About half the problems are variants of problems I have seen elsewhere. At this level it is not easy to be both entertaining and original. Nevertheless even the old favourites appear in acceptable new dress and cannot be dismissed out of hand even by the puzzle-addict. The other half are new to me and involve mathematical ideas that do not feature too often in puzzles. I particularly enjoyed "Bowling Averages" with its use of inequalities and "Wrapping" which makes geometrical sense of what shopkeepers have been doing for years.

The presentation perhaps encourages cheating in that each problem is immediately followed by a very full solution and exposition, but this in itself is far more than half the interest of the book as each problem is placed by the author in its mathematical context, sometimes with ideas for further hard generalizations.

The style is easy to read and in the solutions makes one wonder what the difficulty was—a rare gift. The printing and diagrams are clear with few misprints.

It is an entertaining and well-presented book which would be a good addition to the library of puzzle-collectors and an acceptable present for anyone interested in recreational mathematics.

MAGNUS PETERSON

BAKER, ALAN, *A concise introduction to the theory of numbers* (Cambridge University Press, 1984), xii + 95 pp. £15 cloth, £4.95 paper.

The adjective "concise" is an accurate description of this excellent book. A very bright student could read it without help, but the average honours student will require considerable assistance in following several of the arguments given. As a text for a lecturer to expand on it is admirable. After the usual preliminaries, there are chapters on quadratic residues, forms and fields, and on Diophantine approximation and equations. In the 91 pages of text a surprisingly large amount of material is covered. At the end of each chapter the reader is brought up to date by accounts of recent developments, in many of which the author has played a leading part.

I found the last chapter particularly interesting. In it the equations of Pell, Mordell ($y^2 = x^3 + k$), Fermat, and Catalan ($x^p - y^q = 1$) are discussed. In 15 pages a complete account of these problems is, of course, impossible, but the author has been remarkably skilful in conveying an understanding of the difficulties involved by his comments and choice of examples.

There are exercises at the end of each chapter, some of considerable difficulty. The book is beautifully printed, as one would expect. The only misprint I found was in the index, where, as one knows from experience, printers find it hard to believe that Lebesgue does not have a *q* in place of its *g*.

R. A. RANKIN

CONWAY, J. B. *Subnormal operators* (Research Notes in Mathematics 51, Pitman, 1981), xvii + 476 pp. £15.75.

Of the various special classes of Hilbert space operators which have been studied, normal operators are probably the best understood. Up to unitary equivalence, they are just the operators on L^2 spaces given by multiplication by bounded measurable functions and they can be classified in measure theoretic terms. In 1950, P. R. Halmos generalised the notion of normality by introducing the class of subnormal operators. These are the operators which have normal extensions; that is, an operator S on a Hilbert space H is subnormal if there is a normal operator N on a Hilbert space K containing H such that H is N-invariant and S is the restriction of N to H. The motivating example was the unilateral shift, which is defined as multiplication by z on the Hardy space H^2 and has an obvious normal extension acting on L^2 of the circle.

The early developments in the theory of subnormal operators used mainly the tools of abstract operator theory, whereas more recent work has relied heavily on the techniques of function theory and uniform algebras. The reason for this is that each cyclic subnormal operator S can be represented as multiplication by z on $P^2(\mu)$, where μ is a compactly supported measure on the plane and $P^2(\mu)$ is the closure in $L^2(\mu)$ of the (analytic) polynomials. Furthermore, the ultraweakly