

and so avoid the compressed notation (proscribed in France?):

$$L_n(x_1, \dots, x_n) = Y_n(fx_1, \dots, fx_n), \quad f^k \equiv f_k = (-1)^{k-1}(k-1)!$$

which I have been using for years.

The third kind of Bell polynomial, with the nondescriptive title Partial Ordinary Bell polynomial, may be written

$$\hat{B}_n(x_1, \dots, x_n) = \sum [k; k_1, \dots, k_n] x_1^{k_1} \dots x_n^{k_n},$$

with summation over partitions of  $n = k_1 + 2k_2 + \dots + nk_n$ ,  $k = k_1 + \dots + k_n$  and  $[k; k_1, \dots, k_n]$  a multinomial coefficient. It stays in the memory as a consequence of the generating function identity, dropping the arguments in  $\hat{B}_n$ :

$$1 = (1 - x_1y - x_2y^2 - \dots)(1 + \hat{B}_1y + \hat{B}_2y^2 + \dots).$$

Finally, I notice that the definition of coefficients  $a_{ms}$  in Exercise 27 of Chapter III (p. 166) does not agree with the table on p. 167. Indeed, the table gives values of  $\binom{m}{s} a_s a_{m-s}$ , with  $a_n$  the double factorial (for odd factors):  $a_0 = 1$ ,  $a_n = (2n-1)a_{n-1}$ . The simplest recurrence seems to be  $(s+1)a_{m,s} = m(2s+1)a_{m-1,s}$ .

Also, many of the number sequences in the first edition appear in [2].

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1. J. W. WRENCH, JR., "Concerning two series for the gamma function," *Math. Comp.*, v. 22, 1968, pp. 617-626.

2. NEIL J. A. SLOANE, *A Handbook of Integer Sequences*, Academic Press, New York, 1973.

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8 [8].—E. S. PEARSON & H. O. HARTLEY, Editors, *Biometrika Tables for Statisticians*, Vol. 2, Cambridge Univ. Press, 1972, xvii + 385 pp., 29 cm. Price \$17.50.

Abramowitz [*MTAC*, v. 9, 1955, pp. 205-211; see Savage, *Math. Comp.*, v. 21, 1967, pp. 271-273] reviewed *Biometrika Tables for Statisticians*, Volume 1, with remarks which in large part remain appropriate to Volume 2: this is a major continuing project of fine table making. Again there is an extensive introduction of 149 pages to the tables, 230 pages for 69 tables. The authors point out that Volume 2 "is one of many possible companions" to Volume 1. The main difference between Volume 1 and Volume 2 is the computer revolution. The rationalization for Volume 2 deserves full quotation and careful consideration:

"It seems appropriate to comment briefly on the relevance of statistical tables vis à vis the advent of high-speed computers. Indeed it has been argued by some that there is no need for a new volume of statistical tables since any desired numerical value of the mathematical functions involved can be readily computed with the help of fast sub-routines loaded into a high-speed computer. Tables, it is argued, will in due course be superseded by a library of algorithms for mathematical functions.

"Whilst we do not wish to underrate the growing importance of the latter, we believe the need for printed tables will be with us for a good time to come, both in the area of (a) data analysis and (b) research in statistical methodology. With regard to (a) there is a real danger that automated, stereotype 'processing' of data may discourage intelligent examination of observations for unexpected features which may suggest new results and interpretations. Such intelligent inspection, besides being often assisted by graphical means, will generally be accompanied by the computation of test criteria, the need to apply which evolves in the course of the examination of the observations; this

process will require the use of appropriate pre-tabled functions. Moreover, the immediate access to a high-speed computer permitting the permanent storage of computer codes for all statistical criteria is not likely to be universal for some time longer.

“With regard to (b), research in statistical methodology, there is no doubt that systematic evaluations of the properties of new statistical functions are today being performed to an increasing extent with the help of special algorithms implemented as computer subroutines. However, the efficient planning of such computations invariably requires pilot studies for which pre-worked numerical values are invaluable. Indeed it is an essential feature of research that new ideas should be tested in small pilot computations which will provide feed-backs to the researcher leading to modifications and improvements in method. It would clearly be foolish to invest in large systematic computations before a reasonable chance of success is indicated by such pilot studies.

“On a more personal level, those of us who have learnt to get the ‘feel’ of our data or gain fresh sidelights on our research by work done at home at the end of the day or at weekends, or even on vacation, find it hard to believe that there is not still a place for the desk computer and appropriate books of printed tables. There is surely something lost if a new generation of students is taught to think that the proper thing is to hand everything over to computerized subroutines.”

pp. xiv–xv.

Following is the list of sections and table titles. After the titles are parenthetical remarks regarding: (1) range and accuracy, (2) overlap with Volume 1, (3) origin of table. These notes are rough in that complete descriptions would in many cases defy the reviewer and make the review excessively long.

#### I. The Normal Probability Function and Certain Derived Tables.

1. Values of  $X$  and  $Z$  in terms of  $P$ . (1.  $P = .500 (.001) .9990 (.0001) .9999, 10D$ . 2.  $T. 3, 4, 5$  have  $5D$  and include  $X$  values for  $P = .9800 (.0001) .9990$  but do not include  $Z$  values for  $P = .9990 (.0001) .9999$ . 3. *Biometrika* (1931) with corrections.)

2. Differential coefficients  $D^n Z(X)$ . (1.  $X = .00 (.02) 4.00 (.05) 6.20$  from  $6D$  for  $P$  to  $1D$  for  $n = 9$ . 2. none. 3. new.)

3. Percentage points of the  $\chi^2$  distribution for integral and fractional degrees of freedom. (1.  $P = .0001, .0005, .001, .005, .010, .025, .050, .10 (.10) .50$  and  $1 - P$  and  $\nu = .1 (.1) 3.0 (.2) 10.0 (1) 100, 6 SF$ . 2.  $T. 8$  does not have the fractional  $\nu$  values and covers only  $P = .001, .005, .010, .025, .050, .100, .250, .500$ , and  $1 - P$ .  $T. 7$  gives the probability integral for the chi-square distribution or Poisson sums. 3. *Biometrika* (1964).)

4. Percentage points of the  $F$ -distribution for certain fractional degrees of freedom. (1.  $\nu_1 = .1 (.1) 1.0 (.2) 2.0 (.5) 4.5, \nu_2 = .5 (.1) 1.0 (.2) 3.0 (.5) 7.0, P = .950, .975, .990, .995, .999, 5 SF$ . 2. none. 3. new.)

5. Percentage points of the  $F$ -distribution (variance ratio). Integral degrees of freedom only. (1.  $\nu_1 = 1 (1) 10, 12, 15, 20, 24, 30, 40, 60, 120, \infty, \nu_2 = 1 (1) 30, 40, 60, 120, \infty, P = .50, .75, .90, .95, .975, .99, .995, .9975, .9990, 5 SF$ . 2.  $T. 18$  has same  $\nu_1$  and  $\nu_2$  values,  $P = .75, .90, .95, .975, .99, .995, .999$ , usually  $2D$  but  $4$  or  $5 SF$  for large entries. 3. *Biometrika* (1943), recomputed, enlarged, corrected.)

6. Probability integral of the extreme standardized deviate from the population mean,  $X_n = (x_{(n)} - \mu)/\sigma$  or  $X_1 = (\mu - x_{(1)})/\sigma$ . (1.  $n = 3 (1) 25 (5) 60, 100 (100) 1000, X_n = -\infty (.1) \infty, 7D$ . 2.  $T. 24. n = 1 (1) 30, P = .001, .005, .010, .025, .050, .100$ , and  $1 - P, 3D$ . 3. *Biometrika* (1925) with some newly computed values.)

7. Probability integral of the extreme standardized deviate from the sample mean,  $u_n = (x_{(n)} - \bar{x})/\sigma$  or  $u_1 = (\bar{x} - x_{(1)})/\sigma$ . (1.  $n = 3 (1) 25, u_n = .00 (.01) \infty, 6D$  for

$n \leq 9$ , 5D for  $10 \leq n \leq 19$ , 4D for  $20 \leq n \leq 25$ . 2. T. 25.  $n = 3$  (1) 9.  $P$  as in T. 24, see 6, 2D. 3. *Biometrika* (1948), *Ann. Math. Statist.* (1950).)

8. Probability integral of the mean deviation,  $m$ , from the sample mean. (1.  $n = 2$  (1) 10,  $m = .00$  (.01)  $\infty$ , 5D. 2. T. 34.  $n = 11$  (5) 51 (10) 101 (100) 1001,  $P = .01, .05, .10$ , and  $1 - P$ , 4D. 3. *Biometrika* (1945).)

## II. Tables for Procedures Based on the Use of Order Statistics.

9. Expected values of normal order statistics,  $\xi(i|n)$ . (1.  $n = 2$  (1) 99, 5D. 2. T. 28.  $n = 2$  (1) 26 (2) 50, 3D for  $n \leq 20$ , 2D for  $n \geq 21$ . 3. *Biometrika* (1961).)

10. Variances and covariances of normal order statistics. (1.  $n = 2$  (1) 20, 6D. 2. none. 3. *Ann. Math. Statist.* (1956).)

11. Coefficients for estimating mean and standard deviation as linear functions of  $k$  normal order statistics.

11a. With minimum variance  $\sigma^2(\check{\mu})$ . (1.  $k = 2$  (2) 10, 4D. 2. none. 3. *J. Amer. Statist. Assoc.* (1965).)

11b. With minimum  $\sigma^2(\check{\mu}) + \sigma^2(\check{\sigma})$ . (1.  $k = 2$  (2) 12. 2. and 3. same as 11a.)

11c. With minimum variance and  $p_1 \geq 0.025$ . (1.  $k = 10$  (2) 14. 2. and 3. same as 11a.)

11d. With minimum variance  $\sigma^2(\check{\sigma})$ . (Same as 11b.)

11e. With minimum  $\sigma^2(\check{\mu}) + \sigma^2(\check{\sigma})$ . (Same as 11b.)

11f. With minimum variance and  $p_1 \geq 0.025$ . (1.  $k = 4$  (2) 12. 2. and 3. same as 11a.)

12. Moments and moment ratios of the extreme values,  $x_{(1)}$  and  $x_{(n)}$ , in normal samples. (1.  $n = 1$  (1) 50,  $\mu_2$  and  $\mu_3$  have 8D,  $\mu_4$  has 7D. 2. none. 3. *Biometrika* (1954).)

13. Sums of squares of expected values of normal order statistics. (1.  $n = 2$  (1) 100, 5D. 2. none. 3. new from 9.)

14. Conversion factors to be applied to Table 15 to derive a best linear estimate of  $\sigma$ . (1.  $n = 2$  (1) 50,  $n \leq 20$  has 4D and  $n \geq 21$  has 3D. 2. none. 3. new from 15.)

15. Test for departure from normality: Coefficients  $a_{i,n}$  to use in the  $W$ -test. (1.  $n = 2$  (1) 50, 4D. 2. none. 3. *Biometrika* (1965).)

16. Test for departure from normality: percentage points of  $W$ . (1.  $n = 3$  (1) 50,  $P = .01, .02, .05, .10, .50$ , and  $1 - P$ . 2. none. 3. *Biometrika* (1965).)

17. Test for departure from normality: coefficients for converting  $W$  to a standardized normal variate,  $n = 7$  (1) 50. (1. 4 SF. 2. none. 3. *Technometrics* (1968).)

18. Test for departure from normality: values of  $G$  for argument  $v$ , for normal conversion of  $W$ ,  $n = 3$  (1) 6. (1.  $v = -7.0, -5.4$  (.4) 9.8, 2D. 2. none. 3. *Technometrics* (1968).)

19. Expected values of negative exponential order statistics,  $\eta(i|n)$ . (1.  $n = 1$  (1) 60, 5D. 2. none. 3. Aerospace Research Labs. (1964).)

20. Expected values of order statistics,  $\eta(i|n, m)$ , in samples from certain gamma distributions. (1.  $n = 1$  (1) 20,  $m = .5$  (.5) 3.5, 3D. 2. none. 3. Aerospace Research Labs. (1964).)

21. Expected values of order statistics in samples from a half-normal distribution,  $\zeta(j|n)$ . (1.  $n = 1$  (1) 30, 4D. 2. none. 3. Case Institute of Technology (1964).)

## III. Mean Slippage Tests Based on Ranks.

22. Lower tail critical values,  $W_1$ , for the Wilcoxon two-sample rank-sum test. (1.  $n = 2$  (1) 25,  $m = 1$  (1)  $n$ ,  $P = .001, .005, .010, .025, .05$ . 2. none. 3. *Biometrika* (1963).)

23. The Wilcoxon paired rank test.

23A. Probability integral,  $P(T|N)$  for  $3 \leq N \leq 15$ . (1.  $T = 0$  (1)  $\infty$ . 2. none. 3. Lederle Labs. (1964) and Kraft and van Eeden (1968).)

23B. Lower percentage points,  $T_1(\alpha|N)$  for  $5 \leq N \leq 50$ . (1.  $P = .005, .01, .025, .05$ . 2. none. 3. same as 23A.)

#### IV. Tables and Charts for Non-Central Distributions.

24. Percentage points of the non-central  $\chi$  distribution. (1.  $\nu = 1$  (1) 12, 15, 20,  $\sqrt{\lambda} = .0$  (.2) 6.0,  $P = .005, .01, .025, .05$  and  $1 - P$ , 4 SF. 2. none. 3. *Biometrika* (1969).)

25. Non-central  $\chi^2$ . Values of the non-central parameter,  $\lambda$ , for given degrees of freedom,  $\nu$ , and power,  $\beta$ . (1.  $\nu = 1$  (1) 30 (2) 50 (5) 100,  $P = .95, .99$ ,  $\beta = .25, .50, .60, .70$  (.05) .95, .97, .99, 3D. 2. none. 3. Case Institute of Technology (1962).)

26. Non-central  $t$ . Factors,  $l$ , for determination of percentage points of  $t'$ . (1.  $\nu = 2$  (1) 9, 10, 36, 144,  $u = -1.00$  (.05)  $-.80$  (.1) 1,  $P = .5, .75, .95, .975, .99, .995$ , 4D. 2. T. 10 is a power function chart for  $\nu = 6$  (1) 10, 12, 15, 20, 30, 60,  $\infty$ ,  $P = .95, .99$ . 3. Sandia Corp. (1963).)

27. Non-central  $t$ . Factors,  $l$ , for determination of confidence limits for the non-central parameter,  $\Delta$ . (1.  $\nu = 2$  (1) 9, 16, 36, 144,  $y = -1.0$  (.1)  $-.80$  (.05) 1.00, 4D. 2. none. 3. Sandia Corp. (1963).)

28. Coefficients to assist the determination of the moments of non-central  $t$ . (1.  $f = 2$  (1) 25 (5) 80 (10) 100 (50) 200 (100) 1000, 6 SF. 2. none. 3. *Biometrika* (1961).)

29. Percentage points of non-central  $\chi$ . Extension of Table 24 for  $\sqrt{\lambda} = 8, 10$ . (1.  $\nu = 1$  (1) 12, 15, 20,  $P = .005, .01, .025, .05$ , and  $1 - P$ . 2. none. 3. *Biometrika* (1969).)

30. Charts for determining the power of the  $t$  and  $F$  tests: fixed effects model. (1.  $\nu_1 = 1$  (1) 8, 12, 24,  $\nu_2 = 6$  (1) 10, 12, 15, 20, 30, 60,  $\infty$ ,  $P = .95, .99$ . 2. T. 10 corresponds to  $\nu_1 = 1$ . 3. *Biometrika* (1951) with additions.)

#### V. Systems of Univariate Frequency Distributions.

31. Pearson curves: parameters  $a$  and  $b$  against  $\sqrt{\beta_1}$ ,  $\beta_2$  for  $J$  and  $U$ -Type I distributions included in Table 32. (1.  $\sqrt{\beta_1} = .0$  (.1) 2.0,  $\beta_2$  in increments of .2, 4D. 2. none. 3. new.)

32. Pearson curves: percentage points for given  $\sqrt{\beta_1}$ ,  $\beta_2$  expressed in standard measure. (1.  $\sqrt{\beta_1} = 0.0$  (.1) 2.0,  $\beta_2$  in increments of .2,  $P = 0.000, .0025, .005, .01, .025, .05, .10, .25, .50$ , and  $1 - P$ , 4D. This is a major table. 2. T. 42,  $\beta_1 = .00, .01, .03, .05$  (.05) .20 (.10) 1.00,  $\beta_2 = 1.8$  (.2) 5.0,  $P = .005, .01, .025, .05$ , and  $1 - P$ , 2D. 3. *Biometrika* (1963).)

33. Pearson curves: extension of Table 32 into  $J$  and  $U$  distribution region. (1.  $\sqrt{\beta_1} = .2, .4$  (.1) 2.0,  $\beta_2$  in increments of .2,  $P$  as in 32, 4D. 2. none. 3. new.)

34. Johnson  $S_U$  system: parameter  $-\gamma$  in terms of  $\sqrt{\beta_1}$ ,  $\beta_2$ . (1.  $\sqrt{\beta_1} = .05$  (.05) 2.0,  $\beta_2 = 3.2$  (.2) 15.0, 4 SF. 2. none. 3. *Biometrika* (1965).)

35. Johnson  $S_U$  system: parameter  $\delta$  in terms of  $\sqrt{\beta_1}$ ,  $\beta_2$ . (see 34.)

36. Johnson  $S_B$  system: parameters in terms of  $\sqrt{\beta_1}$ ,  $\beta_2$ . (1.  $\sqrt{\beta_1} = .05$  (.05) 2.0,  $\beta_2 = 1.1$  (.1) 10.7, 4 SF. 2. none. 3. Univ. N. Carolina (1968).)

37. Maximum likelihood estimator of  $p$  in the gamma (Type III) distribution, start assumed known. (1.  $v = .00$  (.01) 1.40, 6D and  $v = 1.4$  (.2) 18.0, 5D. 2. none. 3. *Technometrics* (1960).)

38. Coefficients in expansions for bias and variance of the maximum likelihood estimator  $\hat{p}$  in a gamma distribution, derived from Table 37. (1.  $p = .1$  (.1) 1, 2, 5, 10, 25, 50, 5 SF. 2. none. 3. Union Carbide Corp. (1968).)

### VI. Tables to Use in Applying Techniques of Quantal Assay.

39. Minimum normit  $\chi^2$  procedure: weights for arguments  $r$  and  $n \leq 50$ . (1. 5D. 2. none. 3. *Biometrika* (1957).)
40. Minimum normit  $\chi^2$  procedure: weights for arguments  $p = r/n$ . (1.  $p = .000$  (.001) 1.000, 5D. 2. none. 3. *Biometrika* (1957).)
41. Logits,  $l = \log[P/(1 - P)]$  for argument  $P$ . (1.  $P = .500$  (.001) 1.000, 5D. 2. none. 3. *J. Amer. Statist. Assoc.* (1953).)
42. Antilogits: table giving  $P$  for argument  $l$ . (1.  $l = 0.00$  (.01) 4.99, 5D. 2. and 3. same as 41.)
43. Minimum logit  $\chi^2$  procedure: weights for argument  $P$ . (1.  $P = .000$  (.001) 1.000, 4D. 2. and 3. same as 41.)
44. Nomograms to assist in fitting the logistic function, using maximum likelihood (equally spaced doses)  $\hat{g} = \text{estimate of } \gamma$ , (ED 50), 3 doses. (1. 8 charts. 2. none. 3. *Biometrika* (1960).)
45. Logistic function fitted by maximum likelihood: standard errors of estimators derived using charts of Table 44. (1. Too involved for concise description. 2. none. 3. *Biometrika* (1960).)
46. Maximum likelihood solution for the logistic (general case): weights  $w = PQ$  for argument  $l$ . (1.  $l = .00$  (.01) 4.99, 5D. 2. none. 3. *Biometrics* (1957).)

### VII. Tables for Multivariate Analysis.

47. Wilks' likelihood criterion,  $W = |A|/|A + B|$ . Factors  $C(p, \nu_2, M)$  to adjust to  $\chi^2_{p\nu_2}$ . (1.  $M = 1$  (1) 10, 12, 15, 20, 30, 60,  $\infty$ ,  $p = 3$  (1) 10,  $\nu_2 = 2$  (2) 22,  $P = .95$ , .99, 3D. 2. none. 3. *Biometrika* (1966 and 1969).)
48. Percentage points of the largest characteristic root of the determinantal equation  $|B - t(A + B)| = 0$  (after Pillai et al.). (1.  $n = 5$  (5) 50, 48, 60, 80, 120, 240,  $\infty$ ,  $m = 0$  (1) 5, 7, 10, 15,  $p = 2$  (1) 10,  $P = .95$ , .99, 4D. 2. none. 3. *Biometrika* (1967).)
49. Percentage points of the largest characteristic root of the determinantal equation  $|B - t(A + B)| = 0$  (after Foster & Rees). (1.  $P = .80$  (.05) .95, .99, 4D,  $p = 2$ ,  $\nu_1 = 5$  (2) 41 (10) 101, 121, 161,  $\nu_2 = 2, 3$  (2) 21,  $p = 3$ ,  $\nu_1 = 4$  (2) 46 (4) 70, 98, 194,  $\nu_2 = 3$  (1) 10,  $p = 4$ ,  $\nu_1 = 5$  (2) 51 (4) 71, 99, 195,  $\nu_2 = 4$  (1) 11. 2. none. 3. *Biometrika* (1957).)
50. Test for equality of  $k$  covariance matrices. (1. 4 SF,  $k = 2$  (1) 10,  $p = 2$ ,  $\nu_0 = 3$  (1) 10,  $p = 3$ ,  $\nu_0 = 5$  (1) 13,  $p = 4$ ,  $\nu_0 = 6$  (1) 15,  $p = 5$ ,  $k = 2$  (1) 7,  $\nu_0 = 8$  (1) 16,  $p = 6$ ,  $k = 2$  (1) 5,  $\nu_0 = 10$  (1) 20. 2. none. 3. *Biometrika* (1969).)
51. Percentage points of the extreme roots of  $|\mathcal{S}\Sigma^{-1} - cI| = 0$ . (1.  $p = 2$  (1) 10,  $\nu = 2$  (1) 12, 15 (5) 30 (10) 100 (20) 200,  $P = .95$ , .99, 4 SF. For  $P = .01$  and .05 there is less detail. 2. none. 3. *Biometrika* (1968) and *Ann. Inst. Statist. Math.* (1968).)
52. Percentage points of the multiple correlation coefficient  $R$ . (1.  $R = .0$  (.1) .9,  $\nu_1 = 2$  (2) 12 (4) 24, 30, 34, 40,  $\nu_2 = 10$  (10) 50,  $P = .01$ , .05, .95, .99, 3D. 2. none. 3. new.)
53. Test of the hypothesis that a covariance matrix  $\Sigma = \Sigma_0$ . Percentage points of  $L$ . (1.  $p = 2$  (1) 10,  $\nu$  irregular, 3 SF on 2D,  $P = .95$ , .99. 2. none. 3. *Biometrika* (1968).)

### VIII. Goodness of Fit Tests Based on the Empirical Distribution Function. Tests of Uniformity.

54. Modifications yielding approximate percentage points for the statistics  $D, V, W^2, U^2$  and  $A$  in finite samples of  $n$  observations. (1.  $P = .85$  (.05) .95, .975, .99, 3D. 2. none. 3. *J. R. Statist. Soc. B* (1970).)
55. The Kolmogorov two-sample test. Upper critical values of  $c = mnD_{m,n}$ . (1.  $1 \leq m \leq n \leq 25$ ,  $P = .9$ , .95, .975, .99, .995, .999. 2. none. 3. new.)

## IX. Analysis of Directions on a Circle and Sphere.

56. Percentage points of  $R/N$  (on circle), for given  $N$  and  $\kappa$ . (1.  $N = 5$  (1) 10, 12, 16, 20, 30, 40, 60, 100, 200,  $\infty$ ,  $\kappa = .0$  (.5) 5.0, 3D. 2. none. 3. *Biometrika* (1969).)

57. Charts to determine percentage points of  $R$  (on circle), for given  $N$  and  $X$ . (1. 2 charts. 2. none. 3. *Biometrika* (1962).)

58A. Critical values of  $Z$  for test of equality of two modal vectors (on circle): equal sample sizes,  $N_1 = N_2 = \frac{1}{2}N$ . (1.  $W = .05$  (.05) .70,  $N = 12$  (4) 24, 30, 40, 60, 120, 240,  $\infty$ ,  $P = .9$ , .95, .975, .99, 3D. 2. none. 3. *J. Amer. Statist. Assoc.* (1972).)

58B. Critical values of  $Z$  for test of equality of two modal vectors (on circle): unequal sample sizes,  $N_1 \neq N_2$ . (Like 58A with  $N_1 = 2N_2$  or  $N_1 = 4N_2$ .)

59. Percentage points for  $R/N$  (on sphere), for given  $N$  and  $\kappa$ . (1.  $N = 4$  (1) 10, 12 (4) 20 (10) 40, 60, 100,  $\infty$ ,  $\kappa = .0$  (.5) 5.0,  $P = .01$ , .05, .95, .99, 4D. 2. none. 3. *Biometrika* (1967).)

60. Charts to determine percentage points of  $R$  (on sphere), for given  $N$  and  $X$ . (1. 2 charts. 2. none. 3. *Biometrika* (1962).)

61A. Critical values of  $Z$  for test of equality of two modal vectors (on sphere): equal sample sizes,  $N_1 = N_2 = \frac{1}{2}N$ . (1. Like 58A. 2. none. 3. *Biometrika* (1969).)

61B. Critical values of  $Z$  for test of equality of two modal vectors (on sphere): unequal sample sizes,  $N_1 \neq N_2$ . (1. like 58B. 2. none. 3. *Biometrika* (1969).)

62. Estimation of  $\kappa$  for dispersion on circle. (1.  $a = .10$  (.05) .70 (.02) .86, 4 SF. 2. none. 3. *J. Amer. Statist. Assoc.* (1953).)

63. Estimation of  $\kappa$  for dispersion on sphere. (1.  $a = .10$  (.05) .60 (.02) .80, 4 SF. 2. none. 3. Toronto thesis (1962).)

64. Percentage points of  $S = \sum_i (\cos^2 \theta_i)/N$  (on sphere). (1.  $N = 3$  (1) 10 (2) 20 (5) 50 (10) 100,  $P = .005$ , .01, .025, .05, .10 and  $1 - P$ , 3D. 2. none. 3. *Biometrika* (1965).)

65. Lower tail percentage points for  $S_{\min}$  and upper tail for  $S_{\max}$  (on sphere). (1.  $N = 5$  (1) 10 (2) 20 (5) 30 (10) 80, 100,  $\infty$ ,  $P = .01$ , .025, .05, .10 and  $1 - P$ , 3D. 2. none. 3. Stanford Report, no date.)

## X. Tables to Aid Interpolation.

66. Coefficients  $B_2, B_3, B_4$  for Bessel interpolation formula. (1.  $p = .000$  (.001) .500,  $B_2$  6D,  $B_3$  5D,  $B_4$  4D. 2. none. 3. *Interpolation and Allied Tables* (1956).)

67. Miscellaneous four-point Lagrangian interpolation coefficients. (new.)

68. Lagrangian coefficients for use with harmonic arguments in certain tables of percentage points. (*Biometrika* (1941).)

69. Five-point Lagrangian coefficients,  $L_i$  ( $i = 1, 2, \dots, 5$ ) for interpolation between tabled percentage points. (*Biometrika* (1968).)

A striking aspect of this project is the loving care for detail and accuracy. The final product shows this. The only "error" I noted is that on p. 3 (bottom) and p. 4 (top)  $D(X)$  should be replaced by  $DZ(X)$ . Professor Pearson showed me an obvious error in Table 1. Also Table 34 will need substantial revision; see *Biometrika*, v. 61, 1974, pp. 203–205.

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