

Dr T's Useful Links

This is a curated collection of links to extension tasks for ambitious students.

General links

You should join [Khan Academy](#) This provides thousands of hours of videos in maths and also computer science at all levels from kindergarten to undergraduate and beyond.. They are building up content in a number of other areas. They have a huge set of interactive practice exercises and mastery challenges. You earn points for watching videos and solving problems. There are badges for achieving mastery of topics and whole areas. I have an embarrassing 1,500,000 points and 452 badges. See if you can beat me. My username on Khan Academy is DrMThornber.

For those thinking of a career in engineering or the sciences, now might be a good time to learn modern scientific computing. In my view this means Python with a scipy stack. The right way to do this is in Jupyter notebook. The simplest way is to sign up for a free [Microsoft Azure](#) account. This provides cloud computing in Jupyter notebook. You should sign in with your school email and password. The front page also has links to a number of interesting courses. I would suggest the [Python at Cambridge](#) project. Use the button at the top left to clone the project before you start. You can now do hardcore coding in a browser on your phone! If you'd rather work locally you can download the full [Anaconda Distro](#) to a laptop or desktop. Get the Python 3.7 version.

Those interested in Computer Science should definitely sign up for [Isaac Computer Science](#). This site has some resources for GCSE and A level and it is growing all the time. At the moment Khan Academy is more extensive so sign up for both.

Those interested in Physics or Engineering should sign up for [Isaac Physics](#) It has extensive sets of problems ranging from preparation for A level up to Oxbridge entrance. Their [books](#) of problems are cheap and excellent quality.

There's also an [Isaac Chemistry](#) sub-site. It seems to be in an earlier stage of development, but they do have a nice mastery [book](#)

Those interested in maths at university should register with the [STEP Support Program](#) You don't have to be aiming for maths at Cambridge to take advantage of their advanced problem solving help. The [foundation modules](#) are a set of 25 assignments aimed at students in Y12, although accessible to a strong GCSE student too. Each assignment contains a little theory and a set of accompanying problems. Try one set a week to begin with.

Ideas for Y11 planning to take A level maths or further maths

Check the [DJCS Maths Page](#) Click on the A level tab and then open the Algebra Practice document. This indicates the algebra skills you will be tested on at the start of Y12 and has links to revision materials on Khan Academy.

Once your algebra is practised and secure you can look at some Y12 topics on Khan Academy: [The Unit Circle](#), [Trig Graphs](#), [Limits](#), [Derivatives](#) (up to and including quiz 2 for Y12 work)

Ideas for Y12 going into Y13 maths

You can use Khan Academy to work on the material we normally study at the end of Y12: [Functions](#) (Domain and Range, Inverse Functions, Composing Functions) [Absolute Value](#), [Radian Measure](#), [Trig Identities](#)

Ideas for Y12 going into Y13 further maths

Use Khan Academy to work on the material we study at the end of Y12:

[Continuous Random Variables](#) (it's a bit basic), [Hooke's Law](#) (again, a bit basic), [Series and Induction](#), [Vectors](#)

Ideas for Y12 planning to apply for maths at university

In addition to the end of year work you should make sure you work on the STEP Support Program (see above). You should also check out the [Oxford Maths Admission Test](#) This is taken in October of Y13 so has less content than STEP. There are lots of past papers to practice with. These are good practice for those applying to other universities. Make sure you know [APs and GPs](#).

It's a good idea to use time now to learn basic calculus from Y13 maths. [Product and Quotient Rule](#), [Chain Rule](#), [Integration by parts](#), [Substitution](#), [Partial Fractions](#)

Learn [programming for number theory](#) with MEI. You can email me at my school address for a student login to see all the resources.

Ideas for Y13 waiting for university

Learn a skill via Khan Academy or learn advanced coding in Python. See the links at the start.

I really like the Isaac Physics Quantum Mechanics book. It's hard but working through it will set you up for a physics degree or a degree with a mathematical physics component.

Read a book! Here are a few classics, get them cheap on Amazon marketplace.

How to Solve It *Polya* A small classic on the art of solving undergraduate problems.

Calculus *Spivak* A challenging mix of basic calculus with all of the proofs included and every hard problem there is.

Concrete Mathematics *Graham/Knuth/Patashnik* A lovely book with a nice, chatty introduction to finite mathematics (summing series, binomial identities etc.) Written for Computer Science students.

A Mathematician's Apology *G.H. Hardy* A small but influential book by a giant of British mathematics. (Jeremy Irons played him in the recent movie *The Man Who Knew Infinity*)

The Pleasures of Counting *T.W. Körner* I really like this. It gives lots of applications of simple ideas.

Gödel, Escher, Bach *D. Hofstadter* Great for those interested in mathematical logic or theoretical computer science..

Surely You're Joking, Mr Feynman *R.P. Feynman* Everybody recommends this. It's a riotous read. See the next book too.

QED: The Strange Story of Light and Matter *R.P. Feynman* Less outrageous than the previous book, but with more physics.

The Design of Everyday Things *D. Norman* Every engineer or computer scientist should think more about usability. This is the standard introduction.

Dealers of Lightning: Xerox Parc and the Dawn of the Computer Age *M.A. Hiltzik* A fascinating introduction to why computers are the way they are. These guys planned it all out in 1970!

The New Turing Omnibus *A.K. Dewdney* A set of short articles on lots of aspects of computer science. Often recommended reading for University courses.

A Man for All Markets *E.O. Thorp* The autobiography of the man who used maths to beat the casinos at blackjack and then went on to make a fortune in the stock market.