

Contents

<i>List of figures</i>	xv
<i>Preface</i>	xvii
<i>Preface to the Second Edition</i>	xix

1 Introduction 1

2 Descriptive statistics 5

Measures of ‘central tendency’	8
Measures of ‘spread’	11
Describing a set of data: in conclusion	17
Comparing two sets of data with descriptive statistics	18
Some important information about numbers	21

3 Standard scores 25

Comparing scores from different distributions	26
The Normal Distribution	28
The Standard Normal Distribution	30

4 Introduction to hypothesis testing	35
Testing an hypothesis	36
The logic of hypothesis testing	41
One- and two-tailed predictions	42
5 Sampling	47
Populations and samples	48
Selecting a sample	49
Sample statistics and population parameters	51
Summary	56
6 Hypothesis testing with one sample	59
An example	60
When we do not have the known population standard deviation	64
Confidence intervals	69
Hypothesis testing with one sample: in conclusion	72
7 Selecting samples for comparison	73
Designing experiments to compare samples	74
The interpretation of sample differences	79
8 Hypothesis testing with two samples	81
The assumptions of the two sample t test	85
Related or independent samples	86
The related t test	86
The independent t test	89
Confidence intervals	93

9 Significance, error and power	95
Type I and Type II errors	96
Statistical power	98
The power of a test	99
The choice of α level	100
Effect size	101
Sample size	103
Conclusion	108
 10 Introduction to the analysis of variance	 111
Factors and conditions	112
The problem of many conditions and the t test	112
Why do scores vary in an experiment?	113
The process of analysing variability	118
The F distribution	121
Conclusion	123
 11 One factor independent measures ANOVA	 125
Analysing variability in the independent measures ANOVA	126
Rejecting the null hypothesis	132
Unequal sample sizes	133
The relationship of F to t	135
 12 Multiple comparisons	 137
The Tukey test (for all pairwise comparisons)	140
The Scheffé test (for complex comparisons)	144

13 One factor repeated measures ANOVA	149
Deriving the <i>F</i> value	150
Multiple comparisons	158
 14 The interaction of factors in the analysis of variance	 161
Interactions	164
Dividing up the between conditions sums of squares	167
Simple main effects	169
Conclusion	170
 15 Calculating the two factor ANOVA	 171
The two factor independent measures ANOVA	172
The two factor mixed design ANOVA	181
The two factor repeated measures ANOVA	193
A non-significant interaction	205
 16 An introduction to nonparametric analysis	 207
Calculating ranks	212
 17 Two sample nonparametric analyses	 215
The Mann–Whitney <i>U</i> test (for independent samples)	216
The Wilcoxon signed-ranks test (for related samples)	224

18 One factor ANOVA for ranked data 231

Kruskal–Wallis test (for independent measures)	232
The Friedman test (for related samples)	240

19 Analysing frequency data: chi-square 247

Nominal data, categories and frequency counts	248
Introduction to χ^2	248
Chi-square (χ^2) as a ‘goodness of fit’ test	250
Chi-square (χ^2) as a test of independence	254
The chi-square distribution	256
The assumptions of the χ^2 test	257

20 Linear correlation and regression 261

Introduction	262
Pearson r correlation coefficient	264
Linear regression	270
The interpretation of correlation and regression	275
Problems with correlation and regression	276
The standard error of the estimate	278
The Spearman r_s correlation coefficient	279

21 Multiple correlation and regression 283

Introduction to multivariate analysis	284
Partial correlation	284
Multiple correlation	289
Multiple regression	291

22 Complex analyses and computers 295

Undertaking data analysis by computer	296
Complex analyses	299
Reliability	301
Factor analysis	304
Multivariate analysis of variance (MANOVA)	308
Discriminant function analysis	312
Conclusion	314

23 An introduction to the general linear model 315

Models	316
An example of a linear model	318
Modelling data	320
The model: the regression equation	323
Selecting a good model	327
Comparing samples (the analysis of variance once again)	333
Explaining variations in the data	337
The general linear model	338

<i>Notes</i>	343
<i>Glossary</i>	347
<i>References</i>	357

Appendix: Acknowledgements and statistical tables 359

A.1	The standard normal distribution tables	362
A.2	Critical values of the t distribution	363
A.3	Critical values of the F distribution	364
A.4	Critical values of the Studentized range statistic, q	366
A.5	Critical values of the Mann–Whitney U statistic	367
A.6	Critical values of the Wilcoxon T statistic	369

A.7	Critical values of the chi-square (χ^2) distribution	370
A.8	Table of probabilities for χ_r^2 when k and n are small	371
A.9	Critical values of the Pearson r correlation coefficient	372
A.10	Critical values of the Spearman r_s ranked correlation coefficient	373
 <i>Index</i>		 375