introduction to Dedekind cuts and Cauchy sequences providing different ways of thinking about number systems.

Applebaum describes this last chapter as the effective conclusion of his book. In a way it is, for the next chapter introduces the idea of a function and then differential and integral calculus with the merest nod towards earlier topics when relating integrals to areas under curves. He finishes with a short but interesting chapter on the history of analysis.

Did Applebaum fulfil his intention and did he allay my fears? Well I certainly felt the clarity of his exposition meant that the text was easy to read and the proofs were accessible and full of step-by-step detail. For an undergraduate the mathematics of the analysis is probably of less value than the links that are made by having an extensive reading list and many references to websites. The general reader can enjoy a pot-pourri of analysis-related topics.

John Sykes

Proof of Death
Chris Pearson
£0.99 (Kindle edition) through Amazon
http://www.amazon.co.uk/Proof-of-Death-ebook/dp/B008U8R20K

This is the first time I have reviewed a fictional book and a rather strange experience indeed. I have not read a book of fiction for many, many years and have never intended to since I left school. Shakespeare, Chaucer, Hardy all left such a poor impression that I went out my way to avoid such books. However, I was pleasantly surprised. The book is easy to read, having short chapters with some interesting characters in the plot. Thankfully, (for me!) the plot is fast paced with interesting places being visited along with some relations of well-known mathematicians of the past.

Although not a mathematical book, it has mathematical 'tendencies' with the plot centring around the proof of the Riemann Hypothesis which has now been solved. The number theorist (from Chechnya) who has proven the hypothesis has not released it yet, but has had to contact a lawyer in the UK. With his life in danger due to the power he now holds, a number of characters begin to surface who are after this proof. They range from a Trinity College professor to a Siberian Colonel who is now an assassin to an American banker.

The lawyer becomes much more involved with the dealings than just a courtroom battle and is directly involved with some of these characters. He has realized that mathematics is more than just equations – life and death are very much part and parcel of everything he does. Who wins, lives or dies I will leave you to find out, but if you are a fan of thrillers then this is worthy of a read. Certainly, having a mathematical flavour helped me finish the book.

As was eloquently put to the lawyer by the number theorist. "Mathematics is not simply some form of art to be practised and admired. It is the highest degree of knowledge, capable of defining all things which have been and all things which will be. It is older than creation itself." No more needs to be said other than the proof is still there to be solved with £1m available!

N. G. Macleod

Taking Sudoko Seriously: The math behind the world's most popular pencil puzzle
Jason Rosenhouse and Laura Taalman
Oxford University Press
www.oup.com
ISBN: 978 0 19 975656 8
214 pages, hardback
£13.99

Do you know what X-Wings are, or the difference between a Swordfish and a Squirmbag? Have you used the Ariadne's Thread method? If the answer is no to any or all of these questions then by page 20 of *Taking Sudoko Seriously* you will have had them explained to you. By this stage in the book you will have learnt a variety of methods used in solving Sudoko problems though, if you are like me, employing them to speed up your ability of solving them will need much more practise.

Not happy with standard Sudoko problems Rosenhouse and Taalman move onto Sudoko X in which the diagonals have the numbers 1 to 9 once only as well or the Four Square Sudoko where areas within the 9 × 9 square must also be satisfied by having 1 to 9 once only. We next read about a Latin Square: a simplified grid in which each row and column must have the numbers 1 to 9 once only. The Greco-Latin square, studied by Euler in 1782, moves us away from Sudoko puzzles and describes the grids in which pairs of symbols can be entered into a grid with no repetition in the rows or columns for each element of the pair and no repetition of the pair.

How many Sudoku problems are there? It is easy to follow why there are 288 different Shidoku (4 × 4) grids but for a 9 × 9 grid counting becomes more challenging. Indeed there are over 948 billion ways of obtaining the first three rows alone and in total there are more than 6.67×10^{21} different Sudoko squares; enough to keep us busy for a long time! By page 75 the authors lead us into Equivalence Classes to count the number of Sudoko problems by investigating isometries. We are taken into the concepts of groups, binary operations and the properties of sets and using these we learn that there are approximately 5½ billion fundamentally different Sudoko squares which is still enough to occupy us!

I sometimes enjoy solving the easier 6 × 6 puzzles which we learn in chapter 6 are called Roku-Doku. There is also an explanation as to how to set up such a problem outlining methods to ensure they are sufficiently interesting and challenging. Rosenhouse and Taalman go on to explain methods of devising 9 × 9 Sudoku problems.

As if getting one's mind around solving Soduko problems was not enough the next chapter launches into graph theory, skips through the four colour problem and links the numbers in a puzzle to a Sodoku graph. Following this there is a section devoted to setting up polynomials so, for example, with a Shidoku there are 46 simultaneous equations to solve the grid!

The final chapter takes us through 'extremes', problems involving greater complexity in the setting and solving of Sudoku grids. Then there is the Epilogue – a set of 21 Sudoko grids of different types to solve.

This is an interesting book. The style is conversational and easy to read though it is certainly not an easy read as it requires time and thought spent on it. In the words of the authors "Sudoko is math in the small … by asking a few questions … you are led … to combinatronics, number theory and algebra. Not too shabby for a mere pencil puzzle."

John Sykes

The Essential Guide to Secondary Mathematics
Colin Foster
Routledge
www.routledge.com/books/details/9780415527712/
£21.99 (Softback) £90.00 (Hardback)

The Essential Guide has been written for new teachers although for many experienced teachers, it might be worth reading to refresh on some pedagogical methods or learn current ones. It has been written in the format that it can be used as a reference book rather than reading from page 1 to the end. The book is divided into two parts: Part 1 about preparing to teach mathematics and Part 2 about actually teaching the subject. Throughout the book, there are tasks for the reader which vary from doing mathematics to reflecting upon your own teaching. There are also a number of quotes about mathematics from well-known mathematicians to parents in schools!

One of the sections which is most relevant today is that of self-evaluation, particularly with inspectors breathing down necks. The section begins with a quote from a mathematics teacher who says "I feel like I've got myself into a rut; my lessons are less interesting now than when I started teaching." I'm sure we've all had days like this, but how do we deal with this.

Well that's the $64,000 question! A number of options are presented for the reader to think about including sharing experiences which leads onto the next section. Talking to other teachers is often not the most comfortable thing for us to do, but perhaps discussing topics at departmental meetings more might provide some insights or help stimulate ideas to improve lessons. Another important section is about relevance. How often have we heard pupils asking why we do this? As the author says, in mathematics this might end with teaching only *functional skills* and the real essence of mathematics is lost. Unfortunately, today too many *applications* are not real-life applications – finding the modal size of a class of pupils or carrying 269 up a lift that holds only 14. Why would we do this?

Chapter 5 on Ideas for Lessons looks into openness, creating lessons and learners' perspective. Chapter 8 is a natural follow on which looks into actual examples to use as starters, fillers or finishers.

Part 2 begins with a look at what mathematics is about and what mathematicians think about. For example, asking questions, making conjectures or explaining their reasoning. Other chapters include topics such as assessment, listening skills, extending pupils and independent thinking. All these are worthy of further study even for the experienced teacher.

At the end of each chapter, there are comments on the set tasks, useful resources and websites. The book concludes with a 13-page reference list of further resources and a very good index. There will be very few teachers who will not glean some useful information or at least prompt memories from past experiences. An essential book for every department.

N. G. Macleod

A Prime Puzzle
Martin Griffiths (Series Editor: Gerry Leversha)
United Kingdom Mathematics Trust (UKMT), School of Mathematics, University of Leeds, Leeds LS2 9JT.
www.ukmt.org.uk
ISBN 978 1 906001 16 2
217 pages, paperback
£14

This is another book in the series produced by UKMT which offers both value and excellence. This one is aimed at highly motivated sixth-form students with material different to that of the Olympiad syllabus but most of the content is very much undergraduate level mathematics and in reality is inaccessible to only the most academically gifted students of school age.

A Prime Puzzle sets out to prove Dirichlet's theorem on Primes in Arithmetic Progressions (i.e. the arithmetic progression given by $\{an+b: n = 0, 1, 2, ..\}$ where a and b are positive integers, contains infinitely many primes if, and only if, a and b are coprime).

The book is in three parts. In the first Griffiths sets the scene with explanations of the fundamental theorem of arithmetic and the summation of the reciprocals of the primes. Part II is 'The Tool Box' which aims to explain methods of arithmetic functions, limits, groups, complex numbers, characters (not as in people but as in functions applied to elements of a group!), Dirichlet-L functions and Möbius functions. The written text reads well though the mathematics is challenging. However, Griffiths' explanations are clear and well structured. Part III leads to the proof of Dirichlet's theorem using the ideas developed earlier. The book concludes with hints to the exercises and challenges embedded within the text and a series of appendices covering convergent sequences, proof by contradiction, modular arithmetic and more complex numbers.

My eye was caught by the author's road map to the proof in which he says "the hope is that this will enable the reader to keep in mind the big picture ... whilst navigating through some new and relatively difficult mathematics". Too difficult for most though I suspect this book would be an excellent resource for undergraduates with an interest in this area of mathematics.

John Sykes

Ideas for Sixth Form Mathematics: Further Pure Mathematics & Mechanics
Colin Foster
ATM
£15 each; ATM Member's Price £11.25 each
Also in pdf form: at **http://www.atm.org.uk/shop/products/act091.html**

The author has produced another excellent book in the series on Further Pure and Mechanics. All the main topics are covered – matrices, complex numbers, conics, polar coordinates, group theory and Mechanics including Dynamics, Kinematics, Projectiles, SHM, etc. While it is often recognized that teaching A Level or Advanced Higher (Scotland) can be very much more traditional in order to make it appear similar to what many will face at university, there is always scope to return to other methods of teaching. One of these is making tasks more open-ended so that they can work individually or in groups to solve problems in a non-routine way. This book provides plenty of examples to approach mathematics in this way.

All of the examples could be used in conjunction with the 'real' course, whether as an alternative way to teach it or even as a homework exercise over a week. Due to the nature of the tasks, it is often necessary to seek further knowledge rather than just the basic course work and certain words/phrases printed in italics are intended to be researched, e.g. Stirling's formula. There are often web links to seek further information which is at the heart of the book. The tasks are not meant to be easy, but there is enough theory given in each section to allow all students to *give it a go*. Even without complete success, partial success is an important part of the mathematical journey. By working through these tasks, the students will cope with most concepts faced in an examination.

There are also little snippets of curious information such as the Russian soldier whose life was saved by proving the error of a Taylor series to n terms. And who said mathematics wasn't life changing?

N. G. Macleod

Please get writing! Share your expertise, experiences, reports, reviews, hints, tips, tales and howlers with others in your profession.