in number theory. The author's two main topics are the theory of complex multiplication of elliptic and elliptic modular functions and applications of the theory of Hecke operators to zeta functions of algebraic curves and abelian varieties. Since the prerequisites for studying these topics are quite formidable, probably only the most sophisticated readers will be able to comprehend the book in its entirety.

Professor Shimura has divided his book into three parts which make successively increasing demands upon the reader's mathematical background. The first of these consists of chapters on Fuchsian groups of the first kind, automorphic forms and functions, and the zeta functions associated with modular forms. This material is accessible to those who have mastered the usual introductory graduate courses. However, the Riemann-Roch Theorem and a theorem of Wedderburn about an algebra with radical are stated and used without proof. The next section encompasses elliptic curves, Abelian extensions of imaginary quadratic fields, complex multiplication of elliptic curves, and modular functions of higher level. The classical results of Kronecker, Webber, Takagi and Hasse concerning the construction of maximal Abelian extensions of imaginary quadratic fields by adjoining special values of elliptic and elliptic modular functions are derived by modern methods. Specifically, the adele-theoretic formulation of class field theory as presented in Weil's *Basic Number Theory* and some concepts from algebraic geometry are used freely. The final section treats zeta functions of algebraic curves and Abelian varieties and arithmetic Fuchsian groups. The Hasse-Weil Conjecture, the construction of class fields over real quadratic fields and Fuchsian groups obtained from quaternion algebras are among the topics discussed.

Professor Shimura has made his book even more useful by providing an appendix summarizing the required algebraic geometry and an extensive bibliography.

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53[8].—G. W. HILL, *Reference Table*: *"Student's" t-Distribution Quantiles to* 20D, Technical Paper No. 35, Division of Mathematical Statistics, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1972, 24 pp., 25 cm. Copy deposited in the UMT file.

Quantiles of Student's t-distribution corresponding to the two-tail probability levels $P(t \mid n) = 0.9(-0.1)0.1$, $\{5, 2, 1\} \times 10^{-r}$ for $r = 2(1)5$, 10^{-s} for $s = 6(1)10(5)30$, and for $n = 1(1)30(2)50(5)100(10)150, 200$, $\{24, 30, 40, 60, 120\} \times 10^{r}$ where $r = 1(1)3$, and also for $n = \infty$, are herein tabulated to 20D for $t < 10^3$, otherwise to 20S. These numbers were originally calculated to about 25S on a CDC 6400 system prior to rounding to the tabular precision, and elaborate checks applied at successive stages of the calculations and to the final reproduction inspire acceptance of the author's claim of accuracy of the tabular entries to within half a unit in the least significant digit.

We are informed in the introduction that this table is not intended for daily use, but rather has been designed to provide reference values for resolving discrepancies in previous tables and for determining errors of various approximations.

The explanatory text also includes outlines of the various methods available for the multiple-precision computation of the tabulated quantiles, the probability integral and frequency function for the t-distribution, and the normal probability integral and its inverse.

The exceptionally high precision of this definitive table, as well as its accuracy, should make it a basic reference table for statisticians, as implied in the title.

J. W. W.

54[9].—J. C. P. MILLER, *Primitive Root Counts*, University Mathematical Laboratory, Cambridge, England. Ms. of 15 pp. deposited in the UMT file.

This tabulation of counts of primes with specified primitive roots was started in connection with the preparation of a set of tables of indices and primitive roots compiled by the present author in collaboration with A. E. Western [1]. The counts listed therein (Table 8) have been considerably extended in the present tables, which are based on calculations completed in 1966 on EDSAC 2, using programs prepared by M. J. Ecclestone.

The main listing of counts herein includes all those primes less than 250,000 for which the integer a is a primitive root, where $\pm a = 2(1)60$. These counts are given for such primes occurring in successive intervals of 10^4 integers, with subtotals for successive intervals of $5 \cdot 10^4$ and 10^5 integers, as well as a grand total for each a. Corresponding to $\pm a = 3, 5, 7, 11, 13$, and 17, these counts are extended in a supplementary table to all such primes less than 10^6, appearing in successive intervals of $5 \cdot 10^4$ integers, with subtotals at every fifth interval, and the corresponding grand totals. The corresponding counts of all primes in these intervals are also given, and a numerical comparison is made between the cumulative tabular counts and the corresponding counts predicted from Artin's conjecture as elaborated upon in [1].

The large amount of new material in this manuscript certainly provides a valuable supplement to the corresponding data in [1], which will be of particular interest to number theorists.

J. W. W.

1. A. E. WESTERN & J. C. P. MILLER, *Indices and Primitive Roots*, Royal Society Mathematical Tables, Vol. 9, University Press, Cambridge, 1968. (See *Math. Comp.*, v. 23, 1969, pp. 683–685, RMT **51**.)

55[9].—SAMUEL YATES, *Partial List of Primes with Decimal Periods Less than* 3000, Moorestown, N. J. Ms. of 30 computer sheets (undated) deposited in the UMT file.

Known primitive prime factors of integers of the form $10^n - 1$ are here tabulated for 1564 positive integers n less than 3000. Complete factorizations are listed for the first 30 values of n and for 15 higher values, not exceeding $n = 100$. All admissible primes under $4 \cdot 10^7$ have been tested as factors throughout the range of the table.

Brillhart and Selfridge [1] have proved that $(10^n - 1)/9$ is prime only for $n = 2$, 19, and 23 if $n < 359$. The present table permits this limit to be raised to $n < 379$.

This compilation updates and supplements an earlier one [2], which was limited to prime values of n in the same range.

J. W. W.