classroom. She was sitting in the staff room): Why are you children inside the class? Do you not want to watch the match?

Aarav: Yes, ma'am. But we just learnt about pythagoras theorem and this new identity, (a+b) whole square. We memorised the formula by heart. But, we never learnt or understood the logic behind it. Our book is only limited to the formula. But we never understood how the identity came to be, why it is the way it is.

Ms. Lata: NCERT textbooks can only give you a good score during class tests. For a good understanding of the subject, we must study the subject deeply. Come, give me a piece of chalk and I will clarify all your doubts today itself.

Ms. Lata draws a big square at the centre. She divides this big square into four smaller squares. Two squares adjacent to one another, have a side a, while the other two adjacent squares have a side, b

Ms. Lata: Now, forget everything that you already learnt and focus on the board. If you notice the biggest square that encompasses the four smaller ones, it has a side (a+b).. We know that the area of a square is side multiplied by side. If we multiply the sides with each other, what do we get?

Meera: If I multiply (a+b) to itself, I will get…..(a+b).(a+b). A number multiplied to itself, is a square. So, (a+b) the whole square!

Ms. Lata: Yes, Meera! Well done! Now, Aarav will answer my next question.

Ms. Lata makes a right angled triangle. One side of the triangle looks greater in length than the other two. She makes three squares adjacent to each side of the triangle. One square has a side a, another one has a side b, and the third one has a side, c. Two squares are smaller than the other one



Ms. Lata: Aarav, keep in mind what Meera has already stated. Tell me, what is the area of a square?

Aarav: It is side multiplied to side, easy!

Ms. Lata: Can you tell me the area of the three squares in the diagram, Aarav?

Aarav: One square has a side, a. So a multiplied by a is a square. The second one has a side b. So the area is b square. And….. the last square has an area c square! Am I right, ma'am?

Ms. Lata: Good! Now, Aarav and Meera, can you take out your craft sheets, and cut out two squares that are approximately the same length as the two smaller squares? Then, place the two squares together on top of the biggest square.

Meera and Aarav cut out the squares. They place it on the largest square. They find the two smaller squares superimpose the biggest square completely.



Meera: Ma'am! Look, they fully cover the big square! Isn't that amazing?

Ms. Lata: Yes! That is true, indeed. We can see their areas are equal. The area of the biggest square is a square, and the other two are c square and b square. How can we write it in the form of an equation?

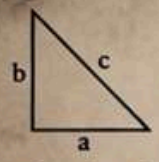
Aarav: Hmm…. The smaller squares together make up the bigger square…. So their sum is equal to the area of the biggest square. So…… we could say- b square plus c square is equal to a square!

Ms. Lata: Correct, beta! This is what Pythagoras theorem also states. The sum of squares of two sides of a triangle is equal to the biggest side, hypotenuse.

Aarav and Meera (*together*): Wow, ma'am, we learnt so much today! Thank you for teaching us!

Ms. Lata: Anytime, children! Whenever you have a doubt from now on, feel free to approach me! Happy Learning!

GLOSSARY



$a^2 + b^2 = c^2$

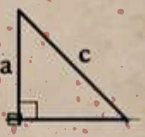
Pythagoras' Theorem
A rule in geometry that says: in a right-angled triangle, the square of the longest side (hypotenuse) is equal to the sum of the squares of the other two sides.

Identity (in Algebra)
An equation that is always true for all values of the variables.
Example: $(a+b)^2 = a^2 + 2ab + b^2$

a^2	b^2	ab
ab	a^2	ab
ab	ab	ab

$a^2 + 2ab + b^2$

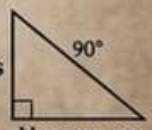
(a+b) whole square
Another way of writing $(a+b)^2$, which means multiplying (a+b) by itself.

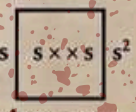


Right-angled triangle
A triangle that has one angle equal to 90°.



Hypotenuse
The longest side of a right-angled triangle, opposite the 90° angle.

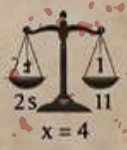




Area
The amount of space inside a shape. For a square, it is side × side.



Superimpose
To place one shape exactly over another so that they match perfectly.



Equation
A mathematical statement that shows two expressions are equal.

NATURE'S PATTERN:

THE FIBONACCI SEQUENCE ALL AROUND US

Math usually doesn't feel like something you'd find outside a classroom. It often comes across as formulas, numbers, and problem-solving. However, it quietly exists in unexpected places like flowers, shells, and even pinecones. One of the most fascinating examples is the Fibonacci sequence.

The Fibonacci sequence is simple. You start with 0 and 1, and each number after that is the sum of the two before it. So it goes like this: 0, 1, 1, 2, 3, 5, 8, and continues on. By itself, it might not seem very special. But when you notice where it shows up in nature, it starts to feel less like coincidence and more like a significant pattern.

Take a shell as an example. If you look closely at its shape, you'll see a smooth spiral that expands outward. This is not random. It follows a form similar to what is called the golden spiral, which connects to the Fibonacci sequence through the golden ratio. This pattern allows the shell to grow without losing its shape. It expands in a balanced and steady way.

Plants also show this pattern, especially in how they grow and arrange themselves. There's a concept called phyllotaxis, which refers to the arrangement of leaves or seeds. In many plants, these arrangements follow Fibonacci numbers. A sunflower is a great example.

If you look at the center, the seeds form spirals in two directions, and the number of these spirals often matches Fibonacci numbers. It may seem like a simple flower, but there is a clear structure beneath it.

The same idea appears in pinecones. The scales form spirals that also follow the sequence. You might not notice it right away, but once you do, it becomes quite clear. These patterns help pack things efficiently and ensure that space is used properly without leaving gaps.

What's also interesting is that these patterns are not just practical; they are visually appealing as well. The golden ratio, which comes from the Fibonacci sequence, is often used in art and design. Many artists and designers use it to create balanced and attractive compositions. This suggests that the reason we find certain things beautiful may relate to these natural mathematical patterns.

In the end, the Fibonacci sequence is not just about numbers. It helps us see how simple rules can lead to complex and beautiful results. Nature doesn't consciously follow mathematical rules, yet these patterns keep appearing. This shows that mathematics is not separate from the world around us but is deeply connected to it.

GLOSSARY

- **Fibonacci Sequence**

A sequence of numbers in which each term is the sum of the two preceding ones, starting from 0 and 1 (e.g., 0, 1, 1, 2, 3, 5, 8...).

- **Golden Ratio**

An irrational number approximately equal to 1.618, often denoted by **φ** (phi), where the ratio of two quantities is the same as the ratio of their sum to the larger quantity.

- **Golden Spiral**

A logarithmic spiral whose growth factor is related to the golden ratio and is often approximated using squares based on Fibonacci numbers.

- **Phyllotaxis**

The study of the arrangement of leaves, seeds, or other plant structures on a stem, often following patterns related to Fibonacci numbers.

- **Spiral Pattern**

A curve that emanates from a central point and moves outward while revolving around it.

- **Spiral Pattern**

A curve that emanates from a central point and moves outward while revolving around it.

- **Mathematical Pattern**

A regular or repeated arrangement governed by a specific rule or set of rules.

- **Self-Similarity**

A property in which a structure appears similar at different scales, commonly observed in fractals and natural patterns.

A Day in Patterns: Discovering Tessellations Everywhere

Dear diary,
Today was unexpectedly very fun because I started noticing something I normally ignore or not care about at all, that is, PATTERNS. Today I came across this word 'tessellations'. At first it felt like one of those maths words that sound serious for no reason, but then I looked at the floor tiles, and that made sense. They were fitting together so neatly, with no gaps or overlaps. And that is basically what tessellations are: tiling patterns made of repeating shapes. Can't believe it took me this long to notice it, lol.

After that, I started seeing them everywhere. The brick wall in the college. The pattern on my notebook cover. The window grill. Even the pavement looked more interesting than usual. It was weirdly satisfying. I feel like these things are always around me, but I just never notice them properly.

After that, I started seeing them everywhere. The brick wall in the college. The pattern on my notebook cover. The window grill. Even the pavement looked more interesting than usual. It was weirdly satisfying. I feel like these things are always around me, but I just never notice them properly.

Most of these patterns are made using polygons like squares, triangles, and hexagons. Some are simple, where one shape repeats again and again in a neat way. Those are called regular tessellations, and the floor tiles at home are the most obvious example. But some patterns use more unusual or mixed shapes, and those are irregular tessellations. I honestly find those more interesting because they look more creative.

he best part, though, was finding out about Escher tessellations. I genuinely thought tessellations were just going to be plain geometric patterns, but then I saw how this Dutch graphic artist, M. C. Escher, made them using birds, fish, and other figures that still fit together perfectly and looks so beautiful. That is such a cool idea. I'm impressed i must say. It is maths, but it also feels like art. Wow such maths are so fun to learn. Now I kind of want to look up more of his work because it is just so satisfying to see.

I also understood symmetry and transformation a bit better today. Some shapes repeat by translation, which just means they slide in the same direction, like square floor tiles laid one after another. Another term 'rotation' is when a shape turns around, and 'reflection' is when it flips like a mirror image. I could imagine this in rangoli designs or wall patterns where the same design repeats but looks turned or reflected. It sounds technical at first, but examples like these make it much easier to understand.



Tessellations are not just textbook stuff. They show up in design and architecture too — in floors, walls, decorations, and buildings. Honestly, I did not expect that one random look at floor tiles could teach me this much. Kind of a lot of knowledge for one day, not gonna lie. But it was fun, right?
Alright, I'll talk to you later

Until next time,
Soumya

Glossary

Tessellation – A pattern made of shapes that fit together perfectly without gaps or overlaps.

Tiling Pattern – A repeated arrangement of shapes covering a surface, like floor tiles.

Repeating Shapes – Shapes that occur again and again in a pattern.

Polygon – A closed shape with straight sides, such as a triangle, square, or hexagon.

Regular Tessellation – A tessellation made using only one type of regular polygon repeated throughout.

Irregular Tessellation – A tessellation made using different shapes or uneven patterns.

Escher Tessellation – Artistic tessellations created by M. C. Escher using figures like animals that still fit together perfectly.

Symmetry – When a shape or pattern looks the same on both sides.

Transformation – A way of changing a shape's position or orientation.

Translation – Sliding a shape from one place to another without rotating it.

Rotation – Turning a shape around a fixed point.

Reflection – Flipping a shape to create a mirror image.

Did You Know?

Quick interesting facts about mathematical patterns in art or nature.

Content- Manya Bhatia

Fibonacci Sequence and the Mathematics of Natural Growth

The Fibonacci sequence exists as a mathematical rule that many natural growth patterns in nature use as their foundation. The sequence starts with two base values and uses the recursive formula

$$F_n = F_{n-1} + F_{n-2}$$

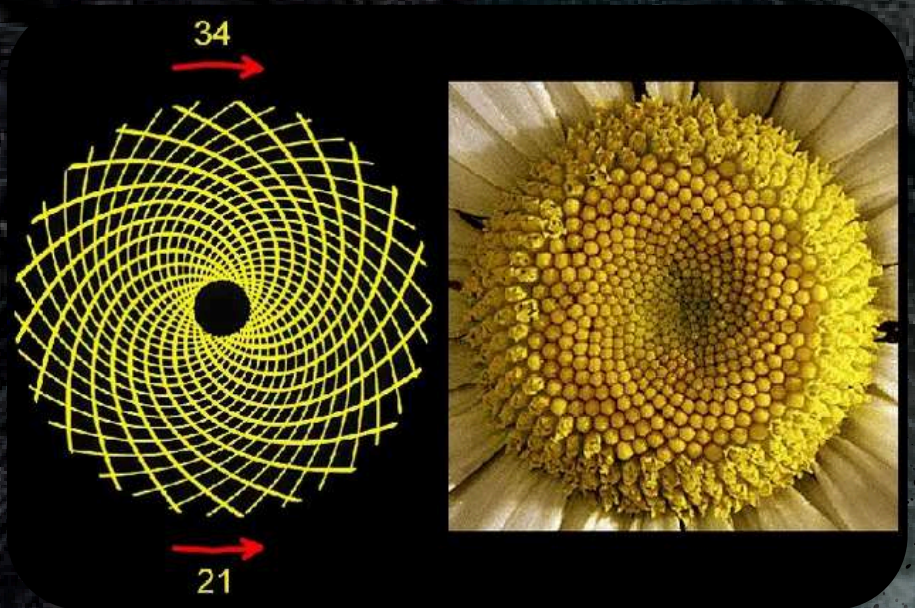
to produce its subsequent values. The sequence generates numbers whose ratios approach the golden ratio

$$\phi = \frac{1+\sqrt{5}}{2} \approx 1.618.$$

In sunflowers and pinecones, the number of spirals in opposite directions often correspond to consecutive Fibonacci numbers. The arrangement of this system emerged through optimization processes instead of being established through random selection. The angular separation between seeds tends toward the "golden angle" which measures approximately 137.5° because this angle provides the best solution for minimizing overlap while achieving maximum packing efficiency. The situation mathematically represents an optimal distribution challenge. The sequence's progression leads to the ratio of

$$\frac{F_{n+1}}{F_n} \to \phi$$

approaching phi which creates natural-looking balanced spiral patterns. The recursive sequences together with their limits allow humans to comprehend nature's growth patterns because mathematical principles control all natural growth processes.



Symmetry and Group Theory in Artistic Patterns

Content- Manya Bhatia

Many artistic patterns develop from mathematical symmetry as their foundational element. Symmetry exists as a combination of transformations which preserve an object's original form through reflection and rotation and translation movements.Scholars who study group theory investigate mathematical transformations that generate structures which create groups.

The y-axis reflection transforms to $R(x,y)=(-x,y)$.

While the rotation operates as $R\theta(x,y)=(x\cos\theta-y\sin\theta, x\sin\theta+y\cos\theta)$.

The original pattern design remains intact through these transformations.

Artists create geometric art and tilings by using recurring elements which adhere to specific symmetry patterns. The group structure maintains all transformations as valid symmetry operations. The design maintains its visual elements through this method.

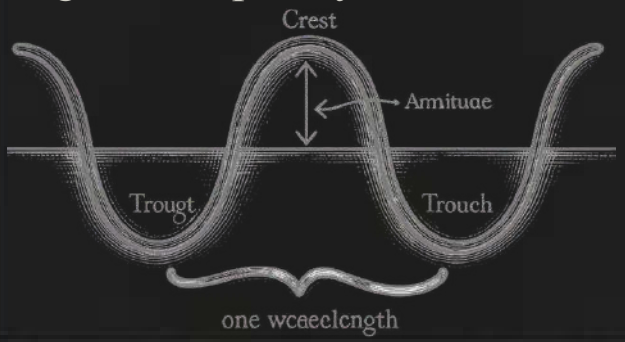
Artists use mathematical transformations to develop visual symmetry which forms the basis of their artistic expression. The art reveals how symmetry links beautiful visual elements to their fundamental mathematical patterns.

Wave Patterns and Mathematical Interference

Content- Manya Bhatia

Researchers utilize mathematical equations to explain the specific patterns which develop from water ripples and sound waves. Scientists employ sine and cosine functions as their primary technique to construct wave models.

The equation $y=A\sin(kx-\omega t)$ represents a fundamental wave pattern.
The equation A represents amplitude while k functions as the wave number and w stands for the angular frequency.



According to the superposition principle two or more waves create distinct interference patterns through their overlapping behaviour. Two waves with identical phase channels combine their respective amplitudes to create constructive interference patterns. The system undergoes destructive interference when two waves work in opposite phases to cancel each other out. The interactions can be depicted as function addition. Water surfaces and light waves and sound all display similar patterns.

The study of wave behavior shows that natural phenomena follow mathematical relationships which connect periodic functions with superposition

Fractals and Infinite Patterns in Nature

Content- Manya Bhatia

Fractals exist because many natural structures create repeating patterns which continue to exist throughout all size dimensions. A fractal describes a shape which maintains the same appearance through its entire structure. Fractals exist as mathematical objects which emerge through the process of applying a function repeatedly for multiple iterations.

The Mandelbrot set exists as a well-known fractal which mathematicians define through the recurrence relation EQUATION



Fractal patterns exist in nature through their presence in trees and coastlines and lightning strikes. The tree branch divides into smaller branches which maintain the same structural pattern to support efficient nutrient distribution. This demonstrates how patterns retain their original form between different dimensions. Fractals show how basic mathematical rules can create complex structures. The system creates a transition space between two extremes which results in a system that creates natural patterns through the use of repeating elements and mathematical principles.

Myth vs Reality

Is Golden Ratio Really Everywhere?

Denoted by the Greek symbol (Phi), the "Golden Ratio" is often treated like a universal standard of beauty. Many people believe that anything beautiful must follow this special ratio of 1.618, as if there exists a hidden rule behind what we find attractive. But in reality, not all of these claims are entirely true. Many have been exaggerated over time. That's why, it's important to pause and understand what is a fact and what is a commonly believed myth.

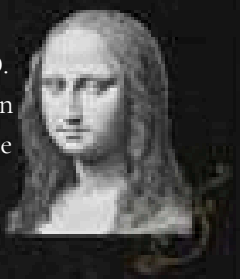


1. The "Perfect" Human Face

Myth - Human beauty is objectively defined by the presence of Golden Ratios in the proportions of facial features (e.g., the hairline to eyes width, nose to mouth width, etc).

Reality - Studies that measure facial beauty have found no "convincing evidence" of facial attractiveness that has been linked to the Golden Ratio. Moreover, beauty is subjective and highly varies across different cultures and ethnicities.

2. The Mona Lisa (Leonardo da Vinci)



Myth - We love to draw golden rectangles over her face, claiming her nose, eyes, and chin align perfectly to φ.

Reality - Leonardo never mentioned it. He used simple and rational ratios (like 1:2). When people draw golden grids over her face, they usually start the lines at arbitrary points (like the edge of an eyelid, the tip of the nose etc) to relate it with the Golden Ratio.

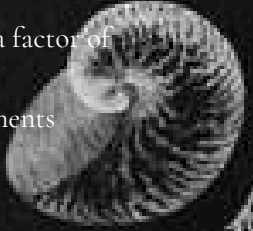


3. Wolfgang Amadeus Mozart

Myth - Scholars claim that Mozart was a "mathematical genius" who timed his sonatas so the climax hits exactly at the 61.8% mark of the song.

Reality - Mozart was a genius of emotion and flow. He wrote music that felt right to the ear. We can find the Golden Ratio in his work, but there is zero evidence in his letters and drafts that he was deliberately doing that so that he adhered to the Golden Ratio.

4. The Nautilus Shell



Myth - The chambered nautilus shell grows in a perfect logarithmic spiral (a spiral that expands by a factor of every quarter turn). This makes nature's perfect example of this Golden Ratio..

Reality - While the nautilus shell is a logarithmic spiral, it is not a golden spiral. Scientific measurements show that nautilus shells vary greatly and it rarely ever follows the 1.618 ratio.

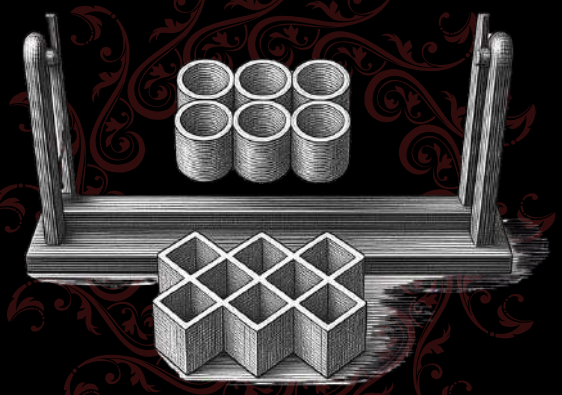
THE MATH BEHIND OPTICAL ILLUSIONS

Ambiguous Object Illustration using Geometric Transformations

Content- Manya Bhatia

Can a singular object be circular and appear square in the reflection at the same time?

Can a singular object be circular and appear square in the reflection at the same time?



The illusion shows that one object becomes circular through direct observation yet shows a square appearance through its mirror image.
So what's the math behind it?

Kokichi Sugihara investigated this phenomenon.

The reason behind this is that the object is not actually a circle or a square The holes are carefully distorted shapes. They are close to circles from one angle and close to squares from another.So mathematically, the boundary is something like:
f(x,y,z) = 0, a 3D surface not a simple equation like x^2 + y^2 = r^2(circle)
Now since a mirror reflects points, the equation becomes (x, y, z) → (x, y, -Z)
But what you see is not just reflection it's a projection onto your eye (2D).
In conclusion ,from the front view, the boundary aligns smoothly looks like a circle similar to x^2 + y^2 = r^2 .But From the mirror view Depth (z) gets flipped, Edges that were curved now line up differently and looks like straight lines |x/<=a, lyl= a. So the full process is:
Object (3D) → Reflection (transform)→ Projection (to 2D image)

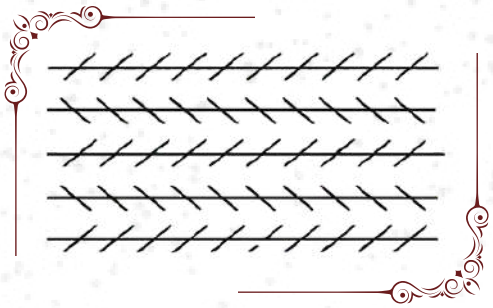
Hence the illusion revealing mathematics is both logic and art.

The Zöllner Illusion: When Parallel Lines Deceive

Content- Manya Bhatia

The Zöllner illusion demonstrates that straight parallel lines can appear tilted. The illusion shows that long parallel lines become non-parallel when short diagonal lines cross them.

The lines maintain their parallel relationship because the two slopes of the lines maintain equal value which results in **m1=m2**



The brief diagonal lines create angles which disrupt our ability to accurately perceive the situation. The angle between two lines is defined mathematically through:

$$\tan\theta = |(m_2 - m_1) / (1 + m_1 m_2)|$$

The brain interprets a non-zero angle because the diagonals create an illusion of movement which exists between both endpoints of the diagonals.

The brain processes visual information by concentrating on immediate visual patterns instead of interpreting complete visual details.

The question arises about our geometric understanding because parallel lines can show non-parallel characteristics to our perception.





Department report

Department Assemblies

Mathematics in Nation-Building

29 January 2026 | Third Floor Hall

The Department of Mathematics organized a Republic Day–themed assembly on “Mathematics in Nation-Building.” The program highlighted the role of mathematics in national development through a poem tracing contributions from ancient scholars like Aryabhatta to modern figures such as Neena Gupta. It connected mathematical concepts to real-world applications including infrastructure, space missions like Chandrayaan, and economic planning.

The assembly also featured a Thought of the Day and a news segment linking mathematics to global progress. The Principal, Molly K. A., appreciated the initiative and emphasized the importance of analytical thinking in nation-building.



Breaking Barriers – Women in Mathematics

12 March 2026 | Third Floor Hall

The department conducted its final assembly of the session on “Breaking Barriers – Women in Mathematics,” celebrating the contributions of women mathematicians. The program included a poem, the Times Mathematica news segment, and a Thought of the Day inspired by Maryam Mirzakhani, highlighting perseverance in mathematical discovery.

Vice President Komal Mishra expressed gratitude to the Principal and faculty for their support. In the Principal’s absence, Ms. Rama Saxena addressed the gathering, appreciating the department’s efforts. The assembly concluded on an inspiring note, reinforcing inclusivity and curiosity in mathematics.

Alumni Talk: From Proofs to Professions

27 February 2026 | AV Room

The Department of Mathematics, Jesus and Mary College, University of Delhi, organized an interactive alumni session titled “From Proofs to Professions.” The event aimed to reconnect students with distinguished alumni and provide insights into diverse career paths.

The session featured Ms. Juhi Chugh and Ms. Tusha Chawla (Batch 2004–2007), who shared their academic journeys and professional experiences. Juhi Ma’am, currently associated with KPMG, highlighted the importance of strong fundamentals, analytical thinking, and confidence in navigating corporate careers. Tusha Ma’am, an independent lawyer practicing at the Supreme Court of India and the Delhi High Court, emphasized consistency, balance, and resilience in pursuing legal and academic goals.

A special video message by Ms. Elizabeth Mohan highlighted opportunities in the armed forces and encouraged students to explore careers in national service. The session concluded with a heartfelt tribute video and a vote of thanks, making the event both insightful and nostalgic.

Matharena 2026

2 April 2026 | Jesus and Mary College, University of Delhi

The Department of Mathematics hosted its annual academic fest Matharena 2026 under the theme “Dimension of Thought: From Concept to Conquest.” The event featured a range of academic and creative competitions, including a Paper Presentation Competition, the quiz “Kaun Banega Ganitpati 2.0,” a photography competition “Pixels” in collaboration with Tabeer, and the theatre competition “Scene-quence” in collaboration with Troubadours. These activities encouraged students to engage with mathematical ideas through creativity, analysis, and performance.

The highlight of the fest was the Emerging Scholars National Conference on “From Mathematical Foundations to Real-World Systems: Analysis, Modelling, and Quantitative Understanding of Complex Phenomena,” providing a platform for research-oriented discussion and academic exchange.

As part of Matharena, Algorithm organized its annual competition “Pi-tch Perfect!”, a pitching competition designed to encourage innovative thinking and creative presentation skills. The event commenced with a warm welcome to the esteemed judges, Dr. Daunthanliu Panmei and Dr. Ashwati C.K., followed by a briefing on the rules and structure of the competition. Participants presented a diverse range of ideas, with some creatively reinterpreting mathematical concepts such as Napier’s Bones in contemporary contexts. The competition witnessed enthusiastic participation, with Team Mentis securing the first position and Team Rocket finishing second. The event successfully highlighted the spirit of innovation and the practical relevance of mathematical thinking.

Farewell: Mehfil-e-Yaadien

27 April 2026 | Room 303

The Department of Mathematics organized its farewell themed “Mehfil-e-Yaadein” to bid a heartfelt goodbye to the outgoing batch. The event was filled with nostalgia, memories, and appreciation for the graduating students.

The highlight of the event was the Miss Farewell Contest, which showcased the talents and personalities of the participants. A total of ten participants presented a variety of performances, including dance, singing, speeches, poetry, and beatboxing, making the celebration vibrant and engaging.

The title of Miss Farewell was awarded to Ms. Neha, while Ms. Avni Jain was honored with the title of Ms. Perfect Equation. Both winners captivated the audience with their poetry presentations, adding an emotional and meaningful touch to the occasion.

The farewell concluded on a warm and memorable note, celebrating the journey of the students and wishing them success in their future endeavors.

Achievements

Riddhi Singhal

- Secured 2nd position in the Delhi University Inter College Handball Tournament (2026).
- Served as the Special Coordinator for the Department of Physical Education (2025–26).
- Successfully placed at 1Lattice through the placement drive of Jesus and Mary College.

Kimaya Duggal

- Winner of Speed 180, a case competition organized by 180 Degrees Consulting, Jesus and Mary College.
- Completed an internship at McCain Foods.

Avni Jain

- Presented ‘Mathematical Characterisations of Accuracy Loss in Differentially Private ML Models’ at a peer reviewed conference International Conference on Informatics and Mathematical Sciences 2025 held by Society for Education. Indexed on Academic Research Library.
- Won first runner up at Emerging Scholars National Conference organised by Department of Mathematics, Jesus and Mary College under their annual fest, Matharena 2026.
- Selected as DU Beat 21 under 21 for my achievements and contributions in Literature.
- Treasurer of Women’s Study Centre, Jesus and Mary College.

- **Reena** was awarded the Highest CGPA in the department, reflecting exceptional academic performance.
- **Chestha** secured 1st position in 3rd Year.
- **Neha** secured 1st position in 2nd Year.
- **Sarah Singh** secured 1st position in 1st Year.

Editorial Board

DESIGN: PRANATI KHANNA



Shruti Sachdeva

Editor-In-Chief



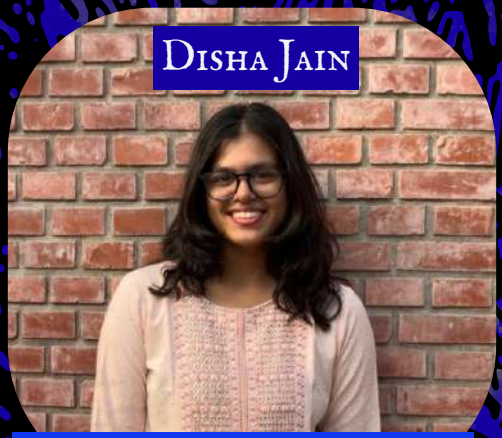
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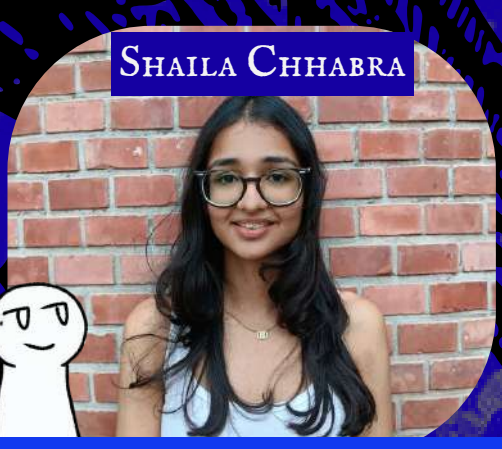
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soumya jacob
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suhani
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taarini trehan
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vrinda kwatra
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zainab
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Senior Sign Off '26













