

Mathematical Methods 2019 v1.2

General Senior Syllabus

MERIDAN STATE COLLEGE - MAM (possible 4 QCE credits)

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www.qcaa.qld.edu.au/senior/senior-subjects

1 Course overview

1.1 Introduction

1.1.1 Rationale

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.

Assumed knowledge, prior learning or experience

Assumed knowledge refers to the subject matter that teachers can expect students to know prior to beginning this subject. Emphasis is placed on the mastery of content, ensuring key concepts or procedures are learnt fully so they will not need reteaching.

Developing mastery often involves multiple approaches to teaching and conceptualising the same mathematical concept. When students have a good understanding of a key concept or procedure, they are more easily able to make connections to related new subject matter and apply what they already know to new problems.

Subject matter from previous unit/s is assumed for subsequent unit/s.

The following is a non-exhaustive list of assumed knowledge from the P–10 Australian Curriculum that must be learnt or revised and maintained as required:

- factorise, expand and simplify algebraic expressions including monic quadratic expressions using a variety of strategies
- apply the four operations to simple algebraic fractions with numerical denominators
- substitute values into formulas to determine an unknown
- solve problems involving linear equations, including those derived from formulas and those that involve simple algebraic fractions
- recall the equation of a line in the form $y = mx + c$
- determine if lines are parallel or perpendicular lines, including $m_1 = m_2$ and $m_1 m_2 = -1$
- explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate
- solve simple quadratic equations using a range of strategies
- solve linear simultaneous equations, using algebraic and graphical techniques, including using digital technology
- solve linear inequalities and graph their solutions on a number line
- solve right-angled triangle problems using trigonometric skills
- describe the results of two- and three-step chance experiments to determine probabilities of events and investigating the concept of independence and [conditional probability](#)
- obtain simple statistics from discrete and continuous data, including mean, median, mode, quartiles, range and interquartile range
- use scatterplots to investigate and comment on relationships between two numerical variables
- investigate and describe bivariate numerical data where the independent [variable](#) is time
- translate word problems to mathematical form.

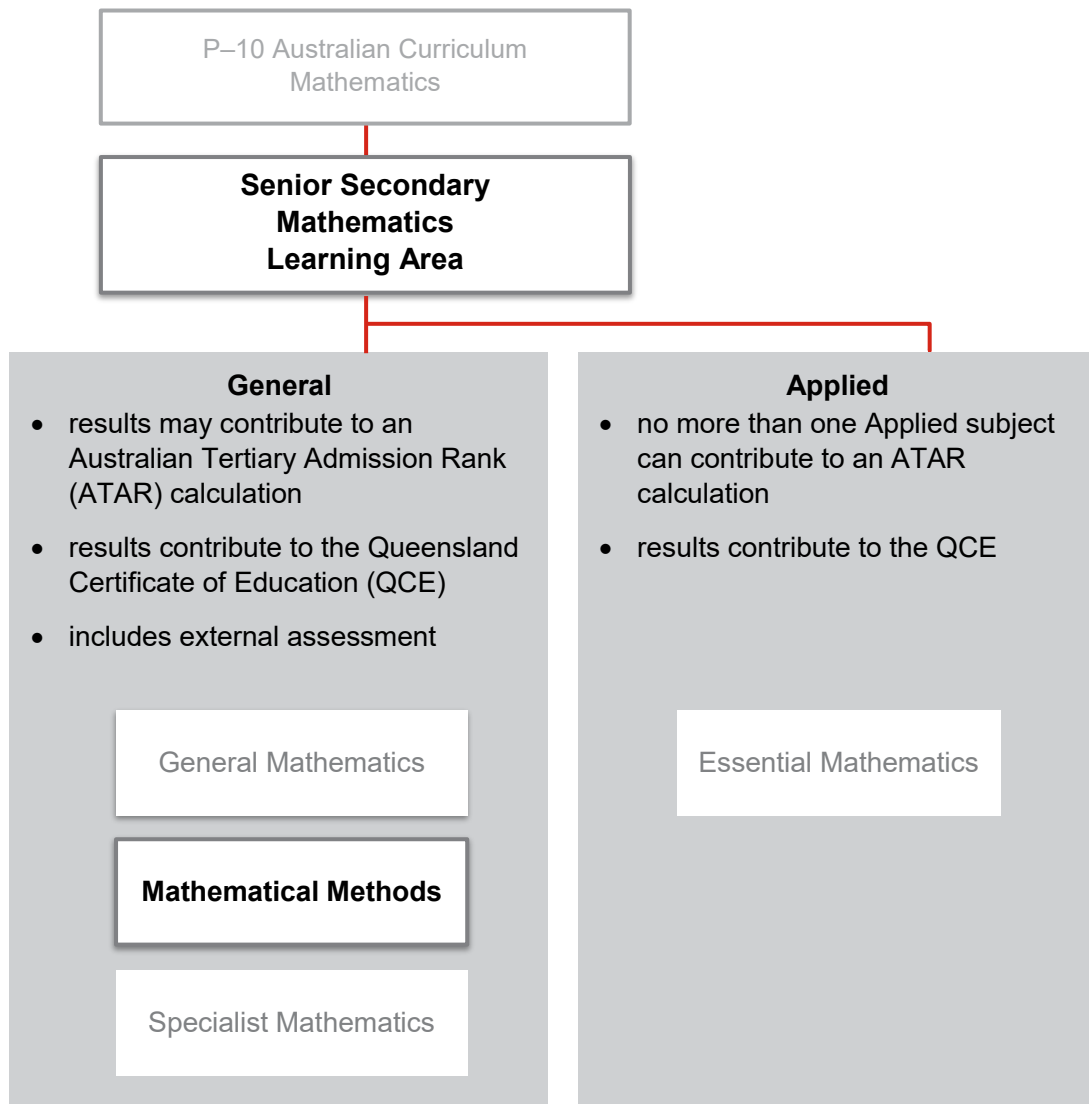
Pathways

Mathematical Methods is a General subject suited to students who are interested in pathways beyond school that lead to tertiary studies, vocational education or work. 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.

1.1.2 Learning area structure

All learning areas build on the P–10 Australian Curriculum.

Figure 1: Learning area structure



1.1.3 Course structure

Mathematical Methods is a course of study consisting of four units. Subject matter, learning experiences and assessment increase in complexity from Units 1 and 2 to Units 3 and 4 as students develop greater independence as learners.

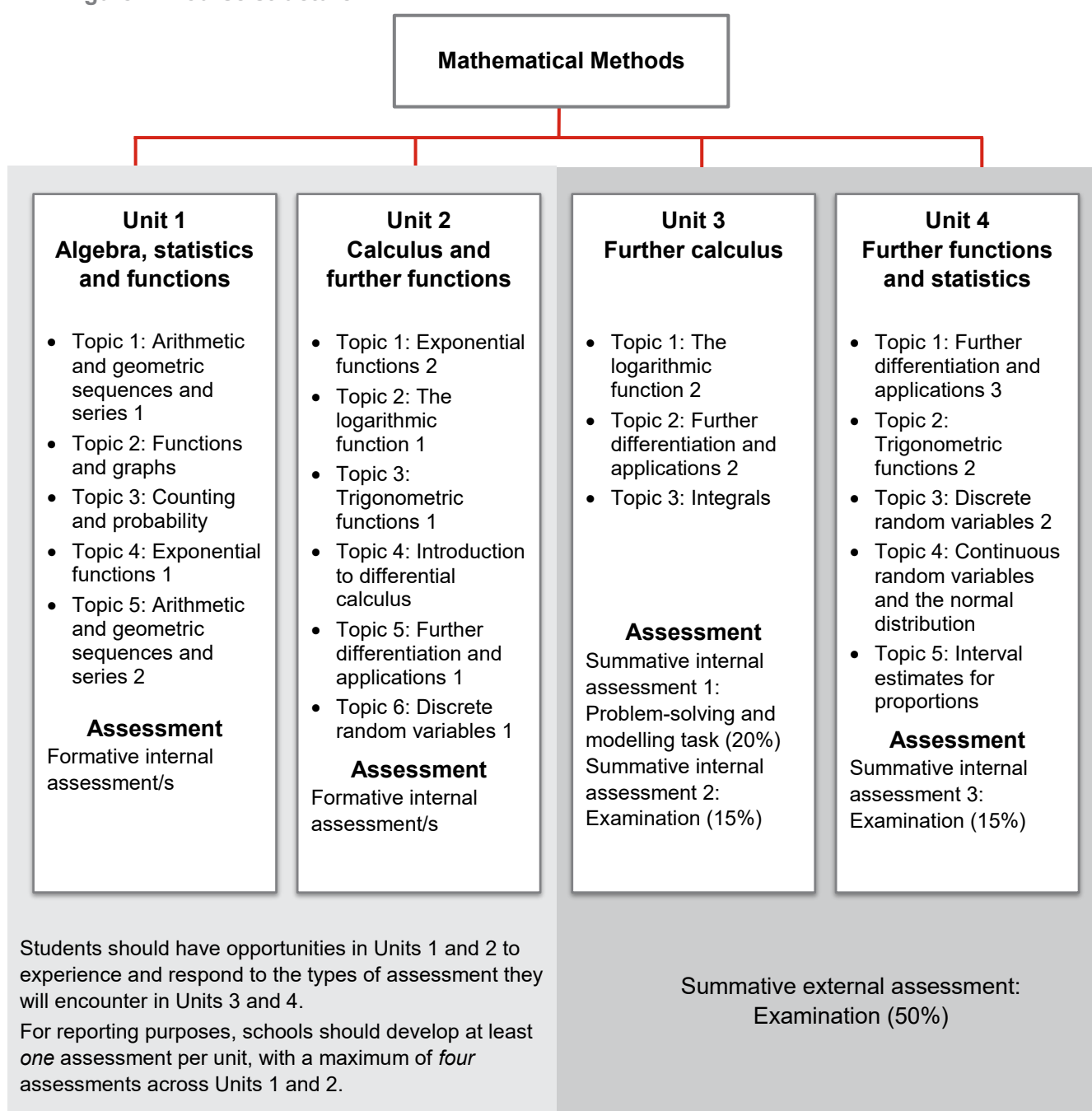
Units 1 and 2 provide foundational learning, which allows students to experience all syllabus objectives and begin engaging with the course subject matter. Students should complete Units 1 and 2 before beginning Unit 3. It is recommended that Unit 3 be completed before Unit 4.

Units 3 and 4 consolidate student learning. Only the results from Units 3 and 4 will contribute to ATAR calculations.

Figure 2 outlines the structure of this course of study.

Each unit has been developed with a notional time of 55 hours of teaching and learning, including assessment.

Figure 2: Course structure



Additional Requirements

Study Requirements	Special Requirements
<p>Being a General subject a significant commitment of time and energy to complete the course successfully is required. This includes:</p> <ul style="list-style-type: none">• Three lesson per week face to face teaching• Regular study at least 3 times each week for a minimum of 1 hour per session, possibly in study groups• Significant increase in work load when preparing for assessments.	<ul style="list-style-type: none">• A Graphics calculator (TI-84 Plus CE), 30cm ruler.