

# ACADEMIC TALK

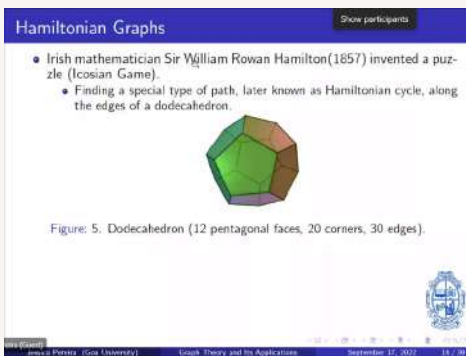
## GRAPH THEORY AND ITS APPLICATIONS

On the 17th of September 2022, "Tesseract" - the Mathematics Society of Shivaji College, orchestrated an online webinar titled "Graph Theory & Its Applications," under the guidance of the esteemed Principal of Shivaji College, Prof. Shiv Kumar Sahdev, and the Teacher-in-Charge of the Department of Mathematics, Dr Deepti, on the platform, Microsoft Teams. The webinar was an endeavour to delve into the intricate concept of graph theory and its multifaceted application to solve real-world problems.

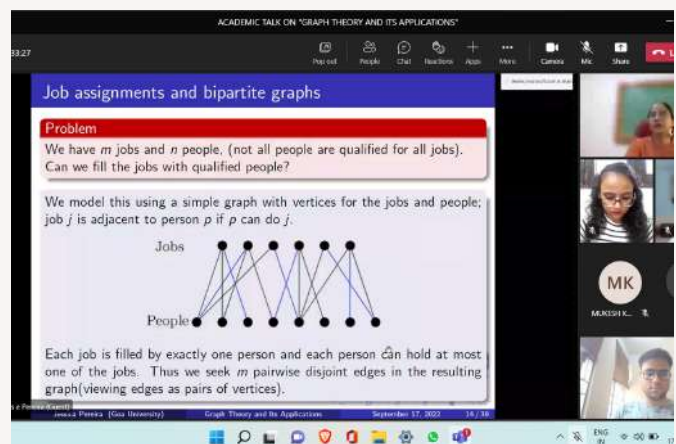
The event commenced by introducing the distinguished speaker, Dr Jessica Fernandez E Pereira, and inviting Dr Deepti to welcome the revered speaker with her kind words and usher the audience to the event.



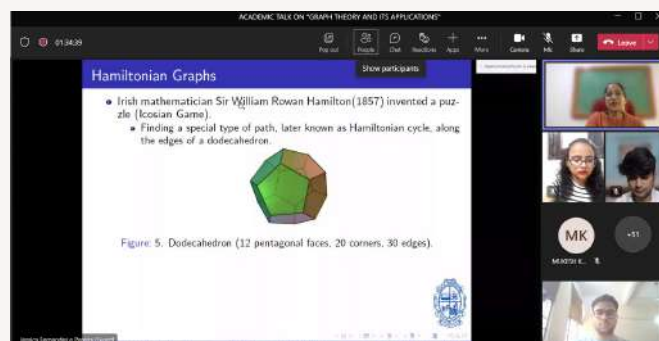
She then raised an intriguing question, "What is a graph?" and presented her perception of graphs after acknowledging answers from various students.



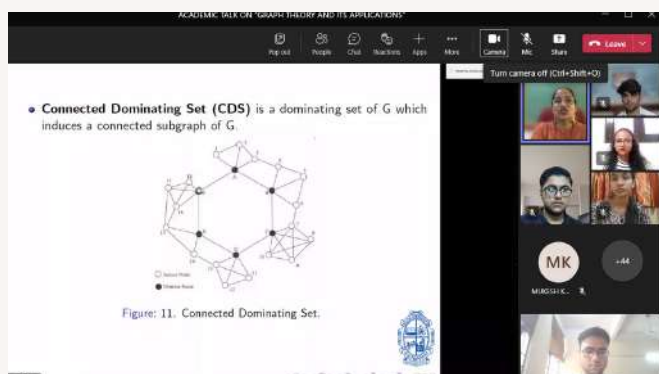
Dr Jessica commenced her address by thanking the organisers for conducting the event and then unfurled the history of graph theory, narrating how the Swiss Mathematician, Leonard Euler, presented a solution to the Konigsberg bridge problem, thereby laying the foundation for graph theory.



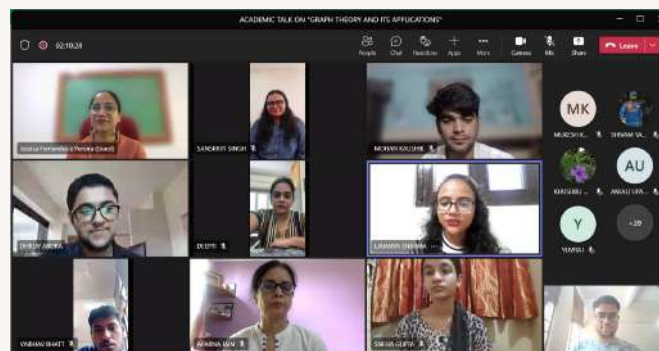
She went on to explain various terminologies related to the subject, apprising the attendees that in graph theory, a real-life problem is modelled as a graph and then worked upon. With various examples, she demonstrated how graphs can be related to real-world conundrums.



Towards the end of the session, the Q&A round was conducted, and Dr Jessica enthusiastically and patiently answered all the queries posed by the students. She appreciated the students for their thought-provoking questions, reflecting their keen interest in the subject. The event concluded with the Vote of Thanks by the Associate Professor, Dr Aparna Jain, who extended her gratitude to the guest speaker for her time and positive response throughout the webinar. She also acknowledged the student council of the Department of Mathematics for the successful completion of the event.



Dr Jessica expounded on several concepts such as the Eulerian graph, Acquaintance relation, Graph model, Job assignment and Bipartite graphs, and their applications. Delving into the Hamiltonian graph and Hamiltonian cycle, she explained its application in puzzle games and how humans become addicted to such games.



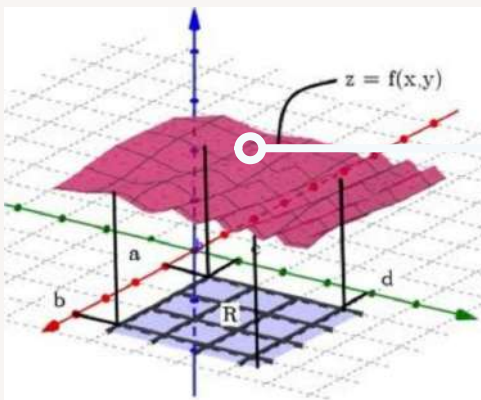
The event went on to enlighten listeners about other notions of graph theory, such as Isomorphism, Planar & Utility graph, graph colouring and graph labelling, and how graph theory has its implemented in every field, from DNA sequencing to software testing, modelling urban cities, and solving day-to-day problems.

All in all, the event was an informative and comprehensive session, which provided an excellent platform for the attendees to gain insights into the complexities of graph theory and its practical applications.

# ACADEMIC TALK

## MULTIPLE INTEGRALS : SOME ODDS AND ENDS

The Mathematics Society of Shivaji College, popularly known as "Tesseract", organised an enlightening online academic talk on the intriguing topic of "Multiple Integrals: Some Odds and Ends" on 15th October, 2022, under the guidance of esteemed Prof. Shiv Kumar Sahdev, the Principal of Shivaji College and the Teacher-in-charge of the Department of Mathematics- Dr Deepti, on the Microsoft Teams platform. The webinar was a comprehensive exploration of the concept of multiple integrals and their different approaches.



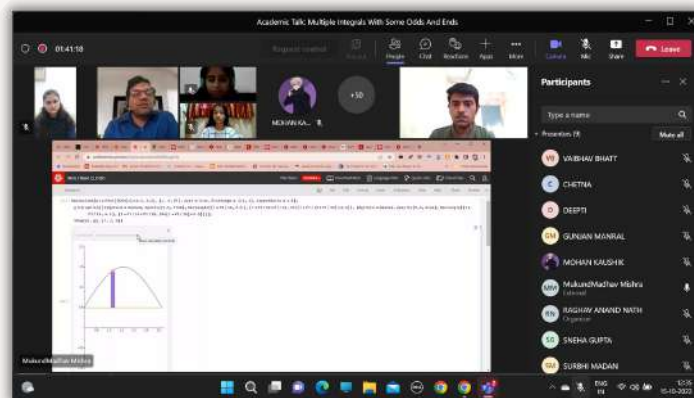
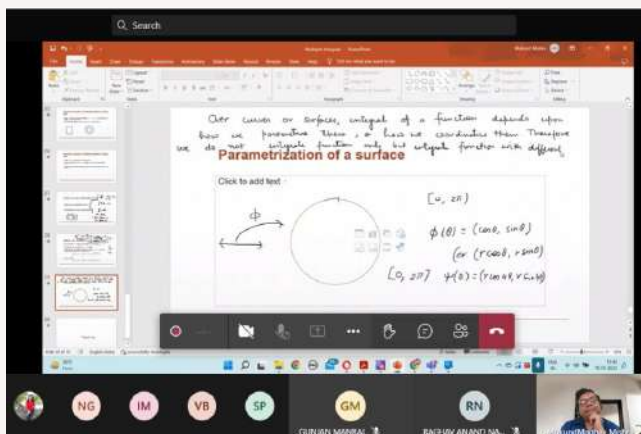
The event commenced with the introduction of the distinguished speaker, Dr Mukund Madhav Mishra, and welcoming him with kind words by Dr Surbhi to carry forward the talk. Dr Mukund expressed his gratitude to the organisers and the student council for the opportunity to present. He began with a crisp and precise definition of the double integral, which laid the foundation to highlight the issues with different definitions of multiple integrals.



He explained that for double integrals, the concept of partial differentiation in two variables is employed and is termed "Iterated Integrals." He also raised the question of the correctness of the definition of Iterated Integrals, making the talk more engaging.

The talk continued with an explanation of the "Riemann Integral," and Dr Mukund effectively involved the audience by asking them a question about the definition of the Riemann Integral. He further made a conclusion that the two approaches of Double Integrals are consistent. Dr Mukund then expounded on what can go wrong while using the Riemann Integral method and elucidated the Fundamental Theorem of Integral Calculus.

The webinar was rich in content and effectively explained various concepts and examples such as Fubini's theorem and its failure, double sequence examples, the positive and negative parts of a function, multivariate integrals, computation of double/triple integrals, change of variables, Jacobian of transformation and its role, Zero Jacobian and non-zero Jacobian, integral over a surface, and parametrization of a surface. Dr Mukund used Wolfram Mathematica to showcase the Riemann-type approach in two variable cases and make the talk more interactive.

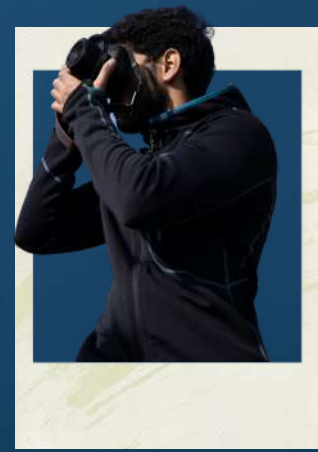


The Q&A round that followed the talk was interactive and thought-provoking. Dr Mukund patiently answered all the queries of the students and appreciated their enthusiasm and engagement throughout the session. The event concluded with a final vote of thanks by Dr Deepti, acknowledging the guest speaker, Dr Mukund, for his time and effort, and expressing her gratitude to the honourable Principal, Prof. Shiv Kumar Sahdev, for providing the opportunity to conduct the academic talk. She also recognized the student council of the Department of Mathematics for the successful completion of the event.

In conclusion, the online academic talk was an informative and engaging session, which undoubtedly contributed to the enhancement of the attendees' knowledge and understanding of the concept of multiple integrals and their different approaches.



# PHOTOMATICS



The Department of Mathematics organized a submission-based photography competition on the theme "Symmetry and Puzzles." The competition received an overwhelming response from students of college and universities across the state, showcasing their artistic skills in capturing the essence of Mathematics.

The entries were evaluated on the basis of originality, creativity, and relevance to the theme. In addition to this, number of likes on their entries on our instagram page also added to the judging criteria. We were impressed by the quality of the submissions and found it challenging to select the top entries.

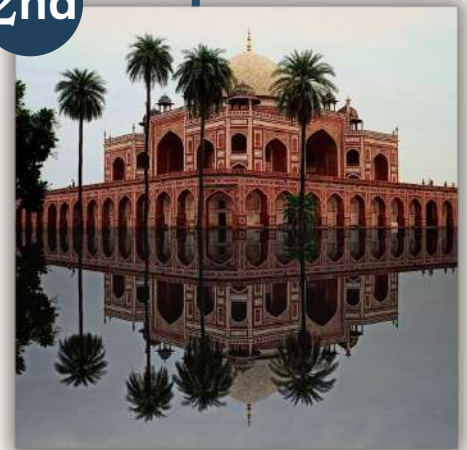
The winning entries were posted on our social handles by the Department. The photographs showcased a wide range of interpretations of symmetry and puzzles, highlighting the beauty and diversity of Mathematics along with our heritage.

The competition proved to be a great opportunity for the students and faculty members to showcase their creativity and appreciation for the subject. The Department plans to organize more such events in the future to promote interdisciplinary learning and foster a creative culture within the Mathematics community.

WINNING

ENTRIES

2nd



1st



# Fresher's Party



*"The more you praise and celebrate your life,  
the more there is in life to celebrate."*

This quote holds true for every student who eagerly anticipates their most memorable occasion - the freshers' party, from the moment they are admitted. The purpose of a freshers' party is to create a warm and friendly atmosphere that encourages creative impulses and boosts confidence. "TESSERACT" - the Mathematics Society - lived up to this purpose by organising a freshers' party "Euphoria" with 90s nostalgia to welcome the freshmen to the department, with energy, joy, and excitement filling the air. The participants were exquisitely attired, with hints of the 90s theme and partying like it's 1999.

Upon entering the auditorium, the new students were greeted with a personalised welcome letter and a gift box. The beginning of the party was bolstered by cheery grins and positive attitudes, with the newcomers walking enthusiastically to 90s music.



Both freshmen and seniors got a chance to display their talent through a variety of dance performances, including solo, couple, and group dancing, as well as by playing a variety of instruments. The live singing performance of 90s songs enthralled everyone, and the magical violin performance enhanced the atmosphere of the auditorium. For the newcomers, there were numerous games with fantastic prizes.





The freshers had an incredible zeal for those games, especially the memorable "Draping the Saree," which brought a lot of laughter and excitement among the audience.

Dr Deepti, the head of the Department of Mathematics, gave blessings to the newcomers and shared her valuable experiences with them, providing them with inspiration and guidance. The chunk of the party was the "Titles." The titles awarded were Mr Fresher and Miss Fresher, with special awards for the best-dressed, Mr Hotshot and Miss Chandni, and others like Showstopper and Disco Dancer. All title winners were given amazing prizes.

The party concluded with the cake cutting and dance, making it a special and treasured day for all those who attended. The freshers' party organised by TESSERACT truly lived up to its purpose, welcoming the newcomers and encouraging them to pursue their creative impulses with confidence, setting the tone for the rest of their academic journey.



# International Conference on Analysis and its Applications

The Mathematics Department of Shivaji College hosted a 2-day "International Conference on Analysis and its Applications" on 27th and 28th February 2023.

The first day of the conference started off with the inauguration ceremony, conducted by Dr. Neetu Rani, Assistant professor, Department of Mathematics, Shivaji College, in the college auditorium with the lamp lighting ceremony under the guidance of our honorable Principal, Prof. Shiv Kumar Sahdev. The ceremony was honored by two distinguished guests, Prof. Balaram Pani, Dean of Colleges, University of Delhi, and Prof. Ajay Kumar, Senior Scientist, Department of Mathematics, University of Delhi.



Thereafter began the plenary talk session after a short breakfast, chaired by Prof. Renu Chug - a renowned expert with a specialization in Non-Linear Functional Analysis, Fuzzy Mathematics, Fractals, and Chaos, introducing her speaker, Prof. Y. Kimura, Department of Information Science, Toho University, Japan, who gave an incredible talk on the topic, "A variation of the shrinking projection method on geodesic spaces' ". It was an interesting and educational session that undoubtedly benefited in comprehending the subject better.

Furthermore, Prof. Anuradha Gupta - an exceptional scholar with specialization in the Theory of Operators, took the stage and introduced her speaker, Prof. Kapil K. Sharma, Department of Mathematics, South Asian University, New Delhi, who gave an instructive and fascinating session on the topic, "Singularity Perputed Problem and its Solution", for the proper understanding.



Following a brief lunch break, the second phase of the plenary talk started. We were joined by Dr. Izhar Uddin, Department of Mathematics, Jamia Millia Islamia, New Delhi, chaired by Dr. Neetu Rani - an exceptional scholar with specialization in Seismology, Applied

Mathematics, and Operational Research. He took the stage and introduced the audience to the recent progress in Fixed Point Theory, keeping the talk vibrant and enlightening.

Then, Prof. Y. Rohen Singh, Department of Mathematics, Manipur University joined the stage, under the chairperson, Dr. Jeetendra Aggarwal - a highly accomplished scholar with a specialization in Topology. Prof. Singh delivered an enlightening session on his topic



“Fixed Points and Generalisation of Metric Spaces-A Survey” and kept the session lively and informative.

Moving forward began the paper reading session after a short tea break. It was conducted simultaneously in three different locations - in Computer Lab-3, Computer Lab-4, and Auditorium, Jijabai block. The sessions were chaired by Prof. Mridula Budhraja - a highly distinguished scholar with a specialization in Dynamical Systems, Dr. Preeti - a highly acclaimed scholar with a specialization in the field of Functional Analysis and Operator Theory, and Dr. Pragati Madan - a distinguished scholar with specialization in Operator Theory. All the paper reading sessions were really insightful and fascinating, with presenters sharing their extensive knowledge with the audience.

And with this, came the end of the first day of the conference



The Second day started off with online plenary talks, beginning with Prof. Fathalla A. Rihan, Department of Mathematical Sciences, UAE University, Al Ain, UAE, on the topic- “Delay Differential Equations and Applications to Immunology”. He was chaired by Dr. Deepti - an extremely qualified scholar with a specialization in Fluid Dynamics and Statistics. The talk was really enlightening since he was going through every concept patiently.

After that, we were joined by Prof. Ahmed Al Rawashdeh, Department of Mathematical Sciences, UAE University, Al Ain, UAE, under the chairperson, Dr. K. Priyanka - an exceptionally qualified scholar with specialization in Sampling Theory, Statistical Inference, Sensitive Estimation Theory, Statistical Modelling,



and Missing Data Analysis. He began with the session on his topic - “Classifications of  $C^*$  - Algebras using Unitary Groups” and made the talk instructive and insightful. Further, we were joined by Prof. E. Malkowski, Department of Mathematics, State University of Novi Pazar, Serbia. He was introduced by Dr. Babita - an extremely qualified scholar with a specialization in the field of Functional Analysis. He spoke on the topic- “Some measures of Non- Compactness and their Applications”. It was a knowledgeable session with interesting concepts.

After a short tea break began the paper reading session and just like the previous day, it was conducted simultaneously in three different locations - in Computer Lab-3, Computer Lab-4, and Auditorium, Jijabai block. The sessions were chaired by Prof. Y. Rohen Singh - a highly accomplished scholar with a specialization in Functional Analysis, and Prof. Anju Gupta - a highly distinguished scholar with a specialization in multiple domains like Generalized Exponential

Operators and Difference Equations, Fuzzy linear programming, etc., and Prof. R. D. Sharma - an eminent scholar with specialization in Topology and Fuzzy Set Theory. With the in-depth knowledge of the presenters, the session was incredible. An online session was also conducted concurrently during this period, chaired by Dr. Surbhi Madan - a highly distinguished scholar with a specialization in Algebraic Coding Theory.

Furthermore, after a short lunch break, the plenary talks began. It began with Dr. Aparna - a highly distinguished scholar with specialization in various domains, some being Algebra, Fuzzy Set Theory, Fuzzy Algebra, Discrete Mathematics, etc., taking the stage to introduce her speaker to the audience, Prof. Sachi Srivastava, Department of Mathematics (South Campus), University of Delhi, New Delhi. She spoke on the topic - "Polynomial Stability, Delay Semigroups, and Damped Wave Equations" and made the session educational with intriguing and interesting concepts.



After that, we were joined by Dr. Hazel Yuksekkaya, Department of Mathematics, University of Dicle, Diyarbakir, Turkey, under the chairperson, Dr. Javed Ali - a highly accomplished scholar with specialization in multiple domains like Non - Linear Functional Analysis,

Fuzzy Metric Spaces and many more. She began the session with her topic - "Existence and Blow-up of Solutions for a Wave Equation with Time-Delay ". The session was really insightful and fascinating with interesting concepts.



Moving further with the conference began the valedictory session conducted by Dr. Surbhi Madan where our distinguished chief guest, Prof. Ruchi Das, Head of the Department of Mathematics, was honored by the honorable Principal, Prof. Shiv Kumar Sahdev, and the participants were also felicitated with certificates for showing enthusiasm and for sharing their extensive knowledge.

And this brought us to the end of an amazing, comprehensive, and insightful 2-day conference. Taking this opportunity, the Department of Mathematics of Shivaji College would like to thank the speakers from both days for taking their valuable time and enriching us with the

knowledge shared via this conference, which is definitely going to assist many in the long run, and since our department always works in the direction of progress, we will soon be back with another such wonderful event.

# X-IOM - 2023

## Battle of Minds



**"Challenges play a crucial role in personal and professional development, providing opportunities to learn new skills, gain valuable experience, and grow as individuals."**

The Department of Mathematics at Shivaji College was presented with such an opportunity in the form of a competition held at Government College of Arts, Science and Commerce, Sanquelim-Goa.

The College of Arts, Sciences, and Commerce Sanquelim invited the Department of Mathematics at Shivaji College to participate in their annual Math Department's fest, Xiom 2023 organized by the Post-Graduate Department of Mathematics, in association with the D.H.E and the D.S.T.W.M on 3rd and 4th March, 2023. The festival was designed to celebrate the beauty of Mathematics through a variety of competitions.

Around 11 teams from different states of India participated in the competition. The invitation was accepted by a team of 18 students who were eager to demonstrate their Mathematical



proWess along with 2 teachers to guide and mentor them. The team from Shivaji College began preparing for the competition, focusing on honing their Mathematical skills and techniques. They were determined to prove their mettle and make a strong showing at the festival.

Participating in the Math Xiom-23 festival presented several challenges for the team from Shivaji College. They had to prepare for a variety of competitions, which involved paper presentation, standup comedy, quizzes, rapid fire rounds, dance competition, treasure hunt, etc. each requiring different skills and approaches.

The team members had to work hard and collaborate effectively to ensure they were ready for each competition. They had to prepare a mascot as well which would represent them & their thoughts.

Despite the challenges, the team from Shivaji College persevered and ultimately made an impressive showing at the Math Xiom-23 festival. The students of Shivaji made their presence louder by grabbing a total of 8 medals, 2 gold, 5 silver and 1 Bronze and gave a tough battle in almost all competitions.



**Among all the students who showed their tremendous performances, following won the medals in the respective competitions:**

## **GOLD MEDAL**

### **MATH WHIZ (HIGHER LEVEL MATHEMATICS QUIZ COMPETITION)**

Sanskriti (IIIrd Year)  
Amit Gupta (IIIrd Year)

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## **SILVER MEDAL**

### **SLIDE WARS (PAPER PRESENTATION)**

Mohan Kaushik (IIIrd Year)

### **LAND PIRATES (GAMING COMPETITION)**

Rakshit Yadav (IIIrd Year)

Shashank Dandriyal (IInd Year)

### **PLANET OF THE APPS (GEOGEBRA)**

Shruti Gupta (IIIrd Year)

Rahul Chaurasia (IIIrd Year)

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## **BRONZE MEDAL**

### **MATH KRAFT(POSTER MAKING)**

Sneha Gupta (IInd Year)



We truly believe that participating in competitions and taking on challenges is essential for personal and professional growth. The experience gained through such endeavors is invaluable and can help individuals develop important skills and abilities that will serve them well in their future endeavors. The Department of Mathematics at Shivaji College rose to the challenge presented by Math Xiom-23 and demonstrated their passion and expertise in Mathematics.

Despite of the hectic schedule during the 2 day event, the organisers of the event hosted a full day Goa tour for the outstation students as well!



# INFINITY ' 2023 - ANNUAL FEST

On April 24, 2023, the Department of Mathematics hosted its annual fest "INFINITY" with the guidance of the esteemed Principal, Prof. Shiv Kumar Sahdev, and the Teacher In-Charge of the Department of Mathematics, Dr Deepti. The fest kicked off with four concurrent competitions, the paper presentation, poster making, reel making and rudoku competetion, which began at 11 a.m.

The participants showcased their creativity and ingenuity by incorporating the Mathematical concepts into their artworks and their presentations, and the resulting masterpieces were mesmerising. The enthusiasm of the participants for solving rubic cube and sudoku problems was contagious, and the competitions provided a platform for students to showcase their skills.



In addition to the competitions, a seminar on an intriguing topic related to some solved and unsolved mathematical problems was conducted in the new auditorium at 10 a.m. The seminar began with a lamp-lighting ceremony and was followed by the esteemed speaker of the day, Prof. C.S. Lalitha, Senior Professor, University of Delhi

who took the stage for the session.



Prof. Lalitha presented the topic using a range of problems and examples that made it easier for the students to understand. The seminar was informative and engaging, and students were able to ask questions during the Q&A session. After the seminar, Prof. Shiv Kumar Sahdev and Dr. Deepti appreciated Prof. Lalitha's contribution and launched the second volume of department's annual newsletter, "Read-O-Math."



Simultaneously, the puzzle rush, maths tambola and treasure hunt competitions were conducted. The puzzle rush competition required students to solve puzzles and answer questions within a given time frame, with the winner being the team that answered the most questions correctly.


At the end of the fest, the winners of the various competitions were awarded certificates and prizes. The student council members were also awarded with certificates for their consistent efforts while serving as members of Tesseract throughout the session and in making this event successful in every possible manner. INFINITY was an exemplar of a perfect balance between learning, knowledge, and entertainment.



The success of the event can be attributed to the hard work and dedication of the organising team, as well as the support and encouragement of the Principal and faculty members. The fest also served as a platform for the development of leadership, event management, and public speaking abilities among the students, as well as providing an opportunity for them to hone their creative skills.

The maths tambola competition tested the speed, intelligence and luck of the participants all together. Following that was an intriguing round of treasure hunt which had the participants scratching their heads while deciphering the clues.



  
 Dr. Deepika  
 TIC  
 Dept of Maths  
 SKVJ's College