SPECIAL LECTURES

Colloquium 1: B. Sury, ISI Bangalore

Date, Time, Venue. 2nd July, Wednesday, 4 PM, AG 69

Title. Some Manifestations of How Group Theory Aids Number Theory

Abstract. Is there a polynomial of degree 2025 over the integers which is irreducible, but becomes reducible modulo each prime? How about $2026, 2027$? If f, g are polynomials with integer coefficients which take same set of values modulo every prime, what is the relation between f and g? If f is an irreducible polynomial over the integers occurring as the characteristic polynomial of two matrices with integer entries, are the matrices similar over $\mathbb{Q}$? Over $\mathbb{Z}$? If $f_1, \cdots, f_r, g_1, \cdots, g_s$ are polynomials over $\mathbb{C}$ such that their compositions $f_1(f_2(....(f_r))) = g_1(g_2(...g_s)))$, what can be said about these decompositions? Given two integer polynomials f and g, are there infinitely many integers x, y such that $f(x) = g(y)$? Which integers are sums of two cubes of rational numbers? What is the size of the partition function $p(n)$? Does the Dedekind zeta function of a number field determine the field? The modus operandi used to address these diverse questions is the exploitation of a group that appears naturally in each situation. We give a panoramic view of this fascinating world.

Colloquium 2: Neena Gupta, ISI Kolkata

Date, Time, Venue. 4th July, Friday, 2:30 PM, AG 66

Title. Affine Algebraic Geometry: Polynomial Rings

Abstract. In this talk we shall discuss a few problems in Affine Algebraic Geometry and mention some progress in recent years.

Colloquium 3: Ramprasad Saptharishi, TIFR Bombay

Date, Time, Venue. 7th July, Monday, 4 PM, AG 66

Title. From card tricks to the Mandelbrot set

Abstract. The Mandelbrot set is an interesting subset of the complex numbers that arise from a very simple-to-state iterative process on the complex numbers. With that as an excuse, let us explore some card tricks!

Card tricks based on mathematical ideas often have a reputation of being boring, but people who say so haven't seen the Gilbreath Principle. The point of this talk will be to explore this principle (named after Norman Gilbreath) that forms the backbone of several astonishing effects. We will see a few card tricks, try and reconstruct the method, and prove some simple and interesting properties of these 'Gilbreath permutations'.

Also, it turns out that Gilbreath permutations have some interesting connections to the Mandelbrot set. Hopefully that gives us sufficient cover to look at these card tricks in a summer school on advanced topics in mathematics.

Colloquium 4: Sahana Murthy, IIT Bombay

Date, Time, Venue. 10th July, Thursday, 4 PM, AG 66

Title. Designing Mathematical Experiences: What Shapes How Mathematics Is Learnt?

Abstract. What shapes our experience of learning mathematics? Beyond theorems and proofs, our understanding is influenced by how mathematics is presented, explored, and discussed. This session will explore how the design of mathematical learning experiences is informed by the development of tools, platforms and representations, as well as the pedagogical frameworks to support learning. Drawing on current research in mathematics education, we will explore how environments such as GeoGebra for dynamic geometry, graphing, and function exploration, NetLogo for modeling emergent mathematical patterns and Jupyter Notebooks for integrating computation with explanation can make mathematical ideas more visible, interactive, and connected. We will also reflect on how design choices made by teachers, learners, or developers shape learning trajectories and influence the kinds of mathematical thinking that become possible. The session invites participants to reimagine mathematics classrooms as designed spaces where learning experiences involving technology are not just delivered but thoughtfully orchestrated.

In addition, we will discuss our experiences with academia-adjacent career options.