BOOK REVIEWS

John Grant McLoughlin

Hungary–Israel Mathematics Competition: The First Twelve Years
By S. Gueron, AMT Publishing, Canberra, 2004
ISBN 1-87642-015-4, paperback, 181 pages, AUD$35.20.
Reviewed by ***Stan Wagon****, Macalester College, St. Paul, MN, USA.*

This book, like any collection of problems at the Olympiad level, is excellent for students preparing for Olympiad-type contests. But the book should also appeal to many other readers. There is excellent variety in the problems, and there is a section with hints, as well as the complete solutions.

I found that a good number of the problems were interesting to me. For example, Problem 1993–1 is very nice: find all rationals b/a so that the number one gets when one writes the digits of a followed by the digits of b, but with a decimal point between them, exactly equals the given rational. It seems somewhat surprising that there is exactly one rational with this property, and the reader is encouraged to find it. Of course, this problem is screaming out for an investigation into other bases. All I found was the rational $18/4$ which works in base 6, because 18 is $30_{(6)}$ and $4.30_{(6)}$ equals the rational $9/2$. But this lacks elegance in that the rational is not in lowest terms. Michael Schweitzer (Berlin) was able to resolve this completely, obtaining the following nice result: A base B admits a rational b/a that is in lowest terms and equals $a.b$ if and only if B has the form $n(n^2+1)$ with $n \geq 2$; and, for such bases, there is exactly one such rational.

One unusual feature of this event is that, for 9 years, there has been a team competition that takes place on a separate day from the individual contest. Here the questions are all on a preannounced theme, thus allowing deeper exploration than in a traditional contest. This book includes those nine years of problems and solutions as well.

I found the theme in 1991 appealing. It concerns polynomials $p(x)$ which are quadratic with integer coefficients. They include the following:

1. Show that a non-square, monic $p(x)$ cannot take on infinitely many square values (for x an integer).
2. Show that, for any positive integer N, there is a non-square, monic $p(x)$ for which there are N square values $p(n)$.
3. Show that there is a non-square $p(x)$ that takes on infinitely many square values.
4. Find a non-square and monic $p(x)$ that is square for four consecutive integer values of x.

The book has a fair number of typographical errors, but most are not significant. There are no references or sources given for any of the problems. Presumably most are original.

Mathematical Adventures for Students and Amateurs
Edited by David F. Hayes and Tatiana Shubin, published by the Mathematical Association of America (Spectrum Series), 2004
ISBN 0-88385-548-8, paperbound, 291+xi pages, US$38.50.
Reviewed by ***David G. Poole****, Trent University, Peterborough, ON.*

The Bay Area Mathematical Adventures (BAMA) is a series of mathematical talks for bright middle and high school students hosted alternately by Santa Clara University and San Jose State University. In existence since 1998, the program has featured six talks per year by many well-known mathematicians—Ronald Graham, Carl Pomerance, Karl Rubin, Joseph Gallian, Jean Pedersen, Sherman Stein, and Robin Wilson, to name a few. This book is a collection of nineteen of the talks presented at BAMA. The essays are not transcripts of the talks but rather presentations of the mathematics contained therein. For a list of all the talks that have been presented as part of BAMA, see the program's website:

`http://www.mathcs.sjsu.edu/faculty/dfhayes/bama.html`

The range of topics is diverse and accessible. The essays are organized under five headings: general, number theory, combinatorics and probability, geometry and topology, applications and history. Graham discusses the mathematics of juggling; Rubin introduces elliptic curves; Gallian describes mathematical detective work needed to decode drivers' licenses; Pedersen addresses the question of how many bounded and unbounded regions in space result when the planes of the Platonic solids are extended in space; Stein revisits Archimedes' analysis of the equilibrium of a floating paraboloid; Wilson presents an account of the mathematics of Charles Lutwidge Dodgson (Lewis Carroll) in the form of a play inspired by Alice in Wonderland. In addition there are talks on communicating with extraterrestrials, the space shuttle Challenger disaster, the mathematics of map-making, collaboration between mathematicians and computers, and many more.

Since the BAMA talks are aimed at talented students, the level of the mathematical exposition is higher than one might initially expect. The required level of mathematical maturity varies from talk to talk, but all of the talks are self-contained and will be accessible to a bright high school student. Although "user-friendly", the mathematics found here is very rigorous, with precisely stated definitions, theorems and conjectures. In addition, most of the articles provide references for further reading or links to related web-sites. As a result, this book is suitable for a wide variety of audiences. High school students and teachers, college and university students, mathematics educators and mathematicians will all find something of interest here.

This book is an excellent example of how to present stimulating topics in mathematics that will inspire both students and teachers. Good students will be able to read the articles independently; teachers may wish to dip into the book to find enrichment material for their classes. As the book's title suggests, the theme is exploration. The articles do a very good job of conveying the sense of wonder and excitement one has when plunged into a rich mathematical world.