5 [F].—K. F. ROTH, *Rational Approximations to Irrational Numbers*, H. K. Lewis & Co., Ltd., London, 1962, 13 p., 26 cm. Price 3s. 6d.

In this brief, readable, and stimulating inaugural lecture, the author discusses his famous theorem:

Let α be algebraic and of degree $n \geqq 2$. If the positive number κ is such that the inequality

$$\left| \alpha - \frac{h}{q} \right| < \frac{1}{q^\kappa}$$

has an infinity of solutions h/q, then $\kappa \leqq 2$.

He traces its history via Liouville, Thue, Siegel, Dyson, and Schneider, and emphasizes the "fundamental weakness" of the proof (which goes all the way back to Thue) in that if κ is chosen greater than 2 it is impossible to put an upper bound on the corresponding largest value of q. This impossibility creates difficulties in applications, and is of immediate concern to investigators of some number-theoretic problems who are utilizing high-speed computers.

He also discusses other drawbacks and some unsolved problems, in particular a conjecture of Littlewood "which can hardly be given too much publicity". He agrees with Mahler's remark that "the whole subject is as yet in a very unsatisfactory state".

D. S.

6 [F].—C. D. OLDS, *Continued Fractions*, Volume 9 of the *New Mathematical Library*, Random House, New York, 1963, viii + 162 p., 23 cm. Price \$1.95.

This is an easy-going exposition of simple continued fractions, that is, those of the form $n_1 + \frac{1}{n_2 +} \frac{1}{n_3 +} \cdots$. There are applications to the expansions of irrational numbers into infinite continued fractions and to the solution of the Diophantine equations $Ax \pm By = \pm C$ and $x^2 - Ny^2 = \pm 1$. There are many problems (mostly numerical) together with their solutions.

As with other volumes in this series, the material is mostly quite elementary, but brief mention is given of some more advanced material such as Hurwitz's theorem, Farey sequences, the (unnamed) Markoff "chain of theorems" (page 128), unsymmetrical approximations (page 129), and the logarithm algorithm (section 3.11). An interesting Appendix II lists some historically famous numerical or analytic continued fractions.

D. S.

7 [F, Z].—ROBERT SPIRA & JEAN ATKINS, *Coding of Primes for a Decimal Machine*; a deck of 159 IBM cards deposited in UMT File.

This deck of IBM cards is an efficient coding of the primes $< 10^5$ for use in a decimal machine. There are 159 cards, each containing a card number in the first 10 columns and seven other ten-digit coding words. The last word of the last card is not used, and is set equal to zero. Thus, the identification of the primes $< 10^5$ is capable of being stored in 1,112 ten-digit words.

This information was stored as follows: The odd numbers not divisible by 3 were written down. Below them were written binary bits: 1, if a prime; 0, if not.

The binary numbers were converted to octal and stored as such in a decimal machine. This makes for a reasonable decoding time. The process is illustrated by the table below.

$$\begin{array}{cccccc} 5\ 7\ 11 & 13\ 17\ 19 & 23\ 25\ 29 & 31\ 35\ 37 & 41\ 43\ 47 & 49\ 53\ 55 \\ \underbrace{1\ 1\ 1}_{7} & \underbrace{1\ 1\ 1}_{7} & \underbrace{1\ 0\ 1}_{5} & \underbrace{1\ 0\ 1}_{5} & \underbrace{1\ 1\ 1}_{7} & \underbrace{0\ 1\ 0}_{2} \end{array}$$

Thus the first number in the deck starts: 775572. . . . The cards were prepared by Miss Jean Atkins at the Duke University Computing Center on an IBM 7072.

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8 [G].—B. H. ARNOLD, *Logic and Boolean Algebra*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1962, 144 p., 23 cm. Price $9.00.

Logic and Boolean Algebra is an introductory text in which attention is mainly directed to an abstract development of the theory of finite Boolean algebras and Boolean rings. The first two chapters, dealing with propositional logic and Boolean functions, respectively, serve to provide illustrative material for the ordered sets and the general notion of an algebraic system in Chapter 3; the book then progresses through lattices (Chapter 4), Boolean Algebras (Chapter 5), Boolean Rings (Chapter 6) and ends in Chapter 7 with a treatment of normal forms and duality. The last chapter deals briefly with applications of Boolean algebra to the design and analysis of switching circuits and computers.

Chapters 5 and 6 form the core of the book. The main result of Chapter 5 is the theorem: Every finite Boolean algebra is isomorphic to the algebra of the set of all subsets of a finite set. In Chapter 6 the equivalence of Boolean rings with a unit and Boolean algebras is demonstrated, and it is shown that every finite Boolean ring is isomorphic to the ring of all n-tuples of Boolean constants for some n.

With the notable exception, in Chapter 1, of a confused discussion of object language versus meta language—a confusion compounded by a misuse of quotation marks and a failure to distinguish adequately names of linguistic objects from the objects themselves—the book is well written. Theorems are clearly stated, and their proofs are sensibly organized. There are numerous problems, many of which give results later used in the text.

The present volume, in short, constitutes a readable, if somewhat elementary, introduction to the study of abstract Boolean algebra.

RICHARD GOLDBERG

International Business Machines Corp.
New York, New York

9 [K].—CHURCHILL EISENHART, LOLA S. DEMING & CELIA S. MARTIN, *Tables Describing Small-Sample Properties of the Mean, Median, Standard Deviation, and Other Statistics in Sampling from Various Distributions*, Government Printing Office, Washington 25, D.C., 1963, iv + 14 p., 26 cm. Price $0.20.

This note is a brief collection of ten single-page tables useful for the study of the