

Abstracts of the small group sessions

1. **Dr Yiftach Barnea: Counting Infinity**

Many times people talk about infinity as the “biggest number”. We will explore the idea of infinity as a number. In particular, we will try to see whether infinite objects may have different sizes.

2. **Dr Mark Damerell: Solving Sudoku**

This talk describes some of the standard methods for solving the ordinary 9 x 9 Sudoku. Armed with these, you should be able to solve almost any Sudoku in systematic fashion.

3. **Dr Christine Davies: Mathematics at University**

Are you interested in studying Mathematics at University? This session will deal with the types of course available and the qualifications required, the ways in which university mathematics is different from or similar to that at A level, and the careers available.

4. **Dr Christian Elsholtz: Counting Primes**

How many primes are there? Well, infinitely many, How can we count them? How many are there in a finite interval from 1 to N ? Are there many primes of the form $p = n^2 + 1$? In this session we will discuss many unsolved problems concerning primes and make some first steps into “counting primes”.

5. **Dr Keith Mayes: Introduction to Smart Cards**

Smart cards are becoming increasingly important in our day today lives. For example they are found in mobile phones, banking cards, identity cards, electronic-tickets etc. Their general capabilities are quite surprising but a most fundamental feature is tamper-resistant security, which is vital as security systems are often subject to a range of sophisticated attacks. The smart card security defences are provided by a mixture of cryptographic and engineering techniques aimed to stay one step ahead of the hackers.

6. **Dr Maura Paterson:**

From teacups to microphones: an exploration of the cardioid and its uses

Mathematicians have been fascinated by the cardioid curve since it was first studied in the eighteenth century. In this workshop we will explore some methods of constructing cardioids and use basic geometry to examine their properties. We will also see how they are used today to control sound direction in microphones.

7. **Dr Andrew Sheer: Introducing MATHEMATICA**

Mathematica is a sophisticated computer package which we use in teaching, and also for some research. Here you will meet some of the simpler features, including algebra, calculus, and graphical work, and examples such as simulating the National Lottery.