BOOK REVIEW

Fibonacci and Lucas Numbers with Applications, by Thomas Koshy
(New York: Wiley-Interscience, 2001; ISBN: 0-47-39969-8)

This is a delightful book which should prove of great value not only to the professional mathematician but also to a great variety of other professionals like architects, biologists, neuro-physiologists, physicists, and stock market analysts, to name but a few. The book is aimed at a broad student audience as well, and it contains a large selection of proposed problems which should make the book a valuable instrument for teaching a first course on number theory. Finally, the book should be of interest to Fibonacci enthusiasts and laypersons alike. This book has a very broad scope indeed!

Koshy begins by offering a lively and well-documented historical perspective on Leonardo Fibonacci and on his mathematical works; he also sketches the contributions made by Édouard Lucas. Next, the author takes the reader through some of the interesting occurrences of Fibonacci numbers in the biological, the chemical, the medical, the physical and the money market worlds. After having set this motivational stage in the first four chapters of the book, Koshy now adeptly moves on, in chapters 5 through 15, to some of the more elementary properties of Fibonacci and Lucas numbers: techniques for generating simple identities are presented and linear recurrence relations are discussed; links between the Fibonacci numbers and Pascal's triangle are established and explored, etc. Finally, the author proceeds to a presentation of more advanced subjects which involve Fibonacci and Lucas numbers, such as divisibility properties, generating functions, continued fractions, periodicity, weighted sums, matrices and the Q-matrix, Fibonacci and Lucas polynomials, Jacobsthal polynomials, Morgan-Voyce polynomials, Tribonacci poly-nomials, etc. The coverage is truly extensive.

The book is well written, well researched, and well organized. One should not overlook these features, particularly the last one, considering the astronomical amount of research and pedagogical literature that exists on Fibonacci numbers! The style is lively and precise. Difficult underlying concepts such as graphs, trees, etc. are all explained with great ease and confidence. I particularly enjoy the numerous theorems, identities, and results that are quoted throughout the book! I am also delighted by Koshy's tendency to provide anecdotal and biographical background on the authors he quotes. As a result of that tendency, the reader can catch a glimpse, albeit too brief at times, of the human face that lies behind this particular theorem or that particular technique. The entire book is liberally sprinkled with historical anecdotes and footnotes which show that the author has thoroughly researched his subject and which add color and vitality to the topic at hand.

I would venture to say that Koshy's book is the most comprehensive collection of results, theorems, and references regarding Fibonacci numbers and their applications to date. The timing and scope of the book make it a rather fitting tribute to the enduring impact of Leonardo Fibonacci's *Liber Abaci* since it was originally published in 1202, 800 years ago next year! I recommend Koshy's book without reservation to professional mathematicians who teach a course on number theory, to professional scientists and engineers, to students, and to the general amateurs and enthusiasts alike.

Reviewed by Napoleon Gauthier