



Suranaree University of Technology



31051000612305

John Bird



Contents

| Preface xi | | | |
|------------|---|--|------|
| 1. | . Basic arithmetic | | 1 |
| | 1.1 | Arithmetic operations | 1 |
| | | Highest common factors and lowest common multiples | 3 |
| | | Order of precedence and brackets | 4 |
| 2. | Frac | ctions, decimals and percentages | 6 |
| | 2.1 | Fractions | 6 |
| | 2.2 | Ratio and proportion | 8 |
| | | Decimals | . 9 |
| | 2.4 | Percentages | 11 |
| | | Assignment 1 | 12 |
| 3. | Indices and standard form | | |
| | 3.1 | Indices | 14 |
| | 3.2 | Worked problems on indices | 14 |
| | | Further worked problems on indices | 16 |
| | - | Standard form | 17 |
| | | Worked problems on standard form | 18 |
| | 3.6 | Further worked problems on standard form | 19 |
| 4. | Calculations and evaluation of formulae | | |
| | 4.1 | Errors and approximations | 20 |
| | | Use of calculator | 21 |
| | | Conversion tables and charts | 24 |
| | 4.4 | Evaluation of formulae | . 26 |
| | | Assignment 2 | 28 |
| 5. | Computer numbering systems | | |
| | 5.1 | Binary numbers | 29 |
| | 5.2 | Conversion of binary to denary | 29 |
| | | Conversion of denary to binary | 30 |
| | | Conversion of denary to binary via octal | 31 |
| | 5.5 | Hexadecimal numbers | 32 |
| 6. | Algebra | | |
| | 6.1 | Basic operations | 36 |
| | 6.2 | Laws of Indices | 38 |

vi Contents

| | 6.3 6.4 6.5 | Brackets and factorization Fundamental laws and precedence Direct and inverse proportionality | 40 42 44 |
|-----|---------------------------------|--|-----------------------------|
| | | Assignment 3 | 45 |
| 7. | Sim | ple equations | 46 |
| | 7.1 7.2 7.3 7.4 | Expressions, equations and identities Worked problems on simple equations Further worked problems on simple equations Practical problems involving simple equations | 46 46 48 49 |
| | 7.5 | Further practical problems involving simple equations | 51 |
| 8. | Tran | sposition of formulae | 53 |
| | 8.1 8.2 8.3 8.4 | Introduction to transposition of formulae Worked problems on transposition of formulae Further worked problems on transposition of formulae Harder worked problems on transposition of formulae | 53 53 54 56 |
| | | Assignment 4 | 58 |
| 9. | Simu | ultaneous equations | 59 |
| | 9.1 9.2 9.3 9.4 9.5 | Introduction to simultaneous equations Worked problems on simultaneous equations in two unknowns Further worked problems on simultaneous equations More difficult worked problems on simultaneous equations Practical problems involving simultaneous equations | 59 59 61 62 64 |
| 10. | Qua | dratic equations | 68 |
| | 10.2 10.3 10.4 10.5 | Introduction to quadratic equations Solution of quadratic equations by factorization Solution of quadratic equations by 'completing the square' Solution of quadratic equations by formula Practical problems involving quadratic equations The solution of linear and quadratic equations simultaneously Assignment 5 | 68 70 71 72 74 |
| 11 | Strai | | |
| 11. | 11.1 11.2 | ght line graphs Introduction to graphs The straight line graph Practical problems involving straight line graphs | 76 76 76 81 |
| 12. | | phical solution of equations | 87 |
| | 12.2 12.3 | Graphical solution of simultaneous equations Graphical solutions of quadratic equations Graphical solution of linear and quadratic equations simultaneously Graphical solution of cubic equations | 87 88 92 |
| | 12.4 | | 93 |
| | 12.4 | Assignment 6 | 93 94 |
| 13. | | | |

| | | | , |
|------|------------------------|--|----------|
| | 13.3 Indicial eq | uations | 00 |
| | | logarithmic functions | 98 99 |
| | i i | Togatamino Tunotions | |
| 14. | 100 | | |
| | 14.1 The expone | | 100 |
| | | exponential functions | 100 |
| | 14.3 The power | | 100 |
| | | exponential functions | 103 |
| | 14.5 Napierian | | 104 |
| | 14.6 Evaluating | Napierian logarithms | 104 |
| | 14.7 Laws of gr | owth and decay | 106 |
| | Assignmer | nt 7 | 109 |
| 15. | Reduction of no | on-linear laws to linear form | 110 |
| | | | 110 |
| | 15.1 Determinat | | 110 |
| | 15.2 Determinat | tion of law involving logarithms | 112 |
| 16. | Geometry and | triangles | 117 |
| | 16.1 Angular me | easurement | 117 |
| | | properties of angles | 118 |
| | 16.3 Properties | | 120 |
| | 16.4 Congruent | | 122 |
| | 16.5 Similar tria | | 123 |
| 2 | 16.6 Construction | | 125 |
| Sara | Assignmen | it 8 | 126 |
| 17. | Introduction to | trigonometry | 128 |
| | 17.1 Trigonome | | 128 |
| | 17.2 The theorem | | 128 |
| | | tric ratios of acute angles | 129 |
| | 17.4 Solution of | right-angled triangles | 131 |
| | | elevation and depression | 132 |
| | 17.0 Evaluating | trigonometric ratios of any angles | 134 |
| 18. | Trigonometric v | vaveforms | 137 |
| | | trigonometric functions | 137 |
| | 18.2 Angles of a | | 138 |
| | | ction of a sine and cosine wave | 140 |
| | 18.4 Sine and co | | . 141 |
| | 18.5 Sinusoidal | form $A\sin(\omega t \pm \alpha)$ | 144 |
| | Assignmen | ıt 9 | 146 |
| 19. | Cartesian and p | oolar co-ordinates | 148 |
| | 19.1 Introduction | n | 148 |
| | | rom Cartesian into polar co-ordinates | 148 |
| | 19.3 Changing f | rom polar into Cartesian co-ordinates | 150 |
| | 19.4 Use of <i>R</i> – | $\rightarrow P$ and $P \rightarrow R$ functions on calculators | 151 |
| 20. | Areas of plane f | ilgures | 152 |
| | 20.1 Mensuratio | n | 152 |
| | 20.2 Properties | of quadrilaterals | 152 |

| | 20.3 | Worked problems on areas of plane figures | 153 |
|-----|-------|--|-----|
| | 20.4 | Further worked problems on areas of plane figures | 157 |
| | 20.5 | Areas of similar shapes | 158 |
| | | Assignment 10 | 159 |
| 21, | The | circle state of the state of th | 160 |
| | 21.1 | Introduction | 160 |
| | 21.2 | Properties of circles | 160 |
| | 21.3 | Are length and area of a sector | 161 |
| | 21.4 | The equation of a circle | 164 |
| 22. | Volu | mes of common solids | 166 |
| | 22.1 | Volumes and surface areas of regular solids | 166 |
| | 22.2 | Worked problems on volumes and surface areas of regular solids | 166 |
| | 22.3 | Further worked problems on volumes and surface areas of regular solids | 168 |
| | 22.4 | Volumes and surface areas of frusta of pyramids and cones | 172 |
| | 22.5 | Volumes of similar shapes | 175 |
| | | Assignment 11 | 175 |
| 23. | Irreg | ular areas and volumes and mean values of waveforms | 177 |
| | 23.1 | Areas of irregular figures | 177 |
| | | Volumes of irregular solids | 179 |
| | | The mean or average value of a waveform | 180 |
| 24. | Triar | ngles and some practical applications | 184 |
| | | Sine and cosine rules | 184 |
| | | Area of any triangle | 184 |
| | 24.3 | Worked problems on the solution of triangles and their areas | 184 |
| | 24.4 | Further worked problems on the solution of triangles and their areas | 186 |
| | 24.5 | Practical situations involving trigonometry | 187 |
| | | Further practical situations involving trigonometry | 190 |
| | | Assignment 12 | 192 |
| 25. | Vecto | ors | 193 |
| | | Introduction | 193 |
| | | Vector addition | 193 |
| | | Resolution of vectors | 195 |
| | | Vector subtraction | 196 |
| | 25.5 | Relative velocity | 198 |
| 26. | Num | ber sequences | 200 |
| | 26.1 | Simple sequences | 200 |
| | 26.2 | The n'th term of a series | 200 |
| | 26,3 | Arithmetic progressions | 201 |
| | 25.4 | Worked problems on arithmetic progression | 202 |
| | 20.5 | Parties worked problems on arithmetic progressions | 203 |
| | | Geometric progressions | 204 |
| | 26.0 | Marked problems on geometric progressions | 205 |
| | | Further worked problems on geometric progressions | 206 |
| | で業者 | Anderment 13 | 207 |

| 27. | Pres | entation of statistical data | 208 |
|------------|---------------|--|-----|
| | | Some statistical terminology | 208 |
| | | Presentation of ungrouped data | 209 |
| | 27.3 | Presentation of grouped data | 212 |
| 28. | Mea | sures of central tendency and dispersion | 217 |
| | | • · · · • | |
| | | Measures of central tendency Mean, median and mode for discrete data | 217 |
| | | | 217 |
| | | Mean, median and mode for grouped data Standard deviation | 218 |
| | | | 219 |
| Α, | 20.5 | Quartiles, deciles and percentiles | 221 |
| 29. | . Probability | | 223 |
| | 29.1 | Introduction to probability | 223 |
| | 29.2 | Laws of probability | 223 |
| | 29.3 | Worked problems on probability | 224 |
| | | Further worked problems on probability | 225 |
| ** | | Assignment 14 | 227 |
| List | of fo | ormulae | 229 |
| Ans | wers | to exercises | 233 |
| Ind | ex | | 247 |