DEPARTMENT OF MATHEMATICS

MATHS 190 Lecture 4 Summary

In this lecture we illustrate two important observations:

- All natural numbers can be built up as products of prime numbers
- There are an infinite number of prime numbers.

Lecture 4 was based around the following question:

Question: What are the building blocks of the natural numbers?

We started by learning the definition of a prime number, as one that can be divided only by itself and 1. We then used the Sieve of Eratosthenes to find all the prime numbers less than 100. We did this with a handout consisting of a table of all the numbers up to 100; we then crossed out all those divisible by 2, then those divisible by 3, etc etc. The ones left were the primes.

In the last lecture we learned that all natural numbers can be expressed as a sum of Fibonacci numbers. Similarly, all natural numbers can be expressed as a product of prime numbers. This means that Fibonacci and Prime numbers are building blocks of all the other natural numbers, but in different ways.

We learned how to factorise a number into prime numbers, and we learned how to use proof by contradiction to show that there is an infinite number of primes.

We also discussed the twin primes conjecture which still isn't proven.

Before you come to the next lecture: You should spend an hour or two thinking and reading about the ideas presented in the lecture. You should also:

- Read Section 2.5 of the textbook.
- Bring something with a **barcode** on it to the next lecture.

Other activities you could do if you have time are:

- What is an illegal prime number? Can you find any examples on the web of such a thing? Find out what you can about illegal prime numbers and bring the information along to the tutorial.