

# Higher 2 contents

## 1 Graphing inequalities 8

- A Inequalities on a grid 8
- B Regions with vertical and horizontal boundaries 10
- C Sloping boundary lines 12
- D Overlapping regions 14
- E Boundaries: included or not included 16

## 2 Enlargement and similarity 18

- A Enlargement and scale factor 18
- B Similar triangles 20
- C Map scale 24
- D Repeated enlargement 24
- E Enlargement with a negative scale factor 25

## 3 The reciprocal function 27

- A Review: reciprocals 27
- B Graphs of reciprocal functions 28

## 4 Arc, sector and segment 30

- A Arc and sector of a circle 30
- B Segment of a circle 32
- C Part of a cylinder 33

## 5 Investigating and identifying graphs 34

- A Investigating graphs 34  
(quadratic, cubic, reciprocal)
- B Identifying graphs 36  
(linear, quadratic, cubic, reciprocal)

## 6 Combining probabilities 39

- A Review: finding probabilities 39
- B Mutually exclusive events 40
- C Independent events 42
- D Tree diagrams 44
- E Dependent events 46
- F Mixed questions 48

## Review 1 50

## 7 Direct and inverse proportion 55

- A Review: ratio 55
- B Quantities related by a rate 56
- C Direct proportion 57
- D Calculating with direct proportion 58
- E  $Q \propto P^2, Q \propto P^3, \dots$  59
- F Inverse proportion 61
- G Identifying a proportional relationship 64

## 8 Quadratic expressions and equations 1 66

- A Review: simple quadratic expressions and equations 66
- B Multiplying out expressions such as  $(2n - 3)(4n + 5)$  67
- C Factorising quadratic expressions 69
- D Solving equations by factorising 71
- E Quadratic expressions that use two letters 72

## 9 Dimension of an expression 74

- A Length, area and volume 74

## 10 Sequences 78

- A Linear sequences 78
- B Quadratic sequences 79
- C Mixed sequences 80
- D Analysing spatial patterns 81

## 11 Enlargement, area and volume 84

- A Enlargement and area 84
- B Enlargement and volume 88
- C Mixed units 93

## 12 Algebraic fractions and equations 1 95

- A Simplifying by cancelling 95
- B Factorising then simplifying 96
- C Multiplying and dividing 98
- D Solving equations that contain fractions 99

### 13 Time series 101

A Trend and moving average 101

#### Review 2 105

### 14 Trigonometric graphs 108

A The sine graph 108

B The cosine graph 111

C The tangent graph 113

D Graphs based on trigonometric functions 116

### 15 Pyramid, cone and sphere 121

A Pyramid and cone 121

B Sphere 126

### 16 Rearranging a formula 129

A Review: rearranging a simple formula 129

B Choosing the first step in a rearrangement 130

C Simplifying squares and square roots 132

D Formulas involving squares and square roots 133

E Formulas where the new subject appears more than once 134

F Forming and manipulating formulas 136

### 17 Sampling 139

A Representative samples 139

B Random sampling 140

C Systematic sampling 143

D Stratified sampling 143

### 18 Using graphs to solve equations 145

A Review: graphs and simple equations 145

B Intersection of a linear and a curved graph 146

C Deciding which linear graph to draw 148

D Forming equations and using graphs to solve problems 150

### 19 Histograms 153

A Reading a histogram using an 'area scale' 153

B Frequency density 155

C Drawing a histogram 157

### 20 Quadratic expressions and equations 2 159

A Perfect squares 159

B Using a perfect square to solve a quadratic equation 160

C Using a formula to solve a quadratic equation 161

D Solving problems 163

E Simultaneous equations 164  
(one linear, one quadratic)

#### Review 3 166

### 21 Working with rounded quantities 170

A Lower and upper bounds 170

B Calculating with rounded quantities 171

C Subtracting 173

D Dividing 174

### 22 Using exact values 176

A Showing  $\pi$  in a result 176

B Showing a surd in a result 178

C Mixed questions 181

D Exact relationships between variables 182

### 23 Fractional indices 184

A Review: positive and negative indices 184

B Roots 184

C Fractional indices of the form  $1/n$  or  $-1/n$  185

D Fractional indices of the form  $p/q$  or  $-p/q$  187

E Powers and roots on a calculator 188

### 24 Exponential growth and decay 189

A Exponential growth 189

B Exponential decay 190

### 25 Angle properties of a circle 192

A Angles of a triangle 192

B Angles in a circle 193

C Angles of a cyclic quadrilateral 196

D Tangent to a circle 199

E Mixed questions 201

continues >

## 26 Algebraic fractions and equations 2 204

- A Adding and subtracting algebraic fractions 204
- B More complex denominators 206
- C Solving equations containing fractions 207
- D Rearranging formulas containing fractions 208

## 27 Vectors 210

- A Vector notation 210
- B Adding vectors 212
- C Subtracting vectors 213
- D Fractions of a vector 215
- E Vector algebra 216
- F Proof by vectors 218

### Review 4 222

## 28 Circles and equations 225

- A Equation of a circle 225  
(centre at the origin)
- B Intersection of a line and a circle 226

## 29 Congruent triangles 230

- A 'Fixing' a triangle 230
- B Proving that two triangles are congruent 232
- C Proving by congruent triangles 233
- D Justifying ruler-and-compasses constructions 235

## 30 Proof 238

- A Proving a statement is false with a counterexample 238
- B Algebraic proof 239

## 31 Extending trigonometry to any triangle 242

- A Revision: trigonometry and Pythagoras 242
- B The sine rule: finding a side 243
- C The sine rule: finding an angle 246
- D The cosine rule 247
- E The sine formula for the area of a triangle 250
- F Mixed questions 251

## 32 Transforming graphs 253

- A Working with quadratic expressions in the form  $(x + a)^2 + b$  253  
(minimum value, features of graph, solving equation)
- B Completing the square 255
- C Transforming quadratic graphs 256  
(translation, stretch, reflection)
- D Transforming graphs in general 259  
(translation, stretch, reflection)
- E Function notation 262
- F Transforming functions 263

## 33 Rational and irrational numbers 268

- A Review: fractions to decimals 268
- B Recurring decimals to fractions 269
- C Irrational numbers 270
- D Simplifying expressions containing square roots 271
- E Multiplying out brackets containing square roots 273
- F Further simplifying with square roots 274  
(including rationalising the denominator)
- G Surd solutions to quadratic equations 275
- H Mixed questions 276

## 34 Pythagoras and trigonometry in three dimensions 278

- A Solving problems using a grid 278
- B Solving problems without a grid 280
- C Using coordinates in three dimensions 284  
(including mid-point of line segment)

### Review 5 286

## Answers 290

## Index 355