Mathematics T

The study of mathematics is vocationally important and is a recommended study in preparation some courses at university and CIT.

Choose the course which best suits your needs. To make this decision you should talk to your maths teacher at high school, college maths teachers, and careers advisers. You should consider:

- your ability and interest in mathematics
- your performance in Year 10 mathematics
- the mathematical requirements of your career choice

There are four T courses in mathematics:

Mathematical Applications T
Mathematical Methods T
Specialist Methods T
Specialist Mathematics T

MATHEMATICAL APPLICATIONS

Mathematical Applications provides students with mathematical and statistical experience that builds on the three strands of the F-10 curriculum.

Students solve problems in contexts of financial modelling, geometric and trigonometric analysis, graphical and network analysis, and growth and decay in sequences. It provides opportunities to develop systematic strategies that involve analysing univariate and bivariate data, including time series data.

Course Patterns

Students can complete a Major or a Minor. The units are sequential.

Units can be combined with Methods or Specialist Methods to create a Major, Major/Minor, or Double Major integrated course - Further Mathematics.

Unit 1

Topic 1: Consumer Arithmetic
Topic 2: Algebra and Matrices
Topic 3: Shape and Measurement

Reviews the concepts of rate and percentage change in the context of earning and managing money. Continues the F-10 study of algebra and introduces matrices. Extends the F-10 curriculum with the concept of similarity and associated calculations involving geometric shapes. The emphasis is on applying these skills in practical contexts, including those involving three-dimensional shapes.
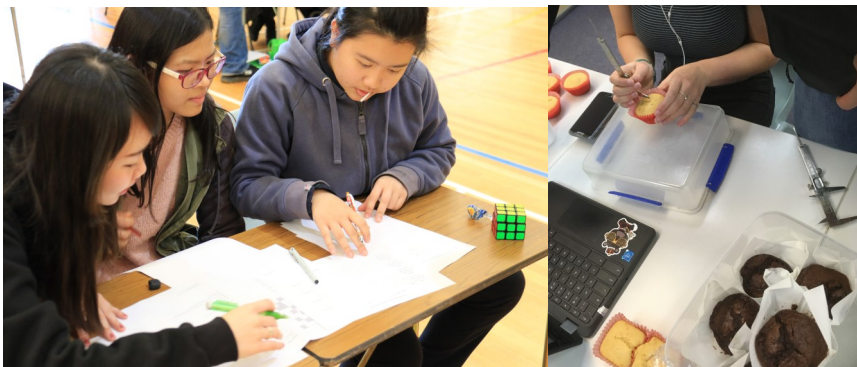
Unit 2

Topic 1: Univariate Data Analysis and the Statistical Investigation Process
Topic 2: Applications of Trigonometry
Topic 3: Linear Equations and their Graphs

Develops students' ability to organise and summarise univariate data. Extends students' knowledge of trigonometry to solve practical problems involving non-right-angled triangles in both two and three dimensions, including problems involving the use of angles of elevation and depression, and bearings. Uses linear equations and straight-line graphs, as well as linear-piecewise and step graphs, to model and analyse practical situations.

Unit 3

Topic 1: Bivariate data analysis
Topic 2: Growth and decay in sequences
Topic 3: Graphs and networks

Introduces methods for identifying, analysing and describing associations between pairs of variables, including the least-squares method as a tool for modelling and analysing linear associations. Uses recursion to generate sequences to model and investigate patterns of growth and decay in discrete situations. These are applied in practical situations, including modelling the growth of compound interest, populations or the decrease in the value of a car over time. . The language of graphs and the way in which graphs, represented as a collection of points and interconnecting lines, can be used to analyse everyday situations such as rail or social networks.

Unit 4

Topic 1: Time series analysis
Topic 2: Loans, investments and annuities
Topic 3: Networks and decision mathematics

Introduces the concepts and techniques of time series. Aims to solve practical problems associated with taking out or refinancing a mortgage and making investments. Uses networks to model and aid decision making in practical situations.

MATHEMATICAL METHODS

Mathematical Methods focuses on the use of calculus and statistical analysis. Calculus provides a basis for an understanding rates of change in the physical world. It uses functions, their derivatives and integrals, to model physical processes. The study of statistics develops the ability to describe and analyse phenomena having uncertainty and variation.

Course Patterns

Students can complete a major or a minor. The units are sequential.

Unit 1

Topic 1: Functions and Graphs
Topic 2: Trigonometric Functions
Topic 3: Counting and Probability

Reviews the basic algebra required for successful study of functions and calculus. Simple relationships between variable quantities used to introduce the concepts of a function and its graph. The study of probability and statistics reviews the fundamentals of probability, and introduces the concepts of conditional probability and independence. The study of the trigonometric functions begins with the unit circle using degrees and the trigonometry of triangles. Radian measure is introduced, and the graphs and applications of the trigonometric functions are explored.

Unit 2

Topic 1: Exponential Functions
Topic 2: Arithmetic & Geometric Sequences
Topic 3: Introduction to Differential Calculus

Introduces exponential functions, their properties and graphs. Arithmetic and geometric sequences and their applications are introduced. Rates of change are introduced, and the concept of the derivative as an 'instantaneous rate of change'. Concepts are reinforced numerically, geometrically, and algebraically. This first calculus topic concludes with derivatives of polynomial functions, using simple applications of the derivative to sketch curves, calculate slopes and equations of tangents, determine instantaneous velocities, and solve optimisation problems.

Unit 3

Topic 1: Further Differentiation & Application
Topic 2: Integrals
Topic 3: Discrete and Random Variables

Continues the study of calculus, introducing the derivatives of exponential and trigonometric functions and their applications, some basic differentiation techniques and the concept of a second derivative and applications. The unit includes integration as a way of calculating areas. The fundamental theorem of calculus is emphasised. Discrete random variables are introduced in modelling processes involving chance and variation.

Unit 4
Topic 1: Logarithmic Function
Topic 2: Continuous Random Variables & Normal Distribution
Topic 3: Interval Estimates for Proportions
introduces the logarithmic function and its derivative. Continuous random variables and their applications are introduced. In this unit students are introduced to one of the most important parts of statistics, statistical inference, where the goal is to estimate an unknown parameter associated with a population using a sample of that population. In this unit, inference is restricted to estimating proportions in two-outcome populations.

SPECIALIST METHODS

Specialist Methods focuses on the development of the use of calculus and statistical analysis.

The course has a challenging level of algebra, so it is expected that students are confident and capable in the algebra skills of the Australian Curriculum 10A course (or equivalent).

Course Patterns
Students can complete a major or a minor. This course is sequential. Students can complete a major-minor or double major in Specialist Mathematics by studying Specialist Methods in conjunction with Specialist Mathematics (only).

Unit 1
Topic 1: Functions and Graphs
Topic 2: Trigonometric Functions
Topic 3: Counting and Probability
Begins with a review of the basic algebraic concepts and techniques. Simple relationships between variable quantities are used to introduce the key concepts of a function and its graph. Radian measure is introduced, and the graphs of the trigonometric functions. The study of probability begins with the introduction of conditional probability and independence. Students further develop their counting techniques in combinatorics in Specialist Mathematics.

Unit 2
Topic 1: Exponential Functions
Topic 2: Arithmetic & Geometric Sequences
Topic 3: Introduction to Differential Calculus
Exponential functions and logarithms their properties and graphs are examined. Arithmetic and geometric sequences are introduced and their recursive definitions. Rates and average rates of change are introduced and the concept of the derivative as an 'instantaneous rate of change'. The concepts are reinforced numerically, geometrically, and algebraically. This first calculus topic concludes with derivatives of polynomial functions, using the derivative to sketch curves, calculate slopes and equations of tangents, determine instantaneous velocities, and solve optimisation problems.

Unit 3
Topic 1: The Logarithmic Function
Topic 2: Further Differentiation & Application
Topic 3: Integrals
The logarithmic function is studied in more detail. The study of calculus continues with the derivatives of exponential and trigonometric functions and the concept of a second derivative, its meaning and applications. The unit includes integration as a way of calculating areas. The fundamental theorem of calculus as a link between differentiation and integration is emphasised. Derivatives of logarithmic and exponential functions are explored.

Unit 4
Topic 1: Discrete Random Variables
Topic 2: Continuous Random Variables
Topic 3: Interval Estimates for Proportions
Simple linear regression is considered for bivariate data. Discrete random variables are introduced, and their uses in modelling random processes involving chance and variation. Continuous random variables are introduced and their applications. Probabilities associated with continuous distributions are calculated using definite integrals. In this unit students are introduced to statistical inference restricted to estimating proportions in two-outcome populations.

SPECIALIST MATHEMATICS

Specialist Mathematics provides opportunities to develop rigorous mathematical arguments and proofs, and to use mathematical models extensively. Specialist Mathematics also extends understanding and knowledge of probability and statistics and introduces the topics of vectors, complex numbers and matrices.

Course Patterns
Students can form a minor, major, major-minor or double major in Specialist Mathematics by studying units from Specialist Methods in conjunction with this course.

Unit 1
Topic 1: Combinatorics
Topic 2: Vectors in the Plane
Topic 3: Geometry
Combinatorics provides techniques that are useful in many areas of mathematics, including probability and algebra. *Vectors in the plane* provides new perspectives on working with two-dimensional space, and serves as an introduction to techniques which can be extended to three-dimensional space in Unit 3. *Geometry* extends studies in Euclidean Geometry, which is of benefit in the study of topics such as vectors and complex numbers.

Unit 2
Topic 1: Trigonometry
Topic 2: Matrices
Topic 3: Real and Complex Numbers
Matrices provides new perspectives for working with two-dimensional space, *Real and complex numbers* provides a continuation of the study of numbers. *Trigonometry* contains techniques that are used in other topics in both this unit and Units 3 and 4. All of these topics develop students' ability to construct mathematical arguments. The principle of mathematical induction is introduced.

Unit 3
Topic 1: Complex Numbers
Topic 2: Functions & Sketching Graphs
Topic 3: Vectors in Three Dimensions
The Cartesian form of complex numbers is extended to the polar form. The study of functions and techniques of calculus is extended and used in the sketching of graphs and problems involving integration. Vectors, is extended to three-dimensional vectors, vector equations and vector calculus, building on students' knowledge of calculus. Cartesian and vector equations, and equations of planes, enable students to solve problems involving motion in three-dimensional space.

Unit 4
Topic 1: Integrations & Applications
Topic 2: Rates of Change & Differential Equations
Topic 3: Statistical Inference
Differentiation and integration of functions is continued, and the techniques are applied to simple differential equations in biology and kinematics. These topics demonstrate the applicability of the mathematics in this course. Students' experience in statistics is drawn together in the study of the distribution of sample means.