REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

72[A–E, G–O, P, S].—R. S. BURINGTON, *Handbook of Mathematical Tables and Formulas*, Fourth edition, McGraw-Hill Book Company, New York, 1965, xi + 423 pp., 21 cm. Price $4.50.

This is a revised, enlarged, and reset edition of a well-known, popular mathematical handbook.

As in the earlier editions, the book is divided into two parts; namely, Part One, "Formulas, Definitions, and Theorems from Elementary Mathematics"; and Part Two, "Tables".

The current trend in mathematical education is reflected in this latest edition in the inclusion in Part One of sections devoted to sets, logic, algebraic structures (including Boolean algebra), number systems, matrices, and statistics.

The second part of the book consists of 39 tables, generally to 5D or 5S. The tables in the third edition have been retained and partially rearranged. These tables include natural and common logarithms, natural and logarithmic values of trigonometric functions, exponential and hyperbolic functions, squares, cubes, square roots, cube roots, reciprocals, circumferences and areas of circles, factorials and their reciprocals, binomial coefficients, probability functions, interest and actuarial tables, the complete elliptic integrals K and E, common logarithms of the gamma function, factors and important constants. Two additional tables have been included in this new edition: one of these, which constitutes part of Table 32, contains 4D square roots of certain common fractions; the other gives 3D values of the χ^2 distribution. One error exists in the latter table: the entry for the 1% point ($\epsilon = 0.01$) and three degrees of freedom ($m = 3$) should read 11.345 instead of 11.341. This has been tabulated correctly by Fisher and Yates [1].

Another improvement over the earlier editions is the inclusion of a glossary of symbols and an index of numerical tables, as well as an appropriately enlarged subject index.

A further feature is a "table locator," which enables the user to readily locate any one of the tables by merely flexing the pages. An abbreviated list of mathematical symbols, abbreviations and the Greek alphabet are now presented on the inside of the front cover and the facing page, respectively.

This improved and expanded edition should be even more useful than its predecessors.

J. W. W.

1. R. A. FISHER & F. YATES, *Statistical Tables for Biological, Agricultural and Medical Research*, 5th ed., Oliver and Boyd, London, 1957.

73[F].—F. GRUENBERGER & G. ARMERDING, *Statistics on the First Six Million Prime Numbers*, Paper P-2460 of the Rand Corporation, Santa Monica, California, 1961, 145 pp., $8\frac{1}{2} \times 11$ in. Copy deposited in UMT File.

The five tables in this report are concerned with the distribution of the first six million primes, from $p_1 = 1$ (which is here counted as a prime) to $p_{6000000} = 104395$-

289. This study followed the printing of these primes [1] from the same tape. For convenience of description, let us define the difference Δ_i by

$$\Delta_i = p_{i+1} - p_i .$$

Table 1 lists, for each $\Delta = (1)220$, (a) the first p_i such that $\Delta_i = \Delta$ (if one such exists), and (b) the number of differences $\Delta_i = \Delta$ within this range.

Table 2 tabulates all 6433 of the pairs Δ_i and p_i such that $\Delta_i > 100$.

Table 3 lists, for each interval $50000K < p < 50000(K + 1)$, $K = 0(1)2087$, the following five quantities.

(a) The number of p_i therein.
(b) The largest p_i therein.
(c) The number of p_i therein such that $\Delta_i = 2$ and $\Delta_{i+1} = 4$.
(d) The number of p_i therein such that $\Delta_i = 4$ and $\Delta_{i+1} = 2$.
(e) The number of p_i therein such that $\Delta_i = 2$, $\Delta_{i+1} = 4$, and $\Delta_{i+2} = 2$.

The last interval, $K = 2087$, is incomplete, and has instead an upper bound of $p_{6000000}$. Through an oversight, this value of $p_{6000000} = 104395289$ is nowhere indicated in the entire report. Cumulative counts are unfortunately not given, except for the grand totals: 6000000 primes in (a), 57658 triples in (c), 57595 triples in (d), and 4917 quadruples in (e).

Table 4 tabulates all 4917 of the p_i that initiate the quadruples just mentioned.

Finally, for the intervals $100000K < p < 100000(K + 1)$, $K = 0(1)1042$, Table 5 lists the number of p_i therein such that $\Delta_i = 2$ (the twin primes). Again, cumulative counts are lacking, except for the grand total of 456998 twin pairs up to 104300000.

With some hack work, though (it would have taken the machine about 0.01 sec.) the reviewer finds that up to 10^8 there are 440312 twins, 55600 triples of the type (c) above, 55556 triples of type (d), and 4768 quadruples of type (e).

No attempt is made in the report to compare these statistics with the famous Hardy-Littlewood conjectures, and it would be too tedious to do this thoroughly now by hand. Some checks are, however, easily made. By the conjectures, primes p such that $p + 2$ is also prime should be equinumerous with primes p such that $p + 4$ is also prime, but only one-half as numerous as primes p such that $p + 6$ is prime. In Table 1 we find 457399 primes with $\Delta_i = 2$, 457478 primes with $\Delta_i = 4$, and 798900 primes with $\Delta_i = 6$. Adding to the last number the 57658 + 57595 triples of Table 3, we do find the pleasing ratios:

$$\frac{457399}{457478} = 0.99983, \qquad \frac{457399}{914153} = 0.50035.$$

Further, one would expect about

$$1.32032 \cdot \frac{10^5}{(\log 10^8)^2} = 389.11$$

pairs of twins in each block of 10^5 numbers near 10^8. One finds in Table 5 that the ten such blocks closest to 10^8 do contain 406, 385, 363, 405, 409, 377, 425, 378, 379, and 392 twins, respectively.

Much more detailed comparisons have been previously given by D. H. Lehmer [2] of these distributions in the smaller range of primes less than $37 \cdot 10^6$.

The reviewer is pleased to announce that the belated appearance of this review is solely due to the belated appearance of a review copy in the editorial office of this journal.

D. S.

1. C. L. BAKER & F. J. GRUENBERGER, *The First Six Million Prime Numbers*, The Rand Corporation, Santa Monica, published by The Microcard Foundation, Madison, Wisconsin, 1959. Reviewed in *Math. Comp.*, v. 15, 1961, p. 82, RMT **4**.

2. D. H. LEHMER, "Tables concerning the distribution of primes up to 37 millions," 1957, ms. deposited in the UMT file and reviewed in *MTAC*, v. 13, 1959, p. 56–57, RMT **3**.

74[G].—LUDWIG BAUMGARTNER, *Gruppentheorie*, Walter de Gruyter & Co., Berlin, 1964, 190 pp., 16 cm. Price DM 5.80 (paperback).

This is the fourth edition of a compact textbook on group theory, which first appeared in the year 1921. Though there is probably not a single sentence in common to the two editions, the book has retained the pedagogical skill of the exposition and of the many exercises (now 151) illustrating the concepts developed in the text in unbroken sequence.

The content of the present edition may be characterized as a substantial portion of the union of the textbooks on group theory by A. Kurosch and by the reviewer (first edition) emphasizing basic concepts, but not considering transfer theory, lattice theory, extension theory, theorems on not finitely generated abelian groups, etc. The attractive historical references and sections on geometric groups of the first edition have given way to a treatment of group theory governed entirely by the restrained abstract viewpoint of the thirties and forties. The group tables appended to the book are very useful for teaching and self-study purposes.

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75[G].—C. A. CHUNIKHIN, *Podgruppy Konechiykh Grupp* (*Subgroups of Finite Groups*), Nauka i Technika (Science and Technology), Minsk, 1964, 158 pp., 21 cm. Price 57 kopecks.

In honor of the ninetieth anniversary of Sylow's theorems (1872) the author devotes a four-chapter monograph to the exposition of the known theorems of finite group theory about the existence of subgroups of given order of a finite group G, starting with Sylow's theorem on the existence of p-subgroups for every p-power divisor of the order of G and the conjugacy of the Sylow p-groups under G, continuing with P. Hall's theorems on Π-subgroups of solvable groups (Π a given set of prime numbers), and concluding with a detailed exposition of the author's results contained in more than 30 research papers.

In Chapter I the known generalizations of Sylow's theorems on p-groups to the corresponding theorems on Π-groups are studied. In Chapter II the factorization of the finite groups utilizing the indices of the principal or composition series is treated. In Chapter III the construction of the subgroups of a finite group, with the help of the "indexials", is discussed. Given a principal chain $G = G_0 \geqq G_1 \geqq \cdots \geqq G_\mu = 1$ ($\mu \geqq 1$) of G and a chain of subgroups $F_i | G_i$ of $G_{i-1} | G_i$ for $i = 1, 2, \cdots, \mu$ such that any conjugate of $F_i | G_i$ under $G | G_i$ already is a conjugate