

Specialist Mathematics Units 1 & 2

Contents

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Series contents

This series comprises **thirteen content workbooks**, cumulative **topic tests**, and a **practice-examination booklet**, covering the complete VCAA Specialist Mathematics Units 1 & 2 course. Specialist Mathematics Units 1 & 2 is designed to be taken in conjunction with Mathematical Methods Units 1 & 2 — together they provide a comprehensive preparation for Specialist Mathematics Units 3 & 4 — and assumes a sound background in number, algebra, function, geometry, probability and statistics. Each content workbook follows the same structure: concise theory, scaffolded and unscaffolded worked examples, graded practice questions, a compact answer key, and fully-worked solutions.

Unit 1 — Algebra, number and structure

Chapter 1 — Proof and number (44 pp)

1A Number systems and set notation · 1B Direct proof, cases, contradiction and contrapositive · 1C Mathematical induction · 1D Primes and the fundamental theorem of arithmetic · 1E Proving inequalities and irrationality

Chapter 2 — Graph theory (59 pp)

2A Graphs, vertices and edges · 2B Simple, complete, bipartite and regular graphs · 2C Trees · 2D Planar graphs and Euler's formula · 2E Trails, circuits, Euler and Hamiltonian graphs

Chapter 3 — Logic, Boolean algebra and algorithms (49 pp)

3A Propositions, connectives and truth tables · 3B Boolean algebra and Karnaugh maps · 3C Logic gates and circuits · 3D Binary numbers · 3E Algorithms and pseudocode

Unit 1 — Discrete mathematics

Chapter 4 — Sequences, series and recurrence relations (28 pp)

4A Arithmetic sequences and series · 4B Geometric sequences and series · 4C Recurrence relations

Chapter 5 — Combinatorics (39 pp)

5A The pigeon-hole principle · 5B The inclusion–exclusion principle · 5C Permutations and combinations · 5D Combinatorial identities

Chapter 6 — Matrices (42 pp)

6A Matrix notation, types and operations · 6B Matrix multiplication · 6C Determinants, inverses and matrix equations

Topic 1 Test A (technology-active) and Test B (technology-free), covering the whole of Unit 1, with fully-worked solutions, are included at the end of the Chapter 6 workbook.

Unit 2 — Data analysis, probability and statistics

Chapter 7 — Simulation, sampling and sampling distributions (40 pp)

7A Mean, variance and standard deviation of a discrete random variable · 7B Linear combinations and sums of independent random variables · 7C Random experiments, simulation and sample statistics · 7D The distribution of sample means

Unit 2 — Space and measurement

Chapter 8 — Trigonometry and identities (37 pp)

8A Radian measure, arcs, sectors and segments · 8B The sine and cosine rules in two and three dimensions · 8C Compound- and double-angle formulas · 8D Product-to-sum and sum-to-product identities

Chapter 9 — Transformations of the plane (31 pp)

9A Points, column vectors and translations · 9B Rotations and reflections as linear transformations · 9C Compositions, inverses and invariance

Chapter 10 — Vectors in the plane (38 pp)

10A Vectors, magnitude and unit vectors · 10B Vector operations and components · 10C The scalar (dot) product, projection and angle · 10D Vector proofs and applications

Unit 2 — Algebra, number and structure

Chapter 11 — Complex numbers (42 pp)

11A Complex numbers in Cartesian form · 11B Quadratics over the complex field and conjugate roots · 11C Regions and loci in the complex plane · 11D Polar form: multiplication, division and powers

Unit 2 — Functions, relations and graphs

Chapter 12 — Partial fractions and reciprocal and inverse circular functions (35 pp)

12A Partial fractions · 12B Reciprocal circular functions · 12C Restricted and inverse circular functions

Chapter 13 — Loci, conics and the absolute value function (41 pp)

13A The parabola, circle and ellipse as loci · 13B The hyperbola, and parametric and polar forms · 13C The absolute value function

Topic 2 Test A (technology-active) and Test B (technology-free), covering the whole of Unit 2, with fully-worked solutions, are included at the end of the Chapter 13 workbook.

Practice examinations

Chapter 14 — Practice Examinations (71 pp)

Six full practice examinations with fully-worked solutions, cumulative over the whole course:

Practice Exams 1–3 — Technology-free (Exam 1 style: 40 marks, 1 hour writing, short-answer), at increasing difficulty · Practice Exams 4–6 — Technology-active (Exam 2 style: 80 marks = Section A 20 multiple-choice + Section B extended-response, 2 hours writing), at increasing difficulty. A formula sheet is provided with each examination.

The series comprises ≈ 599 pages across all booklets.