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IN BRIEF

Mathematics

Ian Stewart
PROFESSOR STEWART'S CABINET OF MATHEMATICAL CURIOSITIES
256pp. Profile. £10.99.
978 1 846 68064 9

When Ian Stewart was fourteen, he started compiling a collection of mathematical and logical puzzles. He kept going, filling one notebook, then another, and now has a filing cabinet of them. This book is the result, and it's quite a mixture – some short and simple, some short and difficult, and some not puzzles at all but interesting brief essays on mathematical topics. The most interesting of the latter type is a discussion of the Riemann Hypothesis, which is the most famous unsolved problem in mathematics. It has important implications for the distribution of prime numbers, though its statement seems to have nothing to do with primes. Stewart's five-page discussion is masterly, but not for the faint-hearted – you really do need a little mathematical sophistication.

This is not so with the puzzles, some of which are old chestnuts, but none the worse for that. This is one of the most challenging: you are given twelve apparently equal coins, one of which is a dud, either lighter or heavier than the others. How do you find it in three weighings on a pair of balances? Each weighing tells you the scales are equal, or one is lighter than the other. This problem was once given in the *Daily Telegraph*, and a reader who had been solving the crossword every day for sixty-five years eventually asked how on earth three weighings could do it. The *Telegraph* got in touch with Ian Stewart, and he and a colleague solved it for them. Their published solution caused all sorts of correspondence, including serious letters giving alternative solutions.

Or for something simpler – how do you create six equal areas using twelve fence panels? This is not the same as constructing six squares with twelve matches, which you can do by using them as the edges of a cube – the areas don't have to be square. And just in case you get stuck on any of the problems, there are answers hidden away at the back of the book.

MARK RONAN

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IN BRIEF

Mathematics

Ian Stewart
TAMING THE INFINITE
The story of mathematics
272pp. Quercus. £20.
978 1 847241818

Is mathematics finished? Has it all been done? Is there anything left to work on, apart from slight improvements to existing methods? To answer such questions, you need a good history of mathematics, and this book serves the purpose very well.

The history of mathematics shows that new questions arise all the time. As soon as a new method is developed to solve an old problem, the method itself gives rise to new questions, and this frequently leads to problems that take on a critical role within mathematics. A good example is the problem of describing solutions to differential equations – in other words, to equations in which the unknown quantities vary continuously. The varying quantities can be treated as coordinates of points, and studying the space they form inspired a new topic called topology. This then led to questions about the very space we live in, an outstanding example being Poincaré's conjecture. New methods were needed to solve this, and the author devotes one of his twenty chapters to topology, and of course to this famous conjecture.

Other chapters tackle topics both old and new, ending with the study of chaos and complexity, which has become important in the world of computers. There is an impressively broad sweep here, and Ian Stewart is an accomplished mathematician who writes very clearly on his subject. In the first few chapters, he explains the early work of the ancient Babylonians, and here he is equally impressive, discussing how they arrived at their results. Their geometric intuition, which is not expressed on their mathematical tablets, is clearly explained.

From a more modern point of view, the section on quadratic equations is particularly good, showing why the solutions can be expressed in terms of the numbers appearing in the equation, along with a single square root. This is important for the later discussion of work in the early nineteenth century on equations having degree at least five, where the solutions cannot normally be expressed using square roots, cube roots, fifth roots, etc. The book is well produced, with useful pictorial material, and will appeal to non-specialists who want to know something of the development of mathematics over the past 4,000 years.

MARK RONAN