

## Programme of Exploring Mathematics, 19th June 2009

10.15am	Refreshments and Welcome
10.30am	Dr Jason Crampton: Quick quiz session
11.15am	Prof Simon Blackburn: “Chomp”
12.15am	Lunch, and tours of Campus
1.30pm	Small group session on a variety of topics
2.40pm	Prof. Kenny Paterson: “From Fish to Phishing”
3.40pm	Panel discussion.
	Tea/Coffee

Most events are in the Main lecture theatre, only the small group sessions are in various rooms across the Campus (details tba).

### Abstracts of the plenary talks

#### **Prof. Simon Blackburn: “Chomp”**

Chomp is a game played by two players on a rectangular grid. This talk gives the rules of Chomp, and uses it to introduce some ideas of game theory and of proof.

#### **Prof. Kenny Paterson: “Fish: An introduction”**

Cryptography is a beautiful and ancient subject, and today is a thriving academic discipline at the intersection of mathematics and computer science. Cryptography plays an important role in securing many facets of everyday life, including, for example, our mobile phone calls, our credit card payments, and (soon) our electronic health records. In this talk, we will focus on Fish, an important encryption system from World War II, and discuss how it was broken at Bletchley Park using a combination of luck, ingenuity and hard work.

# Programme of Exploring Mathematics

## 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 Alex Dent: How to build better railway systems with mathematics.**

If you’ve ever travelled by train, then you’ll know that you can waste a lot of time waiting to change trains with nothing to do. If you are a mathematician then you might spend that time trying to work out how to build a railway system in which no-one ever changes trains: a system where there is a railway line between any two stations. We soon leave the mundane world of platforms behind and start to think about the problem in abstract terms. From there, it’s a short step to a twenty-five year old mathematics problem with no known solution, with fame and fortune for the mathematician that solves it!

### 3. **Dr Stefanie Gerke: How fast can you be?**

When performing tasks, one usually wants to find the fastest method to do so. But how does one know that one has found the fastest method? Why is there no better way of doing it? During this session we will look at the problem of finding ‘the odd ball out’ and sorting numbers and we will count the minimal number of comparisons one has to perform.

### 4. **Prof. Glyn Harman: 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.

### 5. **Dr Alexey Koloydenko, room C103: How is doing mathematics in 21st century different from that in “the good old days”?**

You will have an opportunity to experiment with Matlab, a powerful computer environment which helps us to bridge abstract and concrete. Have in mind a math problem your teacher said could take a century to compute the solution for? See what Matlab thinks about that!

### 6. **Dr Tobias Osborne: Maths of the iPod.**

In this talk I’ll describe how the functioning of devices like the ipod relies crucially on the mathematics of waves, termed Fourier theory. Additionally, I’ll also describe how this theory has played a central role in mathematics, and our everyday life, since its inception in the 1800’s.

### 7. **Dr Maura Paterson: The Cardioid Curve.**

The cardioid curve turns up in spirograph drawings, and in microphone pickup patterns. You can find it in the Mandelbrot set, or in your cup of tea. In this talk we will examine some ways of constructing this curve, and explore the intriguing connections between the places in which it occurs.

### 8. **Dr Andrew Sheer: How to gamble on the markets safely.**

A financial option is a contract which allows the holder (if he or she wishes) to buy or sell a specified amount of shares, currency or commodities at a certain price at some time in the future. The holder can make a profit from this, but cannot make a loss. So how much is the contract worth - how much should you pay for it? We look at how this can be done in simple cases; the result is surprising in what it doesn’t assume.