## **Contents**

To the Teacher xi

Introduction xv

# I Collecting data 1

### 1 Sampling 4

1 The need for sampling design 7 2 Simple random sampling 11 3 Population information from a sample 19 4 Confidence statements 30 5 Sampling can go wrong 35 6 More on sampling design 46 7 Opinion polls and the political process 55 8 Random selection as public policy 62 9 Some ethical questions 66

### 2 Experimentation 75

1 The need for experimental design 78 First steps in statistical design of experiments 84 ities in

experim	entatio	on	94 4	More on ex	perimen	ıtal		
design	105	5	Social e	xperiments	114	6	Ethics a	ınd
experimentation			119					

#### 3 Measurement 134

1 First steps in measurement: Validity 135 2 Accuracy in measurement 145 3 Scales of measurement 151 4 Looking at data intelligently 156

# II Organizing data 173

### 4 Describing distributions 175

1 Displaying data 175 2 Displaying distributions 191 3 Measuring center or average 203 4 Measuring spread or variability 215 5 The normal distributions 226

## 5 Understanding relationships 241

1 Cross-classified data 243 2 Scatterplots and correlation 253 3 Association and causation 272 4 Prediction 281

# 6 The Consumer Price Index and its neighbors 299

1 Index numbers 300 2 The Consumer Price Index 305 3 National economic and social statistics 314 4 Interpreting time series 319

# III Drawing conclusions from data 329

# 7 Probability: The study of randomness 331

1 What is probability? 333 2 Finding probabilities by simulation 348 3 State lotteries and expected values 361 4 The law of large numbers 365

# 8 Formal statistical reasoning 377

1 Estimating with confidence 379 2 Confidence intervals for proportions and means 389 3 Statistical significance 397 4 Significance tests for proportions and means 407 5 Use and abuse of tests of significance 414 6 Inference as decision 422

Table A Random digits 430

Table B The standard normal distribution 431

Table C Normal critical values 432

Index 435