T123855

Business Mathematics and Statistics

Andre Francis BSc MSc

Perinatal Institute
Birmingham

131887

Andre Francis works as a medical statistician. He has previously taught Mathematics, Statistics and Information Processing to students on business and professional courses. His teaching experience has covered a wide area, including training students learning basic skills through to teaching undergraduates. He has also had previous industrial (costing) and commercial (export) experience and served for six years in statistical branches of Training Command in the Royal Air Force.

Sixth Edition

Malta College of Arts, Science and Technology
Institute of Business & Commerce

Corradino Hill, Paola PLA 08
Tel: 21827270 Fax: 21666252
e-mail: ibac@mcast.edu.mt

THOMSON

Australia • Canada • Mexico • Singapore • Spain • United Kingdom • United States

Contents

Preface v

1 Introduction to Business Mathematics and Statistics 1

Part 1 Data and their presentation 5

2 Sampling and Data Collection 6
3 Data and their Accuracy 24
4 Frequency Distributions and Charts 38
5 General Charts and Graphs 63
Examination questions 90

Part 2 Statistical measures 95

6 Arithmetic Mean 96
7 Median 107
8 Mode and Other Measures of Location 117
9 Measures of Dispersion and Skewness 129
10 Standard Deviation 136
11 Quantiles and the Quartile Deviation 148
Examination example and questions 159

Part 3 Regression and correlation 165

12 Linear Functions and Graphs 166
13 Regression Techniques 173
14 Correlation Techniques 191
Examination examples and questions 207

Part 4 Time series analysis 213

15 Time Series Model 214
16 Time Series Trend 219
17 Seasonal Variation and Forecasting 229
Examination example and questions 242

Part 5 Index numbers 247

18 Index Relatives 248
19 Composite Index Numbers 259
20 Special Published Indices 272
Examination questions 281

Part 6 Compounding, discounting and annuities 285

21 Interest and Depreciation 286
22 Present Value and Investment Appraisal 302
23 Annuities 318
Examination examples and questions 330

Part 7 Business equations and graphs **337**

24 Functions and Graphs 338
25 Linear Equations 351
26 Quadratic and Cubic Equations 364
27 Differentiation and Integration 374
28 Cost, Revenue and Profit Functions 385
Examination examples and questions 395

Part 8 Probability **403**

29 Set Theory and Enumeration 404
30 Introduction to Probability 419
31 Conditional Probability and Expectation 436
Examination examples and questions 449

Part 9 Further probability **455**

32 Combinations and Permutations 456
33 Binomial and Poisson Distributions 462
34 Normal Distribution 473
Examination example and questions 490

Part 10 Specialised business applications **495**

35 Linear Inequalities 496
36 Matrices 508
37 Inventory Control 526
38 Network Planning and Analysis 543
Examination example and questions 555

Answers to student exercises **562**

Answers to examination questions **581**

Appendices **650**

1 Compounding and Discounting Tables 650
2 Random Sampling Numbers 654
3 Exponential Tables. Values of e^{-m} 655
4 Standard Normal Distribution Tables 657

Index **659**

Index

Note that the references below refer to chapters and sections. Thus 20:11 refers to chapter 20, section 11.

10 to 90 percentile range 11:18

Absolute error 3:9
Accrued amount 21:7
Accrued amount of invested annuity 23:6
Activities, network 38:3
Activity list 38:3
Activity, dummy 38:5
Actual Percentage Rate (APR) 21:16
Addition and subtraction of matrices 36:6
Addition rule of probability 30:18
Additive model for time series 15:7
Amortization annuity 23:11
Amortization schedule 23:13
Amortized debt 23:11
Amount, accrued 21:7
Amount, principal 21:7
Annual Abstract of Statistics 2:23
Annuity 23:2
Annuity, amortization 23:11
Annuity, certain 23:3
Annuity, contingent 23:3
Annuity, due 23:3
Annuity, NPV 23:9
Annuity, ordinary 23:3
Annuity, perpetual 23:3
Approximate number 3:9
Arbitrary constant 27:13
Area graphs 5:19
Arithmetic mean 6:2
Arithmetic progression 21:3
Asymptote 24:12
Average Earnings Indices 20:11
Average inventory level 37:8
Axis-intersection ratio method 24:4, 35:8

Back-to-back bar chart 5:9
Bar chart, back-to-back 5:9
Bar chart, component 5:14
Bar chart, loss or gain 5:9
Bar chart, multiple 5:14
Bar chart, percentage 5:14
Bar chart, simple 5:8
Base changing, index numbers 18:9
Basic inventory model 37:14
Basic inventory model cost equation 37:15
Bayes theorem 31:13
Bias 2:5
Biased errors 3:17
Biased rounding 3:16
Binomial distribution 33:2
Binomial probability formula 33:4
Binomial situation 33:2
Binomial, mean and variance 33:7
Blue Book 2:23
Boundaries, class 4:9
Break-even points 26:11
British Business 2:23

Calculator, use of accumulating memory 6:13
Calculator, use with compound interest 21:13
Calculator, use with regression line 13:12
Calculator, use with standard deviation 10:8
Calculus 27:2
Capital investment 22:8
Carrying costs 37:3
Cash flow, discounted 22:9
Causal relationship 14:21
Census 2:3
Census of Distribution 2:3
Census of Production 2:3
Centred moving average 16:11
Certain annuity 23:3
Chain base relatives 18:7
Chain linking 18:16
Charts, Gantt 5:22
Charts, strata 5:19
Circular diagrams 5:11
Class boundaries 4:9
Class limits 4:9
Class mid-points 4:9
Class widths 4:9
Classes, open-ended 4:8
Classification of data 3:2
Cluster sampling 2:15
Coefficient of correlation 14:4
Coefficient of determination 14:13
Coefficient of dispersion, quartile 11:15
Coefficient of variation 10:14
Combinations 32:2
Commodity, real value of 18:12
Common difference 21:3
Common ratio 21:5
Comparative histograms 4:15
Comparisons of mean, median and mode 8:10
Compensating errors 3:17
Complement of a set 29:4
Complementary rule of probability 30:17
Component bar charts 5:14
Component time series 5:3
Components of composite index number 19.2
Components of time series 15:8
Composite index number 19:2
Compound experiment 30:22
Compound interest 21:8
Compound interest tables 21:13
Conditional probability 31:6
Conditional probability, definition 31:7
Confidence limits 34:15
Confidence limits for mean 34:16
Confidence limits for proportion 34:17
Constant, arbitrary 27:13
Contingent annuity 23:3
Continuous data 3:4
Control, inventory 37:4
Correlation 14:2

Correlation coefficient 14:4
Correlation, negative 14:8
Correlation, positive 14:7
Correlation, spurious 14:21
Cost equation, basic inventory model 37:15
Cost function 28:6
Cost of capital 22:22
Cost, marginal function 28:13
Cost, set-up 37:19
Costs, holding or carrying 37:3
Costs, ordering or replenishment 37:3
Costs, stockout 37:3
Critical path 38:8
Cubic equations, general form 26:12
Cubic equations, graphical solution 26:13
Cubic functions and equations 24:9
Cumulative frequency curve 4:20
Cumulative frequency distribution 4:19
Cumulative frequency polygon 4:20
Cumulative line diagrams 5:19
Curve, cumulative frequency 4:20
Curve, frequency 4:16
Curve, Lorenz 4:23
Curvilinear regression 13:20
Cycle of inventory 37:8
Cycle of time series 15:4

Data array 4:3
Data classification 3:2
Data collection 2:19
Data, continuous 3:4
Data, deseasonalised 17:16
Data, discrete 3:3
Data, primary 2:2
Data, raw 4:2
Data, secondary 2:2
Debt repayment, sinking fund 23:16
Deciles 11:18
Deflation of time series 18:13
Demand (price) function 28:9
Dependent variable 13:13
Depreciation fund 23:19
Depreciation schedule 23:19
Depreciation, reducing balance 21:20
Depreciation, sinking fund 23:19
Depreciation, straight line 21:20
Derivative of a function 27:4
Derivative, second 27:8
Deseasonalised data 17:16
Design of questionnaires 2:20
Determinant of matrix 36:18
Determination, coefficient of 14:13
Deviation, mean 9:7
Deviation, quartile 11:6
Deviation, standard 10:1
Diagram, line 5:12
Diagrams, cumulative line 5:19
Diagrams, purpose of 5:4
Diagrams, Venn 29:5
Differentiation 27:2
Discount factor 22:4
Discount rate 22:2
Discounted cash flow 22:9
Discounting tables 22:4
Discrete data 3:3
Disjoint sets 29:12
Dispersion, measures of 6:0
Distribution, binomial 33:2
Distribution, census of 2:3
Distribution, frequency 4:4
Distribution, poisson 33:9
Distributions, less than 4:19
Distributions, more than 4:19
Divided circles 5:11
Due annuity 23:3
Dummy activity 38:5

Economic batch quantity (EBQ) 37:19
Economic ordering quantity (EOQ) 37:16
Economic Trends 2:23
Effective interest rate 21:16
Elements of a set 29:2
Empirical probability 30:11
Empirical probability, definition 30:14
Employment Gazette 2:23
Enumeration notation, 2-set 29:18
Enumeration notation, 3-set 29:20
Enumeration of sets 29:13
Enumeration problem, general 29:16
Equality, set 29:4
Equally likely outcomes 30:4
Equation 24:2
Equation, cubic 24:9
Equation, linear form 24:3
Equation, quadratic form 24:3
Equations involving ratios 25:19
Equations, cubic 26:12
Equations, linear 25:2
Equations, quadratic 26:2
Equations, simultaneous linear 25:2
Error avoidance with percentages 3:19
Error rules 3:13
Error, absolute 3:9
Error, relative 3:9, 3:18
Errors in expressions 3:12
Errors, biased 3:17
Errors, compensating 3:17
Errors, rounding 3:11
Errors, unpredictable 3:7
Event, statistical 30:5
Events, independent 30:9
Events, mutually exclusive 30:7
Events, network 38:3
Events, split 31:11
Expectation 31:2
Expected value 31:2
Experiment, compound 30:22
Explained variation 14:12
Exploding sectors 5:11
Extrapolation 13:17

Factor, discount 22:4
Factor, present value 22:4
Factorials 32:4
Factorisation for quadratic equations 26:7
Fair rounding 3:6, 3:16
Family Expenditure Survey 20:5
Feasible region 35:4
Financial Statistics 2:23
First derivative 27:4
Fixed base relatives 18:7
Fixed costs 28:6
Float 38:12

Forecasting with time series 17:9
Formula, amortized debt payment 23:11
Formula, APR calculation 21:18
Formula, Bayes theorem 31:13
Formula, binomial mean and variance 33:7
Formula, binomial probability 33:4
Formula, coefficient of determination 14:13
Formula, coefficient of variation 10:14
Formula, cost function 28:6
Formula, demand function 28:9
Formula, derivative of a function 27:4
Formula, EBQ 37:19
Formula, EOQ 37:16
Formula, expected value 31:3
Formula, factorial 32:4
Formula, geometric mean 8:14
Formula, harmonic mean 8:17
Formula, integration of a function 27:13
Formula, internal rate of return (IRR) 22:16
Formula, Laspeyres index 19:11
Formula, mean deviation 9:8
Formula, mean for distribution 6:11
Formula, mean for set 6:6
Formula, median by interpolation 7:9
Formula, mode by interpolation 8:4
Formula, number of combinations 32:5
Formula, number of permutations 32:6
Formula, Paasche index 19:12
Formula, Pearson's measure of skewness 10:16
Formula, poisson probability 33:11
Formula, present value 22:3
Formula, present value of debt 22:6
Formula, price relative 18:6
Formula, profit function 28:3
Formula, proportional pie charts 5:18
Formula, quantiles by interpolation 11:13
Formula, quantity relative 18:6
Formula, quartile coefficient of dispersion 11:14
Formula, quartile deviation 11:6
Formula, quartile measure of skewness 11:16
Formula, rank correlation 14:15
Formula, real value index 18:13
Formula, reducing balance depreciation 21:23
Formula, revenue function 28:8
Formula, seasonal adjustment 17:7
Formula, solution of quadratic equations 26:5
Formula, split event rule 31:11
Formula, standard deviation, distribution 10:10
Formula, time series forecasting 17:11
Formula, weighted aggregate index 19:7
Formula, weighted average of relatives 19:6
Formula, Z-score 34:5
Formulae, arithmetic progression 21:3
Formulae, geometric progression 21:5
Formulae, interest amount accrued 21:9
Free float 38:12
Frequency 4:4
Frequency curve 4:16
Frequency distribution 4:4
Frequency distribution, cumulative 4:19
Frequency distribution, formation of 4:11
Frequency distribution, grouped 4:7
Frequency distribution, relative 4:10
Frequency distribution, simple 4:4
Frequency distributions, non-numeric 5:2
Frequency polygon 4:16
Function 24:2
Function derivative 27:4
Function, cost 28:6
Function, linear 12:2
Function, marginal 28:13
Function, objective 35:8
Function, profit 28:3
Function, revenue 28:8
Functions, ratio of two linear 24:12
Functions, simple 27:4
Fund, depreciation 23:19
Fund, sinking 23:15

Gantt charts 5:22
Geometric mean 8:13
Geometric mean calculations 8:16
Geometric progression 21:5
Gradient of straight line 12:2
Gradient, determining 12:6
Gradual replenishment model 37:18
Graph of inventory 37:6
Graph of time series 15:10
Graph, semi-logarithmic 5:23
Graphical estimation of IRR 22:15
Graphical estimation of median 7:11
Graphical estimation of mode 8:7
Graphical estimation of quartiles 11:11
Graphical solution, cubic equations 26:13
Graphical solution, quadratic equations 26:8
Graphical solution, simultaneous equations 25:13
Graphs of quadratic functions 24:6
Graphs, area 5:19
Grouped frequency distribution 4:7

Harmonic mean 8:17
Heterogeneous population 2:11
Histogram 4:13
Histograms for unequal classes 4:28
Histograms, comparative 4:15
Historigram 15:10
Historigrams 5:13
Holding costs 37:3
Homogeneous population 2:13
Household Expenditure Survey 20:5

Ideograms 5:7

Independent events 30:9
Independent float 38:12
Independent variable 13:13
Index number 18:2
Index number base changing 18:9
Index number construction considerations 19:15
Index number limitations 19:17
Index number notation 18:4
Index number uses 19:16
Index number, composite 19:2
Index number, points increase 18:16
Index Numbers of Producer Prices 20:10
Index of Industrial Production 20:12
Index of Output of Production Industries 20:12
Index of Retail Prices 20:2
Index of Retail Sales 20:14
Index relative 18:5
Index, Laspeyres 19:11
Index, Paasche 19:12
Index, real value 18:14
Index, Tax and Price 20:8
Index, Wholesale Price 20:10
Indices of Average Earnings 20:11
Industrial Production Index 20:12
Inequalities 35:2
Inequalities, sign technique 35:3
Inspection method, for regression line 13:4
Integration 27:2, 27:13
Interest rate 21:7
Interest rate, effective 21:16
Interest rate, nominal 21:16
Interest, compound 21:8
Interest, simple 21:8
Internal rate of return (IRR) 22:14
Interpolation 13:17
Interpolation formula for median 7:7
Interpolation formula for mode 8:4
Interpolation formula for quantiles 11:13
Interquartile range 11:7
Intersection of sets 29:9
Interview, street 2:19
Interview, telephone 2:19
Interviewer bias 2:5
Inventory 37:2
Inventory control 37:4
Inventory control systems 37:10
Inventory cycle 37:8
Inventory graph 37:6
Inventory models 37:13
Inventory system, periodic review 37:10
Inventory system, reorder level 37:10
Inventory, average level 37:8
Inverse of matrix 36:18
Invested annuity, accrued amount 23:6
Investigation, statistical 1:7
Investment schedule 21:10
IRR, graphical estimation 22:15

Laspeyres index 19:11
Lead time 37:5
Least squares regression 13:9
Least squares regression formula 13:10
Least squares, time series trend 16:7
Less than distributions 4:19
Limits of probability 30:17
Limits, class 4:9
Line diagram 5:13
Line diagrams, cumulative 5:19
Line diagrams, multiple 5:13
Line of equal distribution 4:24
Linear equation form 24:3
Linear equation manipulation 25:8
Linear equations 25:2
Linear equations, algebraic solution 25:4
Linear equations, graphical solution 25:5
Linear function 12:2
Linear inequalities 35:3
Linear programming 35:6
Location, measures of 6:0
Long-term cycles 15:8
Lorenz curve 4:23
Loss or gain bar chart 5:9

Management mathematics 1:5
Manipulation of mean formula 6:16
Marginal functions 28:13
Mathematical limits 4:9
Matrix 36:2
Matrix multiplication, conditions 36:12
Matrix multiplication, with matrix 36:11
Matrix multiplication, with number 36:9
Matrix, addition and subtraction 36:6
Matrix, determinant 36:18
Matrix, inverse 36:19
Matrix, transition 36:23
Matrix, unit 36:18
Maximum (local) point 24:6
Maximum (stock) level 37:5
Maximum error 3:8
Maximum profit point 28:3
Mean deviation 9:7
Mean deviation characteristics 9:11
Mean deviation formula 9:8
Mean for a set 6:6
Mean formula manipulation 6:16
Mean of binomial 33:7
Mean point, regression 13:16
Mean validation 6:13
Mean, arithmetic 6:6
Mean, geometric 8:13
Mean, grouped frequency distribution 6:10
Mean, harmonic 8:17
Mean, simple frequency distribution 6:8
Mean, test of significance 34:19
Mean, weighted 6:17
Measures of dispersion 6:0
Measures of location 6:0
Measures of skewness 6:0
Median by interpolation 7:7
Median characteristics 7:16
Median for a set 7:2
Median for simple frequency distribution 7:6
Median, comparison of techniques 7:14
Members 1:7

Members of a set 29:2
Minimum (local) point 24:6
Minimum (stock) level 37:11
Mode 8:2
Mode characteristics 8:9
Mode, by interpolation 8:4
Models for time series 15:5
Monthly Digest of Statistics 2:23
More than distributions 4:19
Moving average centring 16:11
Moving averages 16:9
Moving totals 5:20
Multi-stage sampling 2:14
Multiple bar charts 5:14
Multiple line diagrams 5:13
Multiple pie charts 5:17
Multiple regression 13:20
Multiple time series 5:3
Multiplication rule of probability 30:20
Multiplication rule, general 31:10
Multiplicative model for time series 15:7
Mutually exclusive events 30:7

Negative correlation 14:8
Net present value (NPV) 22:10
Network planning 38:1
Nominal interest rate 21:16
Non-causal relationship 13:14
Non-numeric frequency distributions 5:2
Non-random sampling 2:7
Normal approximation to binomial 34:12
Normal distribution 34:2
Normal distribution probability 34:4
Notation, index number 18:4
Notation, sigma (summation) 6:5
NPV of annuity 23:9
Number of a set 29:4

Objective function 35:8
Ogive 4:20
One-sided errors 3:17
Open-ended classes 4:8
Optimum solution 35:8
Ordering costs 37:3
Ordinary annuity 23:3
Outcome set 30:4
Outcomes 30:4
Outcomes, equally likely 30:4

Paasche index 19:12
Parabola 24:6
Path, critical 38:8
Pearson's measure of skewness 10:16
Percentage bar charts 5:14
Percentiles 11:18
Period of moving average 16:9
Periodic review inventory system 37:12
Permutations 32:2
Perpetual annuity 23:3
Personal interview 2:19
Pictograms 5:6
Pie charts 5:10
Pie charts, multiple 5:17
Pie charts, proportional 5:18
Pilot survey 1:8
Pink Book 2:23
Points increase (index number) 18:16
Poisson approximation to the binomial 33:15
Poisson distribution 33:9
Poisson probability formula 33:11
Poisson process 33:9
Poisson situation 33:9
Poisson, interval adjustment 33:13
Polygon, cumulative frequency 4:20
Polygon, frequency 4:16
Polynomial 24:11
Population 1:8
Population census 2:3
Population, heterogeneous 2:11
Population, homogeneous 2:13
Positive correlation 14:7
Postal questionnaire 2:19
Precedence table 38:3
Precision 2:17
Predictable errors 3:7
Present value 22:2
Present value factor 22:4
Present value, interest bearing debt 22:6
Price (demand) function 28:9
Price relative 18:5
Primary data 2:2
Principal amount 21:7
Probability 1:6, 30:2
Probability formula, binomial 33:4
Probability formula, poisson 33:11
Probability limits 30:17
Probability table 31:4
Probability, addition rule 30:18
Probability, complementary rule of 30:17
Probability, conditional 31:6
Probability, empirical 30:11
Probability, multiplication rule 30:20
Probability, normal distribution 34:4
Probability, theoretical 30:11
Probability, total rule of 30:17
Process, poisson 33:9
Producer Prices, Index Numbers 20:10
Product moment correlation coefficient 14:6
Product moment correlation formula 14:5
Production Industries, Index of Output 20:12
Production run model 37:18
Production, census of 2:3
Profit function 28:3
Profit point, maximum 28:3
Programming, linear 35:6
Progression, arithmetic 21:3
Progression, geometric 21:5
Projecting a time series trend 17:12
Projection of time series 17:9
Proportional pie charts 5:18
Purchasing Power of the Pound (Index) 20:7

Quadratic equation form 24:3
Quadratic equations, factorisation 26:7
Quadratic equations, general form 26:2
Quadratic equations, graphical solution 26:8
Quadratic function graphs 24:6
Quantile 11:2

Quantiles, interpolation formula 11:13
Quantity relative 18:5
Quartile coefficient of dispersion 11:15
Quartile deviation 11:7
Quartile measure of skewness 11:16
Quartiles 11:3
Quartiles for frequency distribution 11:9
Quartiles, graphical estimation 11:11
Quasi-random sampling 2:7
Questionnaire design 2:20
Quote sampling 2:16

Random factors (variation) 15:8
Random sampling 2:8
Random sampling numbers 2:8
Range 9:4
Range characteristics 9:6
Range, 10 to 90 percentile 11:18
Range, semi-interquartile 11:6
Rank correlation coefficient 14:15
Rank correlation, uses 14:16
Rate of change 27:7
Rate of interest 21:7
Rate of return, internal 22:14
Ratios in equations 25:19
Raw data 4:2
Real value index 18:14
Real value of commodity 18:12
Recording bias 2:5
Reducing balance depreciation 21:20
Region, feasible 35:4
Regional Trends 2:23
Regression 13:2
Regression line, inspection 13:4
Regression line, least squares 13:9
Regression line, semi-averages 13:6
Regression line, x on y 13:6
Regression line, y on x 13:6
Regression mean point 13:16
Regression, curvilinear 13:20
Regression, multiple 13:20
Relative error 3:9, 3:18
Relative frequency distribution 4:10
Relative frequency probability 30:11
Relative, index 18:5
Relative, price 18:5
Relative, quantity 18:5
Relatives, chain base 18:7
Relatives, fixed base 18:7
Reorder level 37:5
Reorder level inventory system 37:11
Reorder quantity 37:5
Replenishment costs 37:3
Residual variation 15:8, 17:14
Retail Prices Index (RPI) 20:2
Retail Sales Index 20:14
Revenue function 28:8
Revenue, marginal function 28:13
Rounding conventions 3:6
Rounding errors 3:11
Rounding, biased 3:16
Rounding, fair 3:6, 3:16
Rules of errors 3:13
Run size 37:18
Run time 37:18

Safety stock 37:5
Sample 1:8, 2:4
Sample size 2:18
Sampling frame 2:6
Sampling, cluster 2:15
Sampling, multi-stage 2:14
Sampling, non-random 2:7
Sampling, quasi-random 2:7
Sampling, quota 2:16
Sampling, random 2:7
Sampling, simple random 2:7
Sampling, stratified random 2:12
Sampling, systematic 2:13
Schedule, amortization 23:13
Schedule, depreciation 23:19
Schedule, investment 21:10
Schedule, sinking fund 23:17
Seasonal adjustment 17:6
Seasonal variation 17:1
Second derivative 27:8
Secondary data 2:2
Secondary data sources 2:22
Secondary statistics 2:2
Sectors of pie chart 5:10
Selection bias 2:5
Semi-averages regression line 13:7
Semi-averages, time series trend 16:4
Semi-interquartile range 11:6
Semi-logarithmic graph 5:24
Set enumeration 29:13
Set equality 29:4
Set intersection 29:9
Set number 29:4
Set union 29:7
Set, complement 29:4
Set, outcome 30:4
Set, universal 29:4
Set-up Cost 37:19
Set-up costs 28:6
Sets 29:2
Sets, disjoint 29:12
Sigma notation 6:5
Sign technique for inequalities 35:3
Significance test for mean 34:19
Simple bar chart 5:8
Simple frequency distribution 4:4
Simple functions 27:3
Simple interest 21:8
Simple random sampling 2:9
Simultaneous equations, graphical solution 25:13
Simultaneous equations, matrix solution 36:20
Simultaneous linear equations 25:2
Sinking fund 23:15
Sinking fund debt repayment 23:16
Sinking fund depreciation 23:19
Sinking fund schedule 23:17
Size of sample 2:18
Skewness 9:13
Skewness, measures of 6:0
Skewness, Pearson's measure of 10:16
Skewness, quartile measure of 11:16
Social Trends 2:23
Solution, 2 x 2 simultaneous equations 25:9
Solution, 3 x 3 simultaneous equations 25:16

Solution, linear equations 25:3
Solution, optimum 35:8
Sources of secondary data 2:22
Spearman's rank correlation coefficient 14:15
Split event rule 31:11
Split events 31:11
Spurious correlation 14:21
Standard deviation 10:2
Standard deviation characteristics 10:13
Standard deviation for a set 10:3
Standard deviation, computational formula 10:6
Standard deviation, derivation 10:18
Standard deviation, frequency distribution 10:11
Standard deviation, set, formula 10:2
Standard error 34:16
Standard normal tables 34:6
States (of transition) 36:23
Statistical diagrams, purpose of 5:4
Statistical event 30:5
Statistical experiment 30:3
Statistical investigation 1:7
Statistical method 1:4
Statistics 1:4
Statistics, Annual Abstract 2:23
Statistics, secondary 2:2
Stock, maximum 37:5
Stock, safety 37:5
Stockout costs 37:3
Straight line 12:3
Straight line depreciation 21:20
Straight line, finding equation of 12:8
Strata charts 5:19
Stratification 2:11
Stratified random sampling 2:12
Street interview 2:19
Structure bias 2:5
Subjective probability 30:11
Subsets 29:4
Summation notation 6:5
Survey 1:7
Survey, Family Expenditure 20:5
Survey, Household Expenditure 20:5
Survey, pilot 1:8
Survey, trial 1:8
Systematic errors 3:17
Systematic sampling 2:13
Systems of inventory control 37:10

Table, probability 31:4
Tables, compound interest 21:13
Tables, discounting 22:4
Tables, standard normal 34:6
Tally chart 4:4
Tax and Price Index 20:8
Telephone interview 2:19
Terms of a progression 21:3
Test of significance for mean 34:19
Theoretical probability 30:11
Theoretical probability, definition 30:12
Time series 5:3, 15:2
Time series additive model 15:7
Time series analysis 15:1
Time series components 15:8
Time series cycle 15:4
Time series deflation 18:13
Time series forecasting 17:9
Time series graph 15:10
Time series multiplicative model 15:7
Time series of relatives 18:7
Time series, component 5:3
Time series, multiple 5:3
Total float 38:12
Total probability rule 30:17
Transition matrix 36:23
Transition states 36:23
Tree diagram 30:23
Trend for time series 16:1
Trend projection, time series 17:12
Trend values significance 16:2
Trial survey 1:8
Trials, binomial 33:2
Turning point 24:11
Turning points, identification of 27:10

Unexplained variation 14:12
Union of sets 29:7
Unit matrix 36:18
Universal set 29:4
Unpredictable errors 3:7

Validation of mean 6:13
Validation of standard deviation 10:12
Value, expected 31:2
Variable costs 28:6
Variance of binomial 33:7
Variation, coefficient of 10:14
Variation, explained 14:12
Variation, unexplained 14:12
Venn diagrams 29:5

Weighted aggregate index 19:7
Weighted average of relatives index 19:6
Weighted mean 6:17
Wholesale Price Index 20:10
Wording bias 2:5
Worth of money 22:22

X on y regression line 13:6

Y on x regression line 13:6
Y-intercept of straight line 12:2