

Contents

First published in 2018 by Folens Publishers
Hibernian Industrial Estate, Greenhills Road, Tallaght, Dublin 24

© Michael Keating, Derek Mulvany, James O'Loughlin, Jim McElroy, Oliver Murphy and Colin Townsend 2018

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, for whatever purpose, without the prior written permission of the publisher, or a licence permitting restricted copying in Ireland issued by the Irish Copyright Licensing Agency, 63 Patrick Street, Dún Laoghaire, Co. Dublin.

To the best of the publisher's knowledge, information in this book was correct at the time of going to press.
No responsibility can be taken for any errors.

The FOLENS company name and associated logos are trademarks of Folens Publishers, registered in Ireland and other countries.

Acknowledgements

Answers were checked by Jonathan Webley.

The author and publisher are grateful for the use of copyrighted material from Alamy, Shutterstock and SPL.

The publisher has made every effort to contact all copyright holders but if any have been overlooked, we will be pleased to make any necessary arrangements.

Any links or references to external websites should not be construed as an endorsement by Folens of the content or views of these websites.

Introduction	vii	Chapter 5 Constructions I	65
Chapter 1 Sets	1	5.1 Construction Equipment.....	66
1.1 Introduction	2	5.2 Construction 1.....	67
1.2 Set Notation.....	3	5.3 Construction 2.....	69
1.3 Subsets	6	5.4 Construction 4.....	71
1.4 Venn Diagrams, Union and Intersection.....	7	5.5 Construction 5.....	73
1.5 The Universal Set	9	5.6 Construction 6.....	75
1.6 Problem-Solving Using Sets	12	5.7 Construction 8.....	77
Chapter 2 Natural Numbers	17	Chapter 6 Rational Numbers	80
2.1 Introduction	18	6.1 Rational Numbers or Fractions	81
2.2 Addition and Subtraction	18	6.2 Adding and Subtracting Fractions.....	86
2.3 Factors and Multiples	22	6.3 Multiplying Fractions	90
2.4 Multiplication and Division	27	6.4 Dividing Fractions	93
2.5 Commutative, Associative and Distributive Properties	31	6.5 Ratio and Proportion.....	95
2.6 Order of Operations	32	Chapter 7 Decimals and Percentages	99
Chapter 3 Integers	36	7.1 Decimals.....	100
3.1 Integers.....	37	7.2 Fractions and Decimals.....	101
3.2 Addition and Subtraction of Integers	40	7.3 Rounding.....	103
3.3 Multiplication and Division of Integers	43	7.4 Percentages	108
3.4 Order of Operations	49	7.5 Calculating with Percentages.....	111
Chapter 4 Geometry I	52	7.6 Percentage Increase and Percentage Decrease.....	113
4.1 Geometry: Introduction	53	Chapter 8 The Fundamental Principle of Counting and Probability	117
4.2 Basic Concepts	53	8.1 Listing Outcomes.....	118
4.3 Angles	55	8.2 The Fundamental Principle of Counting	123
4.4 Perpendicular, Parallel, Vertical and Horizontal Lines.....	60	8.3 Introducing Probability.....	125
4.5 Axioms.....	61	8.4 Describing Probability Using a Scale.....	125

8.5 Relative Frequency (Experimental Probability)..... 128	14.3 Deciding Which Average to Use 227	19.4 Construction 12..... 308	24.6 Theorem Terms..... 406
8.6 Relative Frequency and Fairness 131	14.4 Measure of Spread..... 229	19.5 Construction 13..... 310	24.7 An Introduction to Proof 407
8.7 Theoretical Probability..... 133	Chapter 15 Algebra: An Introduction 233	19.6 Construction 14..... 312	Chapter 25 Co-ordinate Geometry II 413
8.8 Expected Frequency..... 137	15.1 Evaluating Expressions..... 234	19.7 Construction 15..... 316	25.1 Midpoint of a Line Segment 414
8.9 Sample Spaces for Independent Events 139	15.2 Adding and Subtracting Terms..... 236	Chapter 20 Applied Measure I 319	25.2 Slope of a Line..... 416
Chapter 9 Co-ordinate Geometry I 148	15.3 Multiplying Terms..... 238	20.1 Units of Measurements 320	25.3 Distance Between Two Points..... 418
9.1 The Cartesian Plane..... 149	15.4 Multiplying Terms with Brackets 1 239	20.2 Area and Perimeter of Rectangles and Squares..... 321	25.4 Equation of a Line 421
Chapter 10 Transformation Geometry 157	15.5 Multiplying Terms with Brackets 2..... 241	20.3 Nets of Rectangular Solids..... 326	25.5 Equation of a Line in the Form $y = mx + c$ 423
10.1 Axis of Symmetry..... 158	15.6 Multiplying Two Expressions..... 242	20.4 Surface Area of Rectangular Solids 330	25.6 Equation of a Line with Slope m and containing (x_1, y_1) 426
10.2 Transformations..... 162	15.7 Writing Expressions 243	Chapter 21 Applied Arithmetic..... 336	25.7 Graphing Lines 428
Chapter 11 Number Patterns I 174	Chapter 16 Algebra: Solving Linear Equations 248	21.1 Income Tax 337	Chapter 26 Algebra: Solving Simultaneous Equations 432
11.1 Patterns 175	16.1 Solving Linear Equations 1 249	21.2 VAT: Value Added Tax..... 339	26.1 Finding the Point of Intersection of Two Lines Using Graphs 433
11.2 Linear Patterns 177	16.2 Solving Linear Equations 2 251	21.3 Household Bills 342	26.2 Verifying Solutions of Simultaneous Equations..... 437
11.3 Some Non-Linear Sequences..... 179	16.3 Solving Linear Equations 3 253	21.4 Profit, Loss and Discounts..... 345	26.3 Solving Simultaneous Equations Using Algebra 438
11.4 Real-world Phenomena Involving Patterns 183	16.4 Solving Linear Equations: Brackets..... 254	21.5 Ratio and Proportion..... 349	26.4 Solving Word Problems Using Simultaneous Equations..... 441
Chapter 12 Statistics I: Collecting Data 189	16.5 Solving Word Problems Using Linear Equations..... 256	21.6 Currency Exchange 352	Chapter 27 Applied Measure II..... 446
12.1 Statistics in Today's World 190	Chapter 17 Distance, Speed, Time and Real-Life Graphs..... 260	21.7 Compound Interest 354	27.1 Perimeter and Area of Triangles 447
12.2 Statistical Investigations 190	17.1 Time and the 24-hour Clock 261	Chapter 22 Algebra: Solving Linear Inequalities..... 358	27.2 Perimeter and Area of Discs (Circles) 450
12.3 Collecting Data 194	17.2 Timetables..... 264	22.1 Inequalities 359	27.3 Perimeter and Area of Combinations of Rectangle, Square, Triangle and Disc..... 454
12.4 Frequency Tables 196	17.3 Distance, Speed and Time 268	22.2 Graphing Inequalities 360	27.4 Volume of Rectangular Solids..... 456
Chapter 13 Statistics II: Representing Data Graphically 200	17.4 Graphs without Formulae 272	22.3 Solving Linear Inequalities 363	27.5 Volume of Cylinders..... 459
13.1 Line Plots..... 201	17.5 Other Graphs 278	Chapter 23 Indices..... 367	27.6 Scaled Diagrams 462
13.2 Bar Charts..... 202	Chapter 18 Geometry II: Theorems 286	23.1 Indices and Square Roots..... 368	Chapter 28 Algebraic Factorising..... 467
13.3 Pie Charts 205	18.1 Theorems 287	23.2 First Law of Indices and Square Roots..... 370	28.1 Algebraic Factors 468
13.4 Stem and Leaf Plots 209	18.2 Vertically Opposite Angles 287	23.3 Second Law of Indices 373	28.2 Highest Common Factor (HCF): Expressions 470
13.5 Histograms..... 211	18.3 Alternate and Corresponding Angles in Parallel Lines..... 289	23.4 Third Law of Indices 375	28.3 Grouping Factors I..... 471
13.6 Choosing a Suitable Chart..... 214	18.4 Triangles 294	23.5 Scientific Notation..... 377	28.4 Grouping Factors II..... 472
13.7 Misuses of Statistics 216	Chapter 19 Constructions II 301	Chapter 24 Geometry III: Further Theorems ... 381	28.5 Quadratic Trinomials I..... 473
Chapter 14 Statistics III: Representing Data Numerically and Interpreting Data... 220	19.1 Construction 9..... 302	24.1 Quadrilaterals 382	
14.1 Measures of Central Tendency 1: Mode and Median 221	19.2 Construction 10..... 303	24.2 Similar Triangles 388	
14.2 Measures of Central Tendency 2: Mean 224	19.3 Construction 11..... 306	24.3 Congruent Triangles..... 393	
		24.4 The Theorem of Pythagoras 396	
		24.5 Circles 401	



Introduction

28.6 Quadratic Trinomials II.....	476	31.6 Interpreting Graphs and Approximating Solutions	525
28.7 The Difference of Two Squares.....	478	31.7 Using Graphs of Functions to Solve $f(x) = 0$	528
Chapter 29 Algebra: Solving Quadratic Equations	480	Chapter 32 Number Patterns II	535
29.1 Solving Quadratic Equations	481	32.1 General Term of a Linear Sequence	536
29.2 Highest Common Factor	481	32.2 Graphing Patterns	540
29.3 Difference of Two Squares	482	32.3 Using Graphs of Patterns to Solve Problems	546
29.4 Quadratic Trinomials.....	485	Chapter 33 Trigonometry.....	557
29.5 Solving Word Problems Using Quadratic Equations	487	33.1 Right-Angled Triangles and the Theorem of Pythagoras.....	558
Chapter 30 Algebraic Fractions.....	493	33.2 Right-Angled Triangles and the Trigonometric Ratios	560
30.1 Algebraic Fractions	494	33.3 Finding the Length of a Side in a Right-Angled Triangle.....	563
30.2 Solving Equations with Algebraic Fractions	496	33.4 Finding Angles.....	566
30.3 Division in Algebra	500	33.5 Using Trigonometry to Solve Practical Problems.....	567
Chapter 31 Functions.....	504	Appendix	572
31.1 Functions	505	Answers	576
31.2 Important Terms	510		
31.3 Function Notation	512		
31.4 Linear Functions.....	517		
31.5 Quadratic Functions.....	522		

This new edition of *Active Maths 1* is a comprehensive three-year textbook covering the complete Junior Cycle Maths Ordinary Level specification. After finishing *Active Maths 1*, Higher Level students can continue the Junior Cycle Higher Level course with *Active Maths 2*.

The subject of maths covers many different areas and on completion of this book you will be able to:

- Grasp mathematical concepts
- Carry out mathematical procedures efficiently and accurately
- Formulate and solve maths problems
- Think logically, reflect on your thoughts and explain your reasoning to others
- See how useful maths is when applied to the world you live in

Active Maths 1 fully covers the entire Junior Cycle Ordinary Level specification.

1. The Unifying Strand. This strand permeates the whole book. There is no specific content within it, rather the learning outcomes are applicable to the content of the four other strands.

2. Number

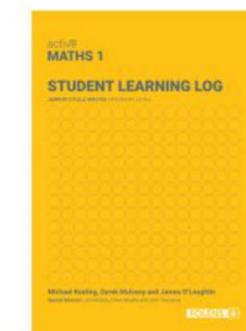
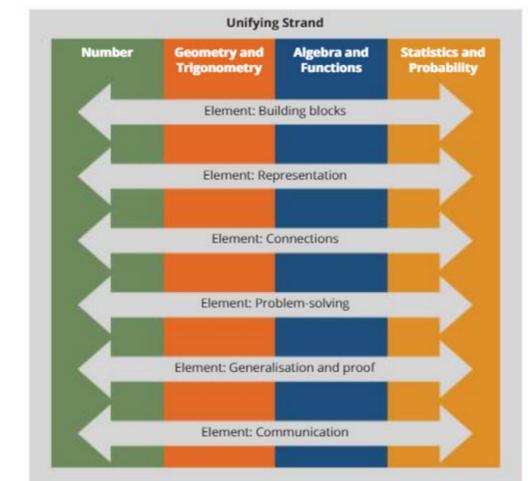
3. Geometry and Trigonometry

4. Algebra and Functions

5. Statistics and Probability

- A separate free Learning Log encourages further investigation of a specific topic within each chapter and also provides you with an opportunity to reflect on your own learning. This is an integral part of the Junior Cycle key skills you are expected to develop as a student.

We have worked hard to improve the quality of this new book and believe that those who use it will enjoy and absorb all that the new Junior Cycle Maths specification has to offer.



Michael Keating, Jim McElroy, Derek Mulvany, Oliver Murphy, James O'Loughlin and Colin Townsend

April 2018

