FACETS 2015 ABSTRACTS

V Arvind (IMSc): Some Algorithmic questions in Finite Group Theory.
Tuesday 30th June 1130am–1245pm Chair: Meena Mahajan

A theorem of Jordan tells us that any transitive subgroup of the symmetric group has a fixed point free element. How efficiently can we find such an element if the subgroup is given by a generating set? We discuss algorithms for this and related questions.

The talk is primarily aimed at BSc/MSc students, and is meant as an invitation to algorithms concerning finite groups.

Rajeeva Karandikar (CMI): Power and Limitations of Opinion Polls.
Tuesday 30th June 200–315pm Chair: S Kesavan

How can obtaining opinions of say 30,000 voters be sufficient to predict the outcome of an election in a country with over 60 crore voters? Can opinion polls conducted say a month before the election accurately predict what is to happen on voting day?

We will address such questions and show that simple mathematics and statistics, lots of common sense and a good understanding of the ground reality or domain knowledge together can yield very good forecast or predictions of the outcome of elections based on opinion polls and exit polls. I will share my own experiences with such polls over the last 15 years.

Vijay Kodiyalam (IMSc): Knotted or not?
Monday 29th June 1130am–1245pm Chair: V S Sunder

What is a knot? When are two knots "the same"? How do we determine whether two knots are the same or different? In this talk we will explore such questions with particular emphasis on the Jones polynomial—a a Laurent polynomial invariant of knots or links—introduced about 30 years ago, which created a revolution in the field of knot theory.

Gautam Menon (IMSc): Contagion: Modelling Infectious Diseases.
Monday 29th June 345–500pm Chair: Krishna Maddaly

Mathematical models play a crucial role in understanding how infectious diseases, such as Ebola, flu, measles, tuberculosis and AIDS, spread within a population. They also help decide the strategies that public health officials and governments must use in response to outbreaks. I will motivate the general study of models of infectious diseases from a historical perspective, describe some of these models very simply and then explain how they have been used and continue to be used in real-life situations. Studies of such models lie at the interface of applied mathematics, data science, bio-statistics and public policy, providing an interesting example of how, in some cases, improved mathematical methods can really make the difference between life and death.

M Ram Murty (Queen's University, Canada):
Mathematics, Measurement and Information Technology.
Mon 29th June, 945–1100am Chair: R Balasubramanian

In this talk, we will highlight the importance of measurement, discuss what can and cannot be measured. Focusing on the measurement of position, importance, and shape, we illustrate by dicussing the mathematics behind GPS, Google and laser surgery. The talk will be accessible to a wide audience.

Harish Seshadri: Shapes and Connectivity.
Tuesday 30th June, 945–1100am Chair: Parameswaran Sankaran

I'll try to describe some elementary aspects of differential geometry (which deals with shapes of spaces) and topology (which is concerned with connectivity of spaces). More specifically, I'll discuss the fundamental notion of curvature of curves and surfaces and how it influences the connectivity of the underlying space.

Ronojoy Adhikari (IMSc), Rajeeva Karandikar (CMI), and S Kesavan: Panel discussion on Prospects in Mathematics.
Tuesday 30th June, 345–500pm Chair: R Ramanujam

The audience will have a chance to pose questions. Given below are some FAQs which the discussion will hope to address.

(1) Does math train you for anything other than becoming a math teacher or math researcher?
(2) Do industry jobs that need math require qualifications apart from BSc / MSc?
(3) Are there jobs that *ACTUALLY* require use of algebra, differential equations, etc, etc?
(4) Where can one get an MSc in financial mathematics / cryptography / mathematical biology / .... ?
(5) I like math very much and am good at it, but am not brilliant. Can I do research in math? It is scary to think I have to prove theorems like Cauchy and Riemann.
(6) To do research in math, we would first need to learn everything people have done before. How long would it all take?
(7) Can I do online courses and use them for entrance to research institutes?
(8) I like math but I also like programming. Is there any area where I can use software skills in math ? What degree should I go for?
(9) Can I start math research and if I find I am not good at it, use my learning to get some job?
(10) Is there some place on the internet where I can find details of math jobs and research prospects available in India?