172.—G. N. WATSON, "A Table of Ramanujan's function $\tau(n)$," London Math. Soc., *Proc.*, s. 2, v. 51, 1949, p. 1–13 [*MTAC*, v. 3, p. 468].

P.12, $n = 847$ *for* 38152 *read* 58152.

This typographical error was noted when Watson's table was put on punch cards and submitted to a series of checks. These cards are available in the UMT FILE.

D. H. L.

UNPUBLISHED MATHEMATICAL TABLES

EDITORIAL NOTE: Beginning with this volume we are starting a collection of unpublished mathematical tables to be known as the UMT FILE. Authors of tables which have no immediate prospect of publication are invited to submit copies for deposit in UMT FILE. Description of such tables will appear in UMT and photostat or microfilm copies will be supplied at cost to any reader of *MTAC*. Address tables or correspondence to D. H. LEHMER, 942 HILLDALE AVE., BERKELEY 8, CALIFORNIA.

90[F].—R. A. LIENARD, *List of primes of the form* $k\cdot 10^6 + 1$ *and* $k\cdot 10^7 + 1$ *for* $k < 1000$. Manuscript in the possession of the author and deposited in UMT FILE.

There are listed 117 primes of the form $k\cdot 10^6 + 1$ and 109 primes of the form $k\cdot 10^7 + 1$.

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91[K].—BALLISTIC RESEARCH LABORATORIES. Aberdeen Proving Ground, Md., *Probability Integral of Extreme Deviation From Sample Mean.*

$$H_n(x) = (n/2\pi(n-1))^{\frac{1}{2}} \int_0^x \exp\left(-t^2/2n(n-1)\right) H_{n-1}(t)dt, \quad (H_1(x) = 1.)$$

For normally distributed and ranked variables $u_1 \leqslant u_2 \leqslant \cdots \leqslant u_n$, $H_n(nk)$ gives the probability that the extreme deviation from the sample mean, i.e., $u_n - \bar{u}$ or $\bar{u} - u_1$ will not exceed k times the population standard deviation for random samples of size n, for $n = 1(1)25$. Each function is tabulated until it becomes sensibly unity. The interval of tabulation for x is as follows:

.1 for $n = 2(1)7$, .4 for $n = 12, 13$,
.2 for $n = 8(1)11$, .8 for $n = 14(1)25$.

The accuracy is 7D.

The work was done on the ENIAC under the direction of J. V. HOLBERTON.

92[K].—BALLISTIC RESEARCH LABORATORIES, Aberdeen Proving Ground, Md., *Binomial Probabilities.*

$$I_p(c, n-c+1) = \frac{1}{B(c, n-c+1)} \int_0^p x^{c-1}(1-x)^{n-c}dx.$$

The probability of c or more successes in n trials is given by $I_p(c, n - c + 1)$, where p is the chance of a success in one trial.

$$n = 1(1)200, \qquad c = 0(1)n, \qquad p = 0(.01)1;\ 7D$$

The work was done on the IBM Relay Calculator under the direction of M. LOTKIN.

93[L].—FASANORI FUKAMIYA, *Mathematical Studies of the High Frequency*, Photostat filed in the Japanese Section of the Board of Trade, Technical Information and Documents Unit. Reference BIOS/JAP/DOC/1550.

This paper contains a certain amount of descriptive text followed, it is stated, by 5 appendices.

Appendices I and II consist of tables and graphs of certain functions (which are not of any interest being purely "ad hoc") connected with radiation from a sectoral horn.

Appendix IV is stated to be a table of "zero points of the derivative of the Associated Legendre function." In actual fact Appendix IV consists of a series of graphs of some unknown function.

Appendix V is the most interesting part of the paper. This consists of tables of $J_n(z)$ as follows:

$$n = 1, \quad z = [0(.1)3;\ 7D], \quad n = 2(1)10, \quad z = [0(.1)10.7;\ 7D],$$
$$n = 11(1)20, \quad z = [0(.1)6;\ 7D], \quad n = 11(1)20, \quad z = [6.4(.1)10;\ 5D].$$

(no explanation is given for the absence of $J_n(z)$ for $n = 11(1)20$, $z = 6.1(.1)6.3$.)

The tables were compared as far as possible with WATSON's Bessel Functions[1] and, apart from differences of 2 or less in the last place, the following discrepancies occur.

	Watson	Fukamiya
$J_3(2.3)$	.1799789	.1899789
$J_3(4.3)$	.4333147	.4333470
$J_5(1.0)$	.0002498	.0002475

It is further stated that tables of Fresnel Integrals for argument s 0–50 have been calculated, but were "destroyed in the event."

Unfortunately the reproduction of the copy seen was poor, only the three pages of text were typewritten, the tables being written. In addition appendix III was missing and no date was given for the work, nor was there any indication of where Fukamiya worked.

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A comparison with the forthcoming B. A., *Mathematical Tables*, v. X revealed many errors; these are often only a unit or two in the last figure, but many are gross errors. Some effect several values of n for the same x and are obviously computational. It is noteworthy that errors are fewer in the range covered by Watson's table[1] and are almost all in the end figure, yet agreement with Watson is not complete, and a value known to be in error in Watson is correct in the table under review.

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[1] G. N. WATSON, *Treatise on the Theory of Bessel Functions*, Cambridge, 1922, second ed. 1944 [*MTAC*, v. 2, p. 49–51.]

94[V].—BALLISTIC RESEARCH LABORATORIES, Aberdeen Proving Ground, Md. *Supersonic Flow past Cone Cylinders.* [See Note **113**.]

AUTOMATIC COMPUTING MACHINERY

Edited by the Staff of the Machine Development Laboratory of the National Bureau of Standards. Correspondence regarding the Section should be directed to Dr. E. W. CANNON, 225 Far West Building, National Bureau of Standards, Washington 25, D. C.

TECHNICAL DEVELOPMENTS

Characteristics of the Institute for Numerical Analysis Computer

In January 1949, members of the staff of the Institute for Numerical Analysis[1] began the development and construction of a high-speed electronic digital computer. As of December 1, 1949, the central computer was approximately eighty per cent completed. The group responsible for the building of this machine is composed of, besides the author, three engineers, three junior engineers, and four technicians. In addition, one mathematician is assigned to the coding and programming of problems to be run on the machine.

Information is stored and processed in the computer in units called words, a word consisting of 41 binary digits. This word length is determined by the number of words which can be stored in the computer's high-speed memory.

Words in the machine sense may represent (1) numerical information, (2) instructions to the computer, and (3) alphabetic information.

In the case of numerical information, one binary digit of a word is used for the sign and 40 binary digits are available for numerical data. Numbers are stored in the memory as absolute value and sign. In the arithmetic unit, negative numbers may be converted to complementary[2] form to keep the operational algorithms relatively simple. Thus, negative numbers involved in addition, subtraction, and compare are complemented upon arrival in the arithmetic unit. In the multiplication, extract, input, and output commands, negative numbers are not complemented.

Numbers may be represented in many different ways. For example, a word may represent a signed-binary number lying somewhere between -2^{40} and $+2^{40}$, or the binary point may be ahead of the most significant digit in which case a word lies in the range -1 to $+1$; the built-in arithmetic operations handle numbers in either of these forms. The word may, on the other hand, represent a signed-ten-decimal-digit number where each decimal digit is represented as a four-digit-binary number. A floating representation may