



# MATHS & FURTHER MATHS

## Read

- **How to study for a maths degree** Lara Alcock (OUP, 2013) This sounds like the sort of book that could be terrible, but it turns out to be rather good. This no-nonsense book translates these research-based insights into practical advice for a student audience.
- **How to Think like a Mathematician** Kevin Houston (CUP, 2009). How can you resist a book the first words of which (relating to the need for accurate expression) are: Question: How many months have 28 days? Mathematician's answer: All of them.
- **Mathematics: Queen and Servant of Science** E.T. Bell (Spectrum, 1996). An absorbing account of pure and applied mathematics from the geometry of Euclid to that of Riemann, and its application in Einstein's theory of relativity. As Martin Gardner says in the foreword: "This continues to be one of the finest of all introductions to the rich diversity of those fantastic structures that mathematicians invent, explore, and apply with such mysterious success to the huge unfathomable world outside the little organic computers at the top of their heads".
- **The Man Who Knew Infinity** R. Kanigel (Abacus, 1992) The life of Ramanujan, the self-taught mathematical prodigy from a village near Madras. Some of his estimates for the number of ways a large integer can be expressed as the sum of integers are extraordinarily accurate, but seem to have been plucked out of thin air
- **A Mathematician's Apology** G.H. Hardy (CUP, 1992) Hardy was one of the best mathematicians of the first part of this century. Always an achiever, he led the renaissance in mathematical analysis in England
- **The man who loved only numbers** Paul Hoffman (Fourth Estate, 1999) An excellent biography of Paul Erdős, one of the most prolific mathematicians of all time. He had no home; he just descended on colleagues with whom he wanted to work, bringing with him all his belongings in a suitcase.
- **Surely You're Joking, Mr Feynman** R.P. Feynman (Arrow Books, 1992) Autobiographical anecdotes from one of the greatest theoretical physicists of the last century, which became an immediate best-seller. You learn about physics, about life and (most puzzling of all) about Feynman. Very amusing and entertaining.
- **The Simpsons and Their Mathematical Secrets** Simon Singh (Bloomsbury, 2013) There is tons of maths hidden in the Simpsons. The sheer love of mathematics by the producers of this popular series (mostly mathematicians) shines through. For this book there is also a companion video, at [https://youtu.be/bk\\_Kjpl2AaA](https://youtu.be/bk_Kjpl2AaA)
- **The Music of the Primes** Marcus du Sautoy (Harper-Collins, 2003) This is a wide-ranging historical survey of a large chunk of mathematics with the Riemann Hypothesis acting as a thread tying everything together. Some of the maths is tough but the history and storytelling paint a convincing (and appealing) picture of the world of professional mathematics.

## Watch

### TED: Maths

- [https://www.youtube.com/playlist?list=PLOGi5-fAu8bElw\\_xkj1FgKr7QY\\_Sahswy](https://www.youtube.com/playlist?list=PLOGi5-fAu8bElw_xkj1FgKr7QY_Sahswy)  
The above is the link to **TED: Maths** talks to blow your mind. The list of talks includes:
  - [The magic of Fibonacci numbers | Arthur Benjamin - YouTube](#)
  - [Adam Spencer: Why I fell in love with monster prime numbers - YouTube](#)
  - [Ron Eglash: The fractals at the heart of African designs - YouTube](#)
  - [How big is infinity? - Dennis Wildfogel - YouTube](#)
  - [Lightning calculation and other "mathemagic" | Arthur Benjamin - YouTube](#)
  - [Margaret Wertheim: The beautiful math of coral \(and crochet\) - YouTube](#)
  - [Benoit Mandelbrot: Fractals and the art of roughness - YouTube](#)
  - [A clever way to estimate enormous numbers - Michael Mitchell - YouTube](#)
  - [Geoffrey West: The surprising math of cities and corporations - YouTube](#)
  - [How does math guide our ships at sea? - George Christoph - YouTube](#)

### Oxford Mathematical Institute:

- [https://www.youtube.com/results?search\\_query=Oxford+mathematical+institute](https://www.youtube.com/results?search_query=Oxford+mathematical+institute)
- The above is the link to the **Oxford Mathematical Institute** YouTube page it includes links to:
  - Recordings of the Oxford Mathematics Open Day 2022 Livestream (Maths at Oxford, Pure Mathematics, Applied Mathematics)
  - 3-minute thesis competition 2022
  - The architecture of the Oxford Mathematical Institute
  - An introduction to Oxford Maths
  - Introductory Calculus: 1<sup>st</sup> year student lecture
  - AND MANY MORE

### Films about maths and famous mathematicians:

- A Beautiful Mind
- Hidden Figures
- Good Will Hunting
- The Imitation Game

- **Humans**, Matt Haig. Told through the romantic and curious perspective of an unnamed alien who replaces a mathematician and takes on his life. It is an honest and mostly-optimistic view on humanity, showing that hope and greatness could be found in our imperfections as individuals and as a whole. Let this book help you rethink about life and see its beauty.
- **The Art of Statistics**, David Spiegelhalter. Statistics are everywhere, as integral to science as they are to business, and in the popular media hundreds of times a day. In this age of big data, a basic grasp of statistical literacy is more important than ever if we want to separate the fact from the fiction. In *The Art of Statistics*, world-renowned statistician David Spiegelhalter shows readers how to derive knowledge from raw data by focusing on the concepts and connections behind the math.
- **How to Make the World Add Up**, Tim Harford. If you aren't in love with stats before reading this book, you will be by the time you're done. Powerful, persuasive, and in these truth-defying times, indispensable
- **The Tiger That Isn't**, Andrew Dilnot and Michael Blastard. Mathematics scares and depresses most of us, but politicians, journalists and everyone in power use numbers all the time to bamboozle us. Most maths is really simple - as easy as 2+2 in fact. Better still it can be understood without any jargon, any formulas - and in fact not even many numbers. Most of it is common-sense, and by using a few really simple principles one can quickly see when maths, statistics and numbers are being abused to play tricks - or create policies - which can waste millions of pounds
- **Fermat's Last Theorem**, Simon Singh. This story of Andrew Wiles's proof of Fermat's Last Theorem is a firm favourite. Simon Singh does a great job of explaining some of the very technical mathematics at the heart of Andrew Wile's proof, the book reads almost as an exciting thriller and conveys true passion for the beauty of mathematics. You can watch the author talk about the mathematics involved in the book on Numberphile, at <https://youtu.be/qiNcEguuFSA>
- **'Factfulness: Ten reasons we're wrong about the world'** (Rosling, H. 2018) – the late, great Hans Rosling presents data in the hope of giving a more realistic, fact-based world view.
- **Humble Pi – a comedy of maths errors**, Matt Parke. What makes a bridge wobble when it's not meant to? Billions of dollars mysteriously vanish into thin air? A building rock when its resonant frequency matches a gym class leaping to Snap's 1990 hit *I've Got The Power*? The answer is maths. Or, to be precise, what happens when maths goes wrong in the real world.
- **Hello World, How to be Human in the age of Machines**, Dr Hannah Fry. Hannah Fry takes us on a tour of the good, the bad and the downright ugly of the algorithms that surround us. In *Hello World* she lifts the lid on their inner workings, demonstrates their power, exposes their limitations, and examines whether they really are an improvement on the humans they are replacing.
- **Power in Numbers: The Rebel Women of Mathematics**, Talithia Williams. Prepare to be inspired. *Power in Numbers: The Rebel Women of Mathematics* is a full-color volume that takes aim at the forgotten influence of women on the development of mathematics over the last two millennia.
- **To Infinity and Beyond Eli Maor** (Princeton, 1991) Not much hard mathematics here, but lots of interesting mathematical ideas, fascinating history and lavish illustrations.

- Stand and Deliver
- The Man who knew infinity
- Pi
- A Brilliant Young Mind
- Moneyball

#### TED talks

##### [Hannah Fry: The mathematics of love | TED Talk](#)

Finding the right mate is no cakewalk -- but is it even mathematically likely? In a charming talk, mathematician Hannah Fry shows patterns in how we look for love, and gives her top three tips (verified by math!) for finding that special someone.

##### [Hannah Fry: Is life really that complex? | TED Talk](#)

Can an algorithm forecast the site of the next riot? In this accessible talk, mathematician Hannah Fry shows how complex social behavior can be analyzed and perhaps predicted through analogies to natural phenomena, like the patterns of a leopard's spots or the distribution of predators and prey in the wild.

##### [Eddie Woo: How math is our real sixth sense | TED Talk](#)

In this engaging talk, high school math teacher and YouTube star Eddie Woo shares his passion for mathematics, calling it an extra sense that we can all access. Using real-world examples of geometry, he encourages everyone to seek out the patterns around them for "a whole new way to see the world."

##### [Samia Talbi: The Real Reason You Should Study Math | TED Talk](#)

The benefit and use of math is seriously questioned in many public debates, schools and societies today. Why should we learn mathematical concepts we never use in life, not even at work? Amid generalizing digitalization, why should children get good at calculation? The present Ted-talk guides us through the mathematical solving process of a tricky problem believed to be posed by North African queen Dihya. Doing so, it shows that math helps us develop an extremely valuable success skill: conditional creativity. Behind this skill lies our very ability to shape our lives, but also become an attractive person able to make a difference.

##### [Emmanuel Schanzer: Why is algebra so hard? The answer is surprisingly simple | TED Talk](#)

MathS teacher Emmanuel Schanzer believes the problem with math lies in what we tell students math is. Learn how Schanzer's innovative online math curriculum teaches students to solve problems through design in this upbeat talk.

##### [The Simpsons and Their Mathematical Secrets | Simon Singh | Talks at Google - YouTube](#)

## Websites

- <http://www.cut-the-knot.org> Alexander Bogomolny (since 1996) This web site is absolutely brilliant. If you haven't seen it before, you should take a look immediately. It is like a mathematical labyrinth: you can wander through it for hours (years, probably), following different links. It covers a huge range of mathematics, much of which is elementary (which is not the same as saying it is easy) and all of which is interesting and beautifully presented — see, for example, the 103 essentially different proofs of Pythagoras's theorem.
- <http://www.dimensions-math.org> Etienne Ghys (since 2006) A mathematical film: a fascinating and very accessible journey through geometry and topology (where a kettlebell and a doughnut have the same shape), touching on maps, tilings, transformations in space and fractals, that takes you gradually to the fourth dimension. On the way you'll pass through Flatland, encounter famous mathematicians and artists, and see abstract mathematical concepts in beautiful graphics by mathematical artist and engineer Jos Leys. And, if you're up to some more difficult mathematics, check out the connections between knots and the Lorenz attractor, and even the Riemann hypothesis, at [www.josleys.com/articles/ams\\_article/Lorenz3.htm](http://www.josleys.com/articles/ams_article/Lorenz3.htm)
- The Norm Chronicles: Stories and numbers about danger David Spiegelhalter and Michael Blastland (Profile, 2014) David Spiegelhalter is the Winton Professor for the Public Understanding of Risk at Cambridge, and a great communicator of maths: check out his website at <https://understandinguncertainty.org>. The book is a 'guide to risk', told with numbers and stories about the fictional characters Norm, Prudence (both self-explanatory) and the reckless Kelvin. You will learn about the micromort (a one-in-a-million chance of death), the microlife (a span of life 30 minutes long), and all sorts of facts and figures: did you know that the dose of radiation you get flying from London to New York is equivalent to that you get from eating 700 bananas? Entertaining and illuminating: after reading this book you'll see the usual scare stories in the media in a very different light!

## Visit

- Bletchley Park, Buckinghamshire [Bletchley Park | Home](#)
- Bank of England Museum, London <https://www.bankofengland.co.uk/education>
- The Royal Observatory, Greenwich <https://www.rmg.co.uk/schools-communities/royal-observatory-digital-school-sessions>
- The Winton Gallery, Science Museum, London <https://www.sciencemuseum.org.uk/learning/mathematics-winton-gallery-school-info>
- Maths City Museum, Leeds. <https://mathscity.co.uk/>

## Listen

Podcast suggestions:

- [BBC Radio 4 - The Curious Cases of Rutherford & Fry - Downloads](#) – Science sleuths Dr Adam Rutherford and Dr Hannah Fry investigate everyday mysteries sent by listeners.
- [The NCETM Maths Podcast \(podbean.com\)](#) – A regular podcast from the National Centre for Excellence in the teaching of maths, exploring areas of interest and debate in the teaching of maths.
- Taking Maths Further – Peter Rowlett and Katie Steckles. Aiming to encourage further uptake of maths at A-level and beyond.
- [Breaking Math \(breakingmathpodcast.app\)](#) – aims to make math accessible to everyone and make it enjoyable.
- [Maths on the Move | a podcast by plus.maths.org \(podbean.com\)](#) – this podcast brings the latest news from the world of maths plus interviews and discussion with leading mathematicians and scientists about the maths that changes our lives.
- [BBC Radio 4 - In Our Time, Science - Downloads](#)
- [BBC Radio 4 - The Infinite Monkey Cage](#)

## Competitions

- Alan Turing Cryptography competition – look at the current and previous competitions. How many of the codes can you break? [https://www.maths.manchester.ac.uk/cryptography\\_competition/](https://www.maths.manchester.ac.uk/cryptography_competition/)
- Also from Manchester University the sister competition – Mathsbomb – aimed at students up to year 13. <https://www.maths.manchester.ac.uk/mathsbombe/>

<p><b><u>Courses</u></b></p> <ul style="list-style-type: none"><li>• MOOCs ( Massive Open Online Courses) – learn about your interests and bolster your CV. Three main providers are:<ul style="list-style-type: none"><li>✓ <a href="#">FutureLearn: Online Courses and Degrees from Top Universities</a></li><li>✓ <a href="#">edX   Free Online Courses by Harvard, MIT, &amp; more   edX</a></li><li>✓ <a href="#">Open Learning - OpenLearn - Open University</a></li></ul></li></ul> <p>Just make sure you look for the free courses. You can complete some courses and only have to pay to receive the certificate.</p> <p><b>If you are a Bursary student, remember that the Student Discretionary Bursary can pay for certification or courses.</b></p>	<p><b><u>Subscriptions</u></b></p> <p><b>Remember that if you have been accepted onto the 16-19 Bursary, Thirsk Sixth Form College can support you with academic subscriptions.</b></p>
<p><b><u>Apps</u></b></p> <ul style="list-style-type: none"><li>•</li></ul>	<p><b><u>Work experience ideas</u></b></p> <ul style="list-style-type: none"><li>•</li></ul>