

Cambridge Maths Master Classes

I don't think any of us were quite ready for what was to come on that freezing cold Saturday morning, but what did come was something quite spectacular. As we made our way through the monumental, picturesque university, absorbed by the beauty of the building, some of us were getting more and more tense while simultaneously, some of us were getting more and more excited. As we entered the room it seemed like any other lesson apart from there was a strong sense of anticipation in the atmosphere.

For our first week we were put into groups of 4 and given a task of completing 20 mathematical questions within an hour. The teams were named after well known mathematicians and there were about 7 groups. The questions varied vastly and each question was unique in its own way, apart from always being difficult yet fun. Only 2 groups finished all 20 which set a record for the masterclasses and one of the groups set another record with the highest score. Later that day we played a game called Nim, where 2 players would take it in turns to take away either 1 or 2 matches (or straws) from a pile of 7 depending on the player's choice. The aim of the game was to force the other player to take away the last straw. After a few games we were asked to make a winning strategy where no matter what your opponent played, you could always win. At the end of that task, it was time to go home and I couldn't wait for next week!

For the second week we were seated in the Old Hall where a man introduced himself as Isumbard Kingdom Brunel. That day we learnt about Brunel and some of the designs he made such as the Clifton suspension bridge. We also used a handheld mathematical piece of equipment, like a tablet, to plot graphs, draw pictures and answer questions that were on the board. Furthermore, we also looked at some tools he might use and we had a go at making our own out of paper. At the end I concluded the first week was better but this week was still very enjoyable.

The third week was very mathematically challenging as we looked at the powers of 11 and a method on how to calculate the next power very quickly without using a calculator. That week we also looked at different combinations of 3 numbers, an example could be: the numbers 1, 2, and 3 and the combinations 123, 132, 213, 231, 312, 321. Then we moved on to looking at combinations of 5 and 6 which also meant there were many possibilities. The third week was better than the last but my favourite was still the first week.

The second to last week, week 4, we learnt about different ways to keep your messages safe using a device called a mix. The mix would hide the identity of the sender and the receiver so the messages would be completely safe. Let's say "A" sends a message to "B" but on the way it passes a mix. A would see message sent from A to the mix and B would see message sent from the mix to B. The only way they would know it was each other was if they said who wrote it in the message. However, if someone was using the mix the wrong way, they could see the sender and the receiver which is why most messages go through 2 mixes. The more the mixes, the safer the message is. Later on we looked at codebreaking and who was sending messages to who, just looking at a series of letters. Overall I would say it was the best week.

For the final week we were set a bunch of 30 questions which were questions with a simple answer but a difficult route, like trick questions. For example, go through all 9 dots (made into a square) with only 4 lines and you cannot go back on yourself and the next line has to start where the last line ended. The answer is to go outside the square when drawing straight lines. The sort of questions that get you thinking outside the box, sometimes literally! Some of them were building, and some of them were drawing but they all were to do with shapes. I really enjoyed the hands on activities. After that it was time to receive our certificates and collect a brightly coloured folder with loads of different pieces of paper inside. We then were invited back for something else but that was for June.

Overall, I've had a great time and I want to thank everyone involved in making the Masterclasses. On the way I had learnt new things, made new friends and had a laugh on the way. I would recommend the

Masterclasses to anyone and everyone. It's a once in a life time opportunity to grasp and yes, it is worth waking up at 8 in the morning and then later that day getting dragged around the shopping centre.

**Thank you for the wonderful opportunity,
Bradley Denison-Shaw**