Oxbridge
INTERVIEWS

Maths Reading List

The study of mathematics is dynamic, creative, and endless fascinating – indeed, much more so than it is generally given credit for! While mathematical knowledge was previously conceived of as a stable and finite system, discoveries by Alan Turing and Kurt Gödel in the 20th century rocked the intellectual landscape of the subject, showing that there are some parts of Maths that we can never really prove to be true. You will quickly find when studying Maths at university level that you begin to engage with philosophical aspects of the subject – as well, of course, as vast numbers of equations!

Books

1) ***Fermat's Last Theorem*, Simon Singh**. Singh is a writer of popular maths and science books, and this one focuses on how Andrew Wiles managed to provide the solution to a 400-year old problem. The French mathematician Pierre de Fermat wrote in the margins of a copy of Diophantus's *Arithmetica* that he had a 'wonderful proof' of the conjecture that no three integers can satisfy the equation $a^n + b^n = c^n$ when n is greater than 2, but that the edge of the book was too narrow to contain it. Unfortunately, he never noted down his proof elsewhere, and mathematicians were plagued by the problem for nearly half a millennium, until it was solved in the 1990s. Singh also recently wrote *The Simpsons and Their Mathematical Secrets*, which considers the physics of the Simpsons universe – definitely worth a read!
2) ***Gödel, Escher, Bach: An Eternal Golden Braid*, Douglas Hofstadter.** This is a *very*challenging read, but worth it! In his Pulitzer Prize winning book, Hofstadter considers the way in which maths, art, and music intertwine through the lens of Gödel's incompleteness theorems, which state that a mathematical system can never be both consistent and complete – thus revealing that there are some truths even mathematics cannot prove. The tone is lightened by some comic interludes by characters from Lewis Carroll's *Alice's Adventures in Wonderland*, which are used to illustrate complex mathematical ideas. Dense stuff, but fascinating.
3) ***The Outer Limits of Reason: What Science, Mathematics, and Logic Cannot Tell Us*, Noson S. Yanofsky.** Yanofsky's book takes a different tack to most popular mathematical works, which tend to extol the various things that maths can teach us about the universe. Against the tide, Yanofsky chooses to focus on what maths and the sciences cannot tell us, honing in on such oddities as uncomputable numbers.
4) ***Arcadia*, Tom Stoppard.** For those individuals who love both English and Maths, this play is a wonderful mishmash of literary scholarship, eighteenth-century gardening theory, fractals, and chaos theory, taking place in both 1812 and 1992.

Websites

5) **Unsolved maths problems,** http://www.math.utah.edu/~pa/math/conjectures.html**.** This site lists some of the more simple unproven mathematical conjectures – see what you make of them!
6) **1089 and all that,** http://plus.maths.org/content/1089-and-all
7) **The Monty Hall Problem,** http://www.nytimes.com/2008/04/08/science/08monty.html
8) **Conway's game of life,** http://www.bitstorm.org/gameoflife/
9) **Bugs and prime numbers,** http://io9.com/5895840/why-do-cicadas-know-prime-numbers
10) **The seven bridges of Königsberg problem,** http://www.mathsisfun.com/activity/seven-bridges-konigsberg.html
11) **Logic puzzles**, http://www.folj.com/puzzles/difficult-logic-problems.htm
12) **The pizza cutting theorem**, http://www.futilitycloset.com/2011/10/22/the-pizza-theorem/
13) **The Tacoma Narrows Bridge collapse**, http://science.howstuffworks.com/29833-understanding-tacoma-narrows-bridge-video.htm
14) **The false positive paradox,** http://en.wikipedia.org/wiki/False_positive_paradox

Talks

15) **TED talk by Arthur Benjamin on the magic of Fibonacci numbers**, http://www.youtube.com/watch?v=SjSHVDfXHQ4&list=PLOGi5-fAu8bEIw_xkj1FgKr7QY_Sahswy . A well-delivered talk on the Fibonacci sequence and its tendency to crop up in various ways in nature.
16) **Royal Society lecture on unsolved problems in maths**, http://royalsociety.org/events/2013/curious-maths/?gclid=CM_z_uHCwbwCFazHtAodsigAZQ. This talk considers some still unproven mathematical conjectures, and why they still prove so fascinating and mysterious to us today.
17) **Fractals:**
    Fractal zoom http://www.youtube.com/watch?v=G_GBwuYuOOs
    Fractals in nature http://www.youtube.com/watch?v=dZM45mfJQ40
    How do fractals work? http://www.youtube.com/watch?v=YiGBNNDDgH0
18) Hannah Fry – How to find your perfect partner, with maths! http://www.youtube.com/watch?v=PPwzUNGXOXA
19) Hexaflexagons http://www.youtube.com/watch?v=VIVIegSt81k
20) Hans Rosling – The best stats you've ever seen http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html
21) Hilbert's hotel (with David Mitchell) http://www.youtube.com/watch?v=faQBrAQ87l4

22) Prime numbers & cryptography http://www.youtube.com/watch?v=56fa8Jz-FQQ
23) Mathematical models http://www.youtube.com/watch?v=_Idra8rVS1I
24) Why maths is important http://www.youtube.com/watch?v=gDkd0Vaxf-c
25) Penney's Game – coin trick http://www.youtube.com/watch?v=OcYnlSenF04
26) The birthday paradox http://www.youtube.com/watch?v=Mt-BRveq0Eg