

STATISTICAL TABLES

By the Senior Author

STATISTICAL METHODS FOR RESEARCH WORKERS. 1925-1941. Oliver and Boyd Ltd.,
Edinburgh.

THE GENETICAL THEORY OF NATURAL SELECTION. 1930. Oxford University Press.

THE DESIGN OF EXPERIMENTS. 1935-1942. Oliver and Boyd Ltd., Edinburgh.

STATISTICAL TABLES

FOR BIOLOGICAL, AGRICULTURAL
AND MEDICAL RESEARCH

BY

RONALD A. FISHER, Sc.D., F.R.S.

GALTON PROFESSOR, UNIVERSITY OF LONDON

AND

FRANK YATES, Sc.D.

HEAD OF STATISTICAL DEPARTMENT, ROTHAMSTED
EXPERIMENTAL STATION

SECOND EDITION
REVISED AND ENLARGED

OLIVER AND BOYD LTD.

LONDON - 98 GREAT RUSSELL STREET, W.C.

EDINBURGH - - - TWEEDDALE COURT

1943

PRINTED IN GREAT BRITAIN BY
OLIVER AND BOYD LTD., EDINBURGH

PREFACE

THE problems with which an active statistical department may have to deal require, if their solutions are to be made widely accessible, a great variety of special tables. A number of those in the present book are familiar to statisticians, and are already widely used. In presenting them in a convenient form, the opportunity has been taken to supplement them with a selection of others, chosen as likely also to be of value, and not accessible elsewhere. The volume is completed with a number of tables of standard functions of general utility. The experience of the authors of the problems arising in practical research, is the basis of the selection, from among those tables which from time to time have been computed for special purposes.

To perform their compilation, the main work has been to complete the tables in a form suitable for the general user, and, what is by no means easy, to ensure their entire accuracy. In addition we have been principally concerned with the design of printing and arrangement, which shall be suitable both for constant and for occasional users. Comments from both classes of reader will therefore be especially valued.

We are indebted to all workers at the Galton Laboratory, and at the Statistical Laboratory, Rothamsted, and especially to W. L. Stevens, for assistance in the completion of our task.

R. A. F.
F. Y.

August 1938

PREFACE TO SECOND EDITION

THE second edition contains as new material Tables V₁ and V₂ for the test of significance of the differences between two means obtained by different methods; Table VIII₁, which supplies solutions of the type of problem illustrated in Examples 1, 2 and 4, more direct than those previously available; and Table VIII₂, which gives densities of organisms estimated by the dilution method.

The combinatorial solutions of Table XVII have been considerably extended and simplified in presentation by the more extensive use of solutions of the cyclic type. The corresponding section of the introduction now gives an account of Youden's Squares, and of the

PREFACE

method of utilising information, formerly discarded, from comparisons between blocks.

For the convenience of owners of the first edition, a list of errata has been included showing all the errors of any importance that have been discovered in the first edition. Our thanks are due to those who have drawn our attention to these errors.

R. A. F.
F. Y.

January 1943

CONTENTS

	PAGE
Introduction	I
I. The Normal Distribution	29
II. Ordinates of the Normal Distribution	29
III. Distribution of t	30
IV. Distribution of χ^2	31
V. Distribution of z and the Variance Ratio	32
V1. Significance of Difference between Two Means	40
V2. Significance of Difference between Two Means—One Component of Error distributed normally, the Other in Student's Distribution	41
VI. The Correlation Coefficient—Values for Different Levels of Significance	42
VII. The Correlation Coefficient—Transformation of r to z (Interclass)	42
VIII. Tests of Significance for 2×2 Contingency Tables	43
VIII1. Binomial and Poisson Distributions: Limits of the Expectation	44
VIII2. Densities of Organisms estimated by the Dilution Method	45
IX. Probits—Transformation of the Sigmoid Dosage Mor- tality Curve to a Straight Line	46
X. Probits—Simple Quantiles of the Normal Distribution	48
XI. Probits—Weighting Coefficients and Probit Values to be used in Adjustments of Special Accuracy	49
XII. The Angular Transformation—Transformation of Per- centages to Degrees	50
XIII. The Angular Transformation—Transformation of Proper Fractions to Degrees	50
XIV. The Angular Transformation—Angular Values for Adjustments of Special Accuracy	51
XV. Latin Squares	52
XVI. Complete Sets of Orthogonal Latin Squares	54
XVII. Balanced Incomplete Blocks—Combinatorial Solutions	56
XVIII. Balanced Incomplete Blocks—Index by Number of Replications	57

CONTENTS

	PAGE
XIX. Balanced Incomplete Blocks—Index by Number of Units in a Block	57
XX. Scores for Ordinal (or Ranked) Data	58
XXI. Scores for Ordinal Data—Sums of Squares of Mean Deviations Tabulated	58
XXII. Initial Differences of Powers of Natural Numbers	60
XXIII. Orthogonal Polynomials	62
XXIV. Calculation of Integrals from equally spaced Ordinates	69
XXV. Logarithms	70
XXVI. Natural Logarithms	72
XXVII. Squares	76
XXVIII. Square Roots	78
XXIX. Reciprocals	82
XXX. Factorials	84
XXXI. Natural Sines	86
XXXII. Natural Tangents	88
XXXIII. Random Numbers	90
XXXIV. Constants, Weights and Measures, etc.	96

ERRATA TO THE FIRST EDITION

(The page numbers are those of the first edition; all these errors have been corrected in the second edition.)

- p. 8. For $\frac{1}{8PQ} = \frac{1}{2(1-R^2)}$ read $\frac{1}{2PQ} = \frac{2}{1-R^2}$.
- p. 27. $n = 3, P = .01$. For 11.341 read 11.345.
- p. 28. In the formula, for 1.2816 read 0.8416, and for 0.6071 read 0.4514.
- p. 41. 6.9. For 15.340 read 15.240.
 7.1. For 7.5056 read 7.5062.
 8.7. For 2147 read 2354.
- p. 42. $p = 72\%$. For 58.7 read 58.1.
- p. 55. $n = 24$. λ of ξ'_1 . For 1 read 2.
- p. 57. $n = 39$, sum of squares of ξ'_2 . For 496,388 read 4,496,388.
- p. 88. Middle C of piano. For 522 read 261.
- p. 90. For 1 sack = 3 bushels read 1 sack = 4 bushels.