

Mathematical Methods

General senior subject

General

Mathematics is a unique and powerful intellectual discipline that is used to investigate patterns, order, generality and uncertainty. It is a way of thinking in which problems are explored and solved through observation, reflection and logical reasoning. It uses a concise system of communication, with written, symbolic, spoken and visual components. Mathematics is creative, requires initiative and promotes curiosity in an increasingly complex and data-driven world. It is the foundation of all quantitative disciplines.

To prepare students with the knowledge, skills and confidence to participate effectively in the community and the economy requires the development of skills that reflect the demands of the 21st century. Students undertaking Mathematics will develop their critical and creative thinking, oral and written communication, information & communication technologies (ICT) capability, ability to collaborate, and sense of personal and social responsibility — ultimately becoming lifelong learners who demonstrate initiative when facing a challenge. The use of technology to make connections between mathematical theory, practice and application has a positive effect on the development of conceptual understanding and student disposition towards mathematics.

Mathematics teaching and learning practices range from practising essential mathematical routines to develop procedural fluency, through to investigating scenarios, modelling the real world, solving problems and explaining reasoning. When students achieve procedural fluency, they carry out procedures flexibly, accurately and efficiently. When factual knowledge and concepts come to mind readily, students are able to make more complex use of knowledge to successfully formulate,

represent and solve mathematical problems. Problem-solving helps to develop an ability to transfer mathematical skills and ideas between different contexts. This assists students to make connections between related concepts and adapt what they already know to new and unfamiliar situations. With appropriate effort and experience, through discussion, collaboration and reflection of ideas, students should develop confidence and experience success in their use of mathematics.

The major domains of mathematics in Mathematical Methods are Algebra, Functions, relations and their graphs, Calculus and Statistics. Topics are developed systematically, with increasing levels of sophistication, complexity and connection, and build on algebra, functions and their graphs, and probability from the P–10 Australian Curriculum. Calculus is essential for developing an understanding of the physical world. The domain Statistics is used to describe and analyse phenomena involving uncertainty and variation. Both are the basis for developing effective models of the world and solving complex and abstract mathematical problems. The ability to translate written, numerical, algebraic, symbolic and graphical information from one representation to another is a vital part of learning in Mathematical Methods.

Students who undertake Mathematical Methods will see the connections between mathematics and other areas of the curriculum and apply their mathematical skills to real-world problems, becoming critical thinkers, innovators and problem-solvers. Through solving problems and developing models, they will appreciate that mathematics and statistics are dynamic tools that are critically important in the 21st century.

Pathways

A course of study in Mathematical Methods can establish a basis for further education and employment in the fields of natural and physical sciences (especially physics and chemistry), mathematics and science education, medical and health sciences (including human biology, biomedical science, nanoscience and forensics), engineering (including chemical, civil, electrical and mechanical engineering, avionics, communications and mining), computer science (including electronics and software design), psychology and business.

Structure

Unit 1	Unit 2	Unit 3	Unit 4
Surds, algebra, functions and probability • Surds and quadratic functions • Binomial expansion and cubic functions • Functions and relations • Trigonometric functions • Probability	Calculus and further functions • Exponential functions • Logarithms and logarithmic functions • Introduction to differential calculus • Applications of differential calculus • Further differentiation	Further calculus and introduction to statistics • Differentiation of exponential and logarithmic functions • Differentiation of trigonometric functions and differentiation rules • Further applications of differentiation	Further calculus, trigonometry and statistics • Further integration • Trigonometry • Continuous random variables and the normal distribution • Sampling and proportions • Interval estimates for proportions

Assessment

Schools devise assessments in Units 1 and 2 to suit their local context.

In Units 3 and 4 students complete *four* summative assessments. The results from each of the assessments are added together to provide a subject score out of 100. Students will also receive an overall subject result (A–E).

Summative assessments

Unit 3		Unit 4	
Summative internal assessment 1 (IA1): 20% Problem-solving and modelling task			
Summative internal assessment 2 (IA2): • Examination — short response	15%	Summative internal assessment 3 (IA3): • Examination — short response	15%
Summative external assessment (EA): 50% • Examination — combination response			

Objectives

By the conclusion of the course of study, students will:

- recall mathematical knowledge
- use mathematical knowledge
- communicate mathematical knowledge
- evaluate the reasonableness of solutions
- justify procedures and decisions
- solve mathematical problems.

