t	h should be	error in 0'.1
19°	69°35'.9	2
21°	68°26'.4	2
22°	67°50'.6	2
24°	66°37'.2	2
25°	65°59'.7	2
29°	63°25'.1	2
31°	62°05'.7	2
36°	58°42'.5	2
39°	56°38'.3	2
	$L = 32°$	
15°	72°32'.5	2
	$L = 33°$	
12°	74°50'.3	2
17°	72°13'.2	2
	$L = 34°$	
15°	74°04'.9	2

t	h should be	error in 0'.1
27°	67°10'.3	2
29°	65°48'.5	2
31°	64°25'.9	2
35°	61°38'.9	2
52°	49°39'.4	2
	$L = 36°$	
11°	77°44'.1	2
12°	77°12'.6	2
	$L = 37°$	
11°	78°29'.4	2
12°	77°56'.4	2
	$L = 38°$	
20°	73°31'.5	2
27°	68°43'.2	2
	$L = 39°$	
5°	82°56'.8	3
6°	82°31'.8	4
7°	82°03'.9	4
28°	68°27'.9	2

I wish to acknowledge the valuable assistance of Miss EVELYN LINDSAY and Miss NANCY ARNOLD in the work of computing and checking the values used.

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[1] See *MTAC*, v. 2, 1946, p. 44.

UNPUBLISHED MATHEMATICAL TABLES

The list of some tables prepared by The Radio Corporation of America, published below, suggests that many other mathematical tables must have been prepared during recent years at various research centers. The Editors would heartily welcome Reports on such tables. Other Unpublished Tables are referred to in RMT **320** (Strömgren). See also N**61**.

50[F].—ROBERT JAMES PORTER (1882–): *Tables giving the complete classification of primitive binary quadratic forms for negative determinants from* $-D = 2$ *to* $-D = 1000$. Ms. calculated during 1945 and the first quarter of 1946, the property of the author, residing at 266 Pickering Road, Hull, England.

The Ms. is in loose-leaf form, 298 pp. 8 × 10½ inches. The tables are in long-hand, in pencil, and consist principally of the main table, 259 pp., arranged in six parallel columns, the first containing the determinant number with its prime factors, in symbolic form; the second, the positive forms belonging to each determinant, arranged in ascending order of magnitude of the middle term; the third, the number of genera; the fourth, all the forms arranged in periods; the fifth, their quadratic and supplementary characters, and the last, the composition, indicated by symbols.

There are several auxiliary tables which occupy 39 pp. These include (1) a list of primes to 1327, to facilitate the computation of the forms, (2) a table indicating by the signs plus and minus the quadratic residues and non-residues mutually appertaining to the first thirty or so primes, to simplify the work of determining the characters, (3) a table giving the composition of a large number of the simpler forms with each other, (4) a table giving the duplication of all the simpler forms in which the first term does not exceed 13, (5) a table showing the possible types of determinant factors with the number of genera each type affords, (6) a table from which the number of forms belonging to a determinant $-DS^2$ may be immediately computed from the number already obtained for the determinant $-D$, this being a valuable check on the working of the former, (7) a table of all determinants giving 1, 2, 4, 8, or 16 genera, according to the number of forms in each, and (8) a serial index of the results for each determinant.

Some observations on the results obtained may be of interest. The total number of forms listed in the main table is 15542. Of these, 1274 are given by 92 determinants of only one genus each, in which the longest period (of 45 forms) is produced by the determinant -971; 6100 forms are given by 402 determinants with 2 genera each (of which, for the determinant -941, each contains 23 forms); 6656 forms are produced by 417 determinants each with 4 genera, of which the most frequently appearing type is that where each genus contains 3 forms—this happens in 109 cases; 1496 forms are given by 87 determinants with 8 genera each, none containing more than 5 forms; and finally, there is only one determinant, namely, -840, which yields 16 genera, each of a single form.

The remaining point of interest is the discrepancy between the number of irregular determinants occurring in the present table, and the number given by Cayley in 1862. In addition to the thirteen there listed (i.e. $-D = 243, 307, 339, 459, 576, 580, 675, 755, 820, 884, 891, 900, 974$) it would appear that irregularity also exists where $-D = 468, 544, 547, 931, 972$. The author of this article will be glad to hear from any computer who can corroborate or correct this last statement.

R. J. PORTER

EDITORIAL NOTE: The most extensive tables of this kind previously published are in A. CAYLEY, "Tables des formes quadratiques binaires pour les déterminants négatifs depuis $D = -1$ jusqu'à $D = -100$, pour les déterminants positifs non carrés depuis $D = 2$ jusqu'à $D = 99$ et pour les treize déterminants négatifs irréguliers qui se trouvent dans le premier millier," *J. f. d. reine u. angew. Math.*, v. 60, 1862, p. 357–372; also in *Coll. Math. Papers*, v. 5, 1892, p. 141–156. See also A. E. COOPER, "Tables of quadratic forms," *Annals of Math.*, s. 2, v. 26, 1925, p. 309–316 for negative determinants for $-D = 101(1)200$.

51[L].—RADIO CORPORATION OF AMERICA, RCA VICTOR DIVISION, *Tables of Integrals* in possession of the Corporation at Camden, New Jersey.

Our unpublished manuscripts of tables of integrals include the following:

1. $A(x) = (2/\pi)\int_0^x \tan^{-1} t\, dt/t$, $x = [0(.01).5; 8D]$.

2. $B(x) = (1/\pi)\int_0^x \ln\left|\frac{1+t}{1-t}\right|\frac{dt}{t} = (2/\pi)\int_0^x \tanh^{-1} t\, dt/t$, $x = [0(.01).97$-$(.005).99(.002)1; 8D]$.

3. $C(u) = \frac{1}{2}\int_0^x J_{-\frac{1}{2}}(t)dt = \int_0^u \cos(\frac{1}{2}\pi t^2)dt$,

$S(u) = \frac{1}{2}\int_0^x J_{\frac{1}{2}}(t)dt = \int_0^u \sin(\frac{1}{2}\pi t^2)dt$,

$x = [0(.001).02(.01)2; 8D]$, $x = \frac{1}{2}\pi u^2$. These are the ordinary Fresnel integrals.

4. $Ch(u) = \frac{1}{2}\int_0^x I_{-\frac{1}{2}}(t)dt = \int_0^u \cosh(\frac{1}{2}\pi t^2)dt,$

$Sh(u) = \frac{1}{2}\int_0^x I_{\frac{1}{2}}(t)dt = \int_0^u \sinh(\frac{1}{2}\pi t^2)dt,$

$x = [0(.001).02(.01)2; 8D]$, $x = \frac{1}{2}\pi u^2$. These are the modified Fresnel integrals.

5. $K(x) = D_x^{\frac{1}{2}} \sin x = (1/\pi^{\frac{1}{2}})\int_0^x \cos(x-t)dt/t^{\frac{1}{2}},$

$L(x) = D_x^{\frac{1}{2}} \sinh x = (1/\pi^{\frac{1}{2}})\int_0^x \cosh(x-t)dt/t^{\frac{1}{2}},$

$M(x) = D_x^{\frac{1}{2}}(1-\cos x) = (1/\pi^{\frac{1}{2}})\int_0^x \sin(x-t)dt/t^{\frac{1}{2}},$

$N(x) = D_x^{\frac{1}{2}}(\cosh x - 1) = (1/\pi^{\frac{1}{2}})\int_0^x \sinh(x-t)dt/t^{\frac{1}{2}},$

$x = [0(.02)1(.1)5; 8D]$. These are the one-half derivatives of Riemann and can be expressed in terms of Fresnel integrals and modified Fresnel integrals.

6. $H(x^{\frac{1}{2}}) = (1/\pi^{\frac{1}{2}})\int_0^x e^{-t}dt/t^{\frac{1}{2}} = (2/\pi^{\frac{1}{2}})\int_0^{\sqrt{x}} e^{-t^2}dt$

$= (2^{\frac{1}{2}}/\pi)\int_0^x K_{\frac{1}{2}}(t)dt = 2^{\frac{1}{2}}[Ch(u) - Sh(u)],$

$x = \frac{1}{2}\pi u^2 = [0(.001).02(.01)2; 8D]$. This is the error function for the argument $\sqrt{x}$.

7. $D(x^{\frac{1}{2}}) = (1/\pi^{\frac{1}{2}})\int_0^x e^t dt/t^{\frac{1}{2}} = (2/\pi^{\frac{1}{2}})\int_0^{\sqrt{x}} e^{t^2}dt$

$= 2^{\frac{1}{2}}[Ch(u) + Sh(u)].$

$x = \frac{1}{2}\pi u^2 = [0(.001).02(.01)2; 8D]$. This is closely related to Dawson's integral for the argument $\sqrt{x}$.

MURLAN S. CORRINGTON

Advanced Development Section

MECHANICAL AIDS TO COMPUTATION

23[Z].—D. R. HARTREE, "The ENIAC, an electronic calculating machine," *Nature*, v. 157, 20 April 1946, p. 527.

Concluding sentence: Its flexibility and speed of operation will make it possible to carry out many numerical calculations, in many fields of investigation, which without its assistance would have been regarded as much too long and laborious to undertake.

24[Z].—HARVARD UNIVERSITY, Computation Laboratory, *Annals*, v. 1: *A Manual of Operation for the Automatic Sequence Controlled Calculator.* Cambridge, Mass., Harvard University Press, 1946, xiv, 561 p. + 9 plates. 20 × 26.7 cm. $10.00.

This volume gives the first really scientific account of the Automatic Sequence Controlled Calculator, the first of the large all-purpose digital calculators developed during the war, and was prepared by a staff of 24, Comdr. H. H. AIKEN in charge, largely through the efforts of Lt. GRACE M. HOPPER. The volume consists of six chapters, a bibliography of numerical analysis, and a sizable appendix in eight parts. There are 16 full-page photographs showing parts of the machine.

Chapter 1, entitled Historical Introduction, gives a short account of early mechanical computers of the "difference engine" type, especially those associated with the names of