Revision Resources

A-Level Maths

Reading List

How to Think like a Mathematician Kevin Houston (CUP, 2009)

This sounds like the sort of book that elderly people think that young people should read. However, there is lots of good mathematics in it (including many interesting exercises) as well as lots of good advice. 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.

The MaTH βOOK Clifford A Pickover (Sterling, 2009)

The subtitle is 'From Pythagoras to the 57th Dimension, 250 Milestones in the History of Mathematics'. Each left hand page has a largely non-mathematical description of one of the great results in mathematics and each right hand page has a relevant illustration. There is just enough mathematical detail to allow you to understand the result and pursue it (if you fancy it), via google. The book is beautifully produced. The illustration for the page on Russell and Whitehead's Principia Mathematica, said here to be the 23rd most important non-fiction book of the 20th century, is the proposition occuring several hundred pages into the book, that 1 + 1 = 2.

Mathematics: a very short introduction Timothy Gowers (CUP, 2002)

Gowers is a Fields Medalist (the Fields medal is the mathematical equivalent of the Nobel prize), so it is not at all surprising that what he writes is worth reading. What is surprising is the ease and charm of his writing. He touches lightly many areas of mathematics, some that will be familiar (Pythagoras) and some that may not be (manifolds) and has something illuminating to say about all of them. The book is small and thin: it will fit in your pocket. You should get it.

Solving Mathematical Problems Terence Tao (OUP, 2006)

Tao is another Fields Medalist. He subtitles this little book 'a personal perspective' and there is probably no one better qualified to give a personal perspective on problem solving: at 13, he was the youngest ever (by some margin) gold medal winner in International Mathematical Olympiad. There are easy problems (as well as hard

problems) and good insights throughout. The problems are mainly geometric and algebraic, including number theory (no calculus).

The Pleasures of Counting T.W. K¨orner (CUP, 1996) A brilliant book.

There is something here for anyone interested in mathematics and even the most erudite professional mathematicians will learn something new. Some of the chapters involve very little technical mathematics (the discussion of cholera outbreaks which begins the book, for example) while others require the techniques of a first or second year undergraduate course. However, you can skip through the technical bits and still have an idea what is going on. You will enjoy the account of Braess's paradox (a mathematical demonstration of the result, which we all know to be correct, that building more roads can increase journey times), the explanation of why we should all be called Smith, and the account of the Enigma code–breaking. These are just a few of the topics K¨orner explains with enviable clarity and humour.

Calculus for the Ambitious T.W. K¨orner (CUP, 2014)

You can and should supplement your sixth-form calculus with K¨orner's latest offering. You will find here some familiar ideas seen from unfamiliar angles and almost certainly much that is unfamiliar; multivariable calculus for example (when functions depend on more than one variable). This excerpt from introduction gives you a flavour of the style: When leaving a party, Brahms is reported to have said 'If there is anyone here whom I have not offended tonight, I beg their pardon.' If any logician, historian of mathematics, numerical analyst, physicist, teacher of pedagogy or any other sort of expert picks up this book to see how I have treated their subject, I can only repeat Brahms apology.

What is Mathematics? R. Courant & H. Robbins (OUP, 1996)

A new edition, revised by Ian Stewart, of a classic. It has chapters on numbers (including ∞), logic, cubics, duality, soap-films, etc. The subtitle (An elementary approach to ideas and methods) is rather optimistic: challenging would be a more appropriate adjective, though interesting or instructive would do equally well. Stewart has resisted the temptation to tamper: he has simply updated where appropriate — for example, he discusses the solution to the four–colour problem and the proof of Fermat's Last Theorem.

From Here to Infinity Ian Stewart (OUP, 1996)

This is a revised version of Problems in Mathematics (1987); revised of necessity, as the author says, because some of the problems now have solutions — an indication of the speed at which the frontiers of mathematics are receding. Topics discussed include solving the quintic, colouring, knots, infinitesimals, computability and chaos. In the

preface, it is guaranteed that the very least you will get from the book is the understanding that mathematical research is not just a matter of inventing new numbers; what you will in fact get is an idea of what real mathematics is.

What's Happening in the Mathematical Sciences B. Cipra (AMS, 1993, '94, '96, '99, '02)

This really excellent series is published by the American Mathematical Society. It contains low(ish)-level discussions, with lots of pictures and photographs, of some of the most important recent discoveries in mathematics. Volumes 1 and 2 cover recent advances in map–colouring, computer proofs, knot theory, travelling salesmen, and much more. Volume 3 (1995–96) has, among other things, articles on Wiles' proof of Fermat's Last Theorem, the investigation of twin primes which led to the discovery that the Pentium chip was flawed, codes depending on large prime numbers and the Enormous Theorem in group theory (the theorem is small but the proof, in condensed form, runs to 5000 pages). Exciting stuff.

Archimedes' Revenge P. Hoffman (Penguin, 1991)

This is not a difficult read, but it covers some very interesting topics: for example, why democracy is mathematically unsound, Turing machines and travelling salesmen. Remarkably, there is no chapter on chaos.

The Mathematical Experience P.J. Davis & R. Hersh (Penguin, 1990)

This gives a tremendous foretaste of the excitement of discovering mathematics. A classic.

Beyond Numeracy J. A. Paulos (Penguin, 1991)

Bite-sized essays on fractals, game-theory, countability, convergence and much more. It is a sequel to his equally entertaining, but less technical, Numeracy.