Contents

Preface	ix
CHAPTER 1	PRELIMINARY CONSIDERATIONS 3
	Problem Solving as a Goal • An Illustrative Research Report • Measurement • Scales of Measurement • Vari- ables • Subfields of Statistics • Statistic, Statistics, and Statistics • Historical Perspective on Arabic Numerals • Exercises
CHAPTER 2	FREQUENCY DISTRIBUTIONS 17
	Univariate Frequency Distributions • Bivariate Frequency Distributions • Beginnings of Descriptive Statistics • Exercises
CHAPTER 3	CENTRAL TENDENCY 39
	Arithmetic Mean • Median • Mode • Comparison of the Mean, Median, and Mode • Geometric Mean • Tabling and Graphing Central Tendency • Graphs that Create False Impressions • Historical Perspective on the Indices of Central Tendency • Exercises
CHAPTER 4	VARIABILITY 67
	Range • Variance and Standard Deviation • Semi-Inter- quartile Range • Historical Perspective on the Indices of Variability
CHAPTER 5	CORRELATION 89
	Background Concepts • The Concept of Correlation and Slope • Coefficient of Determination • Prediction • Ef- fect of Range upon Correlation • Multiple and Partial

v

Correlation • Correlation, Causation, and Experimentation • Historical Perspective on Correlation • Exercises

CHAPTER 6 PROBABILITY

Probability and Probability Numbers • Sampling and Probability • Computing Probabilities • Probability Distributions • Historical Perspective on Probability • Exercises

CHAPTER 7 SAMPLING DISTRIBUTIONS

The Concept of Sampling Distribution • Sampling Distributions of Proportions • Sampling Distributions of Means • Sampling Distributions and Statistical Inference • Exercises

CHAPTER 8 NORMAL DISTRIBUTION AND HYPOTHESIS TESTING 201

Normal Distribution • Ascertaining Probabilities for Intervals of a Normal Distribution • Using the Standard Normal Distribution to Test Hypotheses Concerning Population Means • Error and Power • Two Controversial Issues • Historical Perspective on the Normal Distribution • Exercises

CHAPTER 9 INFERENCES CONCERNING MEANS AND VARIANCES 239

Hypotheses Concerning a Single Population Mean \bullet Hypotheses Concerning Differences Between Population Means \bullet Recapitulation: Tails and Tests \bullet Review of Formulas \bullet Testing Equality of Two Population Variances \bullet A Further Controversial Issue: Magnitude of Effect \bullet Historical Perspective on the *t* Test \bullet Exercises

Two or More Samples: Test of Independence • Exercises

CHAPTER 10ANALYSIS OF VARIANCE277Overview of Analysis of Variance • One-Factor Analysis
of Variance • Two-Factor Analysis of Variance • Three-
or-More Factor Analysis of Variance • R. A. Fisher and
Analysis of Variance • Exercises277CHAPTER 11AN INTRODUCTION TO CHI SQUARE323
Chi Square Statistic • Chi Square Applied to a Single
Sample: Test of Goodness of Fit • Chi Square Applied to

Contents

vi

175

137

CHAPTER 12 MEASURES OF CORRELATION AND TESTS OF SIGNIFI-CANCE 345

Significance of the Pearson Product-Moment Correlation Coefficient, $r \cdot$ Spearman's Rank-Order Correlation Coefficient, $r' \cdot$ Point Biserial Coefficient, $r_{pb} \cdot$ Correlation Ratio, $\eta \cdot$ Exercises

CHAPTER 13 DISTRIBUTION-FREE STATISTICAL TESTS

Distribution-Free and Nonparametric Statistical Tests • Use of Nominal and Ordinal Characteristics of Obtained Data • Assumptions • Treatment of Zero Difference Scores and Tied Ranks • Sign Test for One Sample • Sign Test for Two Dependent Samples • Wilcoxon Rank-Sum Test • Wilcoxon Signed-Rank Test • Advantages and Disadvantages of Distribution-Free Tests • Historical Perspective on Distribution-Free Tests • Exercises

Appendix A	Elementary Set Theory	385
------------	-----------------------	-----

Appendix B	An Introduction to Summation Algebra	395

Appendix C Tables

References

401
Table I. Proportions of Area Under the Normal Curve
Table II.Critical Values of t
Table III(a). Critical Values of F for α Equal to .05 and .01
Table III(b). Critical Values of F for α Equal to .025 and .005
Table IV. Critical Values of Chi Square
Table V. Critical Values of the Correlation Coefficient
Table VI. Critical Values of r' , the Spearman Rank-Order Coefficient
Table VII. Table of Probabilities Associated With Values as Small as Observed Values of r in the Sign Test
Table VIII. Critical Lower-Tail Values of W_n for Wilcoxon's Rank-Sum Test
Table IX. Critical and Quasi-Critical Lower-Tail Values of W_+ (and Their Probability Levels) for Wilcoxon's Signed-Rank Test
1 650
425

Exercise Answers	427
Index	445

Contents

361

401

vii