

What I have come to love about mathematics is the excitement that comes with problem-solving; the satisfaction gained from systematically working through a complex problem to an often non-obvious solution. I recently wrote an essay on complex numbers, delving into its role in the proof of various results including the most beautiful result in mathematics: Euler's Identity. Whilst completing the essay, I encountered several fascinating examples of complex numbers being used in the real world, such as in the physical equations which describe alternating-current circuits.

For my Extended Project, I have opted to investigate the concept of infinity. What draws me to this intriguing field, and in particular the continuum hypothesis, is that an apparently simple question about infinite sets can be neither proved nor disproved. Moreover, the most enthralling aspect of my research has been trying to independently demonstrate the bijection between different types of sets. Reading "The Foundations of Mathematics" by Stewart further expanded my sense of the subject; and by understanding set theory in greater detail, I was able to formalise my own proofs from Olympiad questions. As a Maths Mentor at my school, I assist younger students in their mathematical studies and in helping to train the junior maths team, I have further developed my teaching skills and thus consolidated my own understanding. I also enjoy taking part in the BMOS Mentoring Scheme where at weekly meetings we discuss and solve challenging problems - something I would love to continue at University. Through the BMOS, I was introduced to Lucas numbers, thanks to a brilliant lecture from Prof McBride at the Royal Society's IMO Presentation Evening.

I have supplemented my classroom mathematics with masterclasses, such as one at the Royal Institution, to which I was invited on the basis of my top score in the Senior Maths Challenge (SMC), as well as the Computational Mathematics Summer School. It was here reading "Alex's Adventures in Numberland" inspired me to research the applications of non-Euclidean geometry and using WolframAlpha I programmed an accurate, geodesic flight calculator. Applying my strong mathematical skills at the Senior Physics Challenge Summer School, run by the University of Cambridge, taught me the value of rigorous grounding in maths (for example in deriving the Schrodinger equation) and it reaffirmed my decision to explore it further.

I relish the chance to challenge myself by stretching my academic abilities to the limit. Therefore I partake in as many competitions as possible, not just because it is hugely stimulating, but also because they are great fun. Achieving gold certificates in the SMC has qualified me for the British Mathematics Olympiad, where I passed with distinction. I have achieved a Top 50 Gold award in the AS Physics challenge and a Top 5 Gold award in the GCSE Physics Challenge, receiving my prize at the Royal Society. I have also consistently been awarded the School Mathematics Prize, which attests my academic scholarship.

As the Head Boy of Merchant Taylors' School, I have demonstrated that I am capable of working productively with both students and teachers, and leading by example. In addition, the Duke of Edinburgh Gold Award has allowed me to deal with unusual predicaments under pressure, whilst receiving a distinction in the Grade 8 LAMDA qualification in Reading for Performance was a personal highlight due to the sheer hard work it entailed. Furthermore, I also derived great satisfaction teaching maths to a child with learning disabilities and donating the funds to the Wings of Hope Achievement Award, which supports the education of underprivileged children in Malawi.

The study of maths is exciting in so many ways - the elegance of the application of logic to derive a proof; the elation I feel when I have solved a challenging problem. I look forward with anticipation to furthering my study of mathematics at university.