DEPARTMENT OF EDUCATION
learners first

Discipline-based Study

Mathematics

General Mathematics 2

COURSE DOCUMENT

DRAFT

PHASE 3 CONSULTATION

Catholic Education Tasmania

INDEPENDENT SCHOOLS TASMANIA

Years 9 to 12 Learning

Tasmanian Government

Table of Contents

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General Mathematics, 150 hours – Level 2

This course is the Level 2 component of the General Mathematics program.

Aims

The purpose of Years 9 to 12 Education is to enable all students to achieve their potential through Years 9 to 12 and beyond in further study, training or employment.

Years 9 to 12 Education enables: Personal Empowerment, Cultural Transmission, Preparation for Citizenship and Preparation for Work.

This course supports the principles of Access, Agency, Excellence, Balance, Support and Achievement as part of a range of programs that enables students to access a diverse and highly flexible range of learning opportunities suited to their level of readiness, interests and aspirations.

Courses aligned to the Years 9 to 12 Curriculum Framework belong to one of the five focus areas of Discipline-based Study, Transdisciplinary Projects, Professional Studies, Work-based Learning and Personal Futures.

General Mathematics Level 2 is a Discipline-based Study course.

Focus Area – Discipline-based Study

Discipline-based Study includes content, core concepts and big ideas; enabling deep knowledge and understanding of the content and the application of what is learned. Students consider accepted key disciplinary knowledge, apply distinctive ways of thinking and become increasingly independent learners. They use methodologies specific to the discipline to explore and strengthen their understanding of key concepts and develop deep knowledge, skills and understanding.

Discipline-based Study courses have three key features that guide teaching and learning:

- specialist knowledge
- theories and concepts and
- methodology and terminology.

In this course learners will engage with specialist knowledge, core concepts and big ideas in the strands of algebra, networks, finance, statistics and measurement. Students will apply their knowledge and understanding through selection and application of methodologies including problem solving, mathematical modelling and statistical investigations with and without the aid of technology. Throughout the course, learners will demonstrate conceptual understanding through their fluency of calculation, mathematical reasoning and communication of mathematical ideas and information using appropriate conventions, terminology and representations.

Rationale

The *General Mathematics* Level 2 course is designed to develop learners' understanding of concepts and techniques drawn from:

- number including finance, algebra and matrices
- measurement including right-angled trigonometry
- networks and statistics.

This breadth of mathematical experience will enable learners to apply mathematical concepts and perform techniques to solve applied problems, synthesise mathematical information, and design and conduct mathematical investigations to calculate and communicate possible solutions. The *General Mathematics* Level 2 course will enable learners the opportunity to develop the foundations for study of *General Mathematics* Level 3. Mathematics and numeracy provide a way of interpreting everyday practical situations and provide the basis for many informed personal decisions. This course will enable learners to develop their mathematical competence such that they may contribute productively in an ever-changing global economy, with both rapid revolutions in technology and global and local social challenges. This is a key factor in ensuring Tasmania and Australia's current and emerging needs are met as an economy competing globally requires substantial numbers of professional with a strong grounding in mathematics and other disciplines of STEM. This course is designed to support learners' entry into *General Mathematics* Level 3, thus enabling them to continue into tertiary education programs for non-STEM specific professions including teaching, social sciences, health sciences, accounting, business and marketing.

Integration of General Capabilities and Cross-Curriculum Priorities

The general capabilities addressed specifically in this course are:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Intercultural understanding
- Literacy
- Numeracy
- Personal and social capability

The cross-curriculum priorities are enabled through this course are:

- Aboriginal and Torres Strait Islander Histories and Cultures
- Asia and Australia's Engagement with Asia
- Sustainability

Course Description

In *General Mathematics* Level 2, learners will engage with concepts and techniques drawn from:

- number including finance, algebra and matrices
- measurement including right-angled trigonometry
- networks and statistics.

Learners will use these mathematical concepts and techniques to:

- solve applied problems
- design and conduct mathematical investigations
- construct reasoned arguments.

In this course, learners will:

- investigate and solve real-world problems.
- develop skills to support their engagement in further schooling, work and life
- reflect on their own learning and mathematical experiences.

This course provides a foundational pathway to study in General Mathematics Level 3.

Pathways

The *General Mathematics* Level 2 course enables learning continuity from Year 10 Australian Curriculum: Mathematics for learners who have achieved a 'C' rating or higher. Additionally, learners who have successfully undertaken Level 2 of the *Essential Mathematics* course under development may progress into this course if recommended through ongoing course counselling at their provider of education.

General Mathematics Level 2 will provide a foundational pathway to study *General Mathematics* Level 3 and additionally provides foundational knowledge to support students undertaking other Level 2/3 courses (non-STEM) requiring mathematical competence.

Course Requirements

Resources

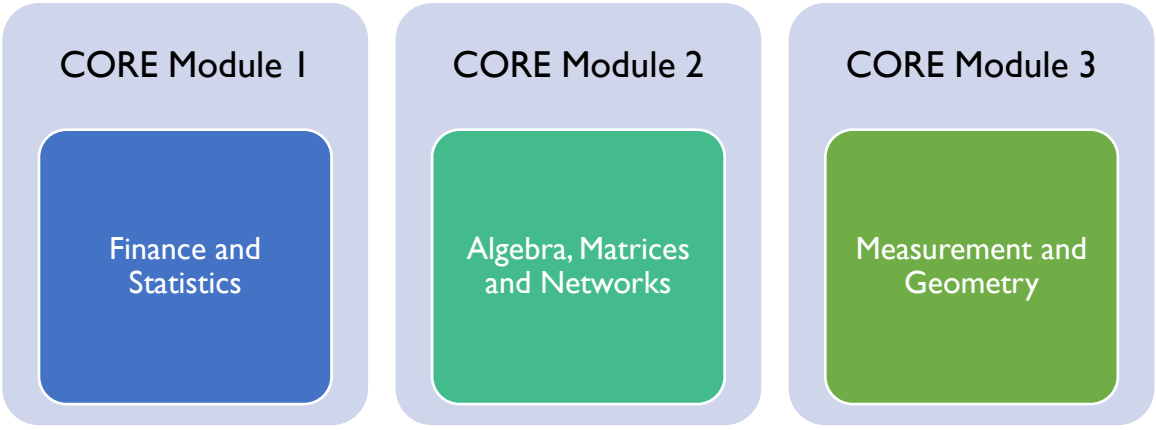
- Students will require access to graphics calculators

Course Structure, Delivery and Progression

Structure

This course consists of three 50-hour modules.

Modules available
Core Module 1: Finance and Statistics
Core Module 2: Algebra, Matrices and Networks
Core Module 3: Measurement and Geometry



Delivery

There is no specific recommended delivery sequence for the modules

Developmental Progression

At both the module and course level the learner is introduced to and builds upon key ideas, concepts, skills, knowledge and understanding leading to performance of understanding reflected in the work requirements.

Individual modules have a developmental progression that introduces, builds upon and culminates in a performance of understanding in the work requirements. Between modules there is also a developmental progression that leads to a culminating performance of understanding in the final work requirements.

Module 1 - Finance and Statistics

This module contains two topics:

- Consumer arithmetic
- Univariate data analysis.

'Consumer arithmetic' reviews the concepts of rate and percentage change in the context of earning and managing money, and provides fertile ground for the use of spreadsheets.

'Univariate data analysis' develops students' ability to organise and summarise univariate data in the context of conducting a statistical investigation.

Module 1 Learning Outcomes

On successful completion of this module, learners will be able to:

1. define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems from a range of everyday and real-life contexts
2. select and apply mathematical processes to open-ended practical contexts, analyse and discuss the obtained results
3. apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions
4. communicate and represent mathematical information and apply mathematical conventions.

Module 1 Content

Consumer arithmetic

Key knowledge and skills:

- review rates and percentages (ACMGM001)
- calculate weekly or monthly wage from an annual salary, wages from an hourly rate including situations involving overtime and other allowances and earnings based on commission or piecework (ACMGM002)
- calculate payments based on government allowances and pensions (ACMGM003)
- prepare a personal budget for a given income taking into account fixed and discretionary spending (ACMGM004)
- compare prices and values using the unit cost method (ACMGM005)
- apply percentage increase or decrease in various contexts; for example, determining the impact of inflation on costs and wages over time, calculating percentage mark-ups and discounts, calculating GST, calculating profit or loss in absolute and percentage terms, and calculating simple and compound interest (ACMGM006)
- use currency exchange rates to determine the cost in Australian dollars of purchasing a given amount of a foreign currency, such as US$1500, or the value of a given amount of foreign currency when converted to Australian dollars, such as the value of €2050 in Australian dollars (ACMGM007)
- calculate the dividend paid on a portfolio of shares, given the percentage dividend or dividend paid per share, for each share; and compare share values by calculating a price-to-earnings ratio. (ACMGM008)
- use a spreadsheet to display examples of the above computations when multiple or repeated computations are required; for example, preparing a wage-sheet displaying the weekly earnings of workers in a fast-food store where hours of employment and hourly rates of pay may differ, preparing a budget, or investigating the potential cost of owning and operating a car over a year. (ACMGM009).

Univariate data analysis

Key knowledge and skills:

- review the statistical investigation process; for example, identifying a problem and posing a statistical question, collecting or obtaining data, analysing the data, interpreting and communicating the results. (ACMGM026)

- classify a categorical variable as ordinal, such as income level (high, medium, low), or nominal, such as place of birth (Australia, overseas), and use tables and bar charts to organise and display the data (ACMGM027)
- classify a numerical variable as discrete, such as the number of rooms in a house, or continuous, such as the temperature in degrees Celsius (ACMGM028)
- describe, with the aid of an appropriate graphical display (chosen from dot plot, stem plot, bar chart or histogram), the distribution of a numerical dataset in terms of modality (uni or multimodal), shape (symmetric versus positively or negatively skewed), location and spread and outliers, and interpret this information in the context of the data (ACMGM029)
- determine the mean and standard deviation of a dataset and use these statistics as measures of location and spread of a data distribution, being aware of their limitations. (ACMGM030)
- construct and use parallel box plots (including the use of the 'Q1 – 1.5 × IQR' and 'Q3 + 1.5 × IQR' criteria for identifying possible outliers) to compare groups in terms of location (median), spread (IQR and range) and outliers and to interpret and communicate the differences observed in the context of the data (ACMGM031)
- compare groups on a single numerical variable using medians, means, IQRs, ranges or standard deviations, as appropriate; interpret the differences observed in the context of the data; and report the findings in a systematic and concise manner (ACMGM032)
- implement the statistical investigation process to answer questions that involve comparing the data for a numerical variable across two or more groups; for example, are Year 11 students the fittest in the school? (ACMGM033).

Module 1 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes an extended application of knowledge through a statistical investigation as the work requirement.

The work requirement for this module is an extended application of knowledge through a statistical investigation.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 1 Assessment

This module will assess criteria 1, 2, 3, 4.

Module 2 - Algebra, Matrices and Networks

This module contains three topics:

- linear equations and their graphs
- matrices and matrix arithmetic
- graphs and networks

'Linear equations and their graphs' uses linear equations and straight-line graphs, as well as linear-piecewise and step graphs, to model and analyse practical situations.

'Matrices and matrix arithmetic' introduces matrices as a tool for storing information in databases, and solving problems including those that involve networks.

'Graphs and networks' introduces students to 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 a rail or social network.

Module 2 Learning Outcomes

On successful completion of this module, learners will be able to:

1. define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems from a range of everyday and real-life contexts
2. select and apply mathematical processes to open-ended practical contexts, analyse and discuss the obtained results
3. apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions
5. interpret mathematical objects and information in a variety of contexts and evaluate the effectiveness of its use.

Module 2 Content

Linear equations and their graphs

Subtopics:

- substitution
- linear equations and graphs
- simultaneous linear equations
- piece-wise linear graphs and step graphs.

Substitution:

Key knowledge and skills:

- substitute numerical values into linear algebraic and simple non-linear algebraic expressions, and evaluate (ACMGM010)
- find the value of the subject of the formula, given the values of the other pronumerals in the formula (ACMGM011)
- use a spreadsheet to construct a table of values from a formula, including two-by-two tables for formulae with two variable quantities: for example, a table displaying the body mass index (BMI) of people of different masses and heights. (ACMGM012)

Linear equations and graphs:

Key knowledge and skills:

- identify and solve linear equations (ACMGM038)
- develop a linear formula from a word description (ACMGM039)
- construct straight-line graphs both with and without the aid of technology (ACMGM040)
- determine the slope and intercepts of a straight-line graph from both its equation and its plot (ACMGM041)
- interpret, in context, the slope and intercept of a straight-line graph used to model and analyse a practical situation (ACMGM042)

- construct and analyse a straight-line graph to model a given linear relationship; for example, modelling the cost of filling a fuel tank of a car against the number of litres of petrol required. (ACMGM043).

Simultaneous linear equations:

Key knowledge and skills:

- solve a pair of simultaneous linear equations, using technology when appropriate (ACMGM044)
- solve practical problems that involve finding the point of intersection of two straight-line graphs; for example, determining the break-even point where cost and revenue are represented by linear equations. (ACMGM045).

Piece-wise linear graphs and step graphs:

Key knowledge and skills:

- sketch piece-wise linear graphs and step graphs, using technology when appropriate (ACMGM046)
- interpret piece-wise linear and step graphs used to model practical situations; for example, the tax paid as income increases, the change in the level of water in a tank over time when water is drawn off at different intervals and for different periods of time, the charging scheme for sending parcels of different masses through the post. (ACMGM047)

Matrices and matrix arithmetic

Key knowledge and skills:

- use matrices for storing and displaying information that can be presented in rows and columns; for example, databases, links in social or road networks (ACMGM013)
- recognise different types of matrices (row, column, square, zero, identity) and determine their size (ACMGM014)
- perform matrix addition, subtraction, multiplication by a scalar, and matrix multiplication, including determining the power of a matrix using technology with matrix arithmetic capabilities when appropriate (ACMGM015)
- use matrices, including matrix products and powers of matrices, to model and solve problems; for example, costing or pricing problems, squaring a matrix to determine the number of ways pairs of people in a communication network can communicate with each other via a third person. (ACMGM016)

Graphs and networks

Key knowledge and skills:

- explain the meanings of the terms: graph, edge, vertex, loop, degree of a vertex, subgraph, simple graph, complete graph, bipartite graph, directed graph (digraph), arc, weighted graph, and network (ACMGM078)
- identify practical situations that can be represented by a network, and construct such networks; for example, trails connecting camp sites in a National Park, a social network, a transport network with one-way streets, a food web, the results of a round-robin sporting competition (ACMGM079)
- construct an adjacency matrix from a given graph or digraph. (ACMGM080)

- recognise and explain the meaning of the terms planar graph and face
- apply Euler's rule $V + F - E = 2$ to solve problems relating to planar graphs.

Module 2 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

The work requirement for this module is an extended application of knowledge through a problem solving and/or mathematical modelling task.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 2 Assessment

This module will assess criteria 1, 2, 3, 5.

Module 3 - Measurement and Geometry

This module contains two topics:

- Shape and measurement
- Pythagoras' theorem and trigonometry

'Shape and measurement' extends the knowledge and skills students developed in the F-10 curriculum with the concept of similarity and associated calculations involving simple and compound geometric shapes. The emphasis in this topic is on applying these skills in a range of practical contexts, including those involving three-dimensional shapes.

'Pythagoras' theorem and trigonometry' 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 in navigation.

Module 3 Learning Outcomes

On successful completion of this module, learners will be able to:

1. define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems from a range of everyday and real-life contexts
2. select and apply mathematical processes to open-ended practical contexts, analyse and discuss the obtained results
3. apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions
6. manage self, take responsibility for their own learning and evaluate their mathematical development.

Shape and measurement

This topic has two subtopics:

- Mensuration
- Ratio, similarity and scale factors

Mensuration:

Key knowledge and skills:

- solve practical problems requiring the calculation of perimeters and areas of circles, sectors of circles, triangles, rectangles, parallelograms and composites (ACMGM018)
- calculate the volumes of standard three-dimensional objects such as spheres, rectangular prisms, cylinders, cones, pyramids and composites in practical situations; for example, the volume of water contained in a swimming pool (ACMGM019)
- calculate the surface areas of standard three-dimensional objects such as spheres, rectangular prisms, cylinders, cones, pyramids and composites in practical situations, for example, the surface area of a cylindrical food container. (ACMGM020)

Ratio, similarity and scale factors:

Key knowledge and skills

- solve practical problems involving ratio, for example capture-recapture, mixtures for building materials or cost per item
    - work with ratio to express a ratio in simplest form, to find the ratio of two quantities and to divide a quantity in a given ratio
    - use ratio to describe map scales
- review the conditions for similarity of two-dimensional figures including similar triangles (ACMGM021)
- use the scale factor for two similar figures to solve linear scaling problems (ACMGM022)
- obtain measurements from scale drawings, including maps (including cultural mappings or models) or building plans, to solve problems
- interpret commonly used symbols and abbreviations on building plans and elevation views
- obtain a scale factor and use it to solve scaling problems involving the calculation of the areas of similar figures (ACMGM024)
- obtain a scale factor and use it to solve scaling problems involving the calculation of surface areas and volumes of similar solids. (ACMGM025)
- calculate the perimeter or area of a section of land, using the Trapezoidal rule where appropriate, from a variety of sources, including a site plan, an aerial photograph, radial surveys or maps that include a scale
- calculate the volume of rainfall over an area, using $V = Ah$, from a variety of sources, including a site plan, an aerial photograph, radial surveys or maps that include a scale

Pythagoras' theorem and trigonometry

Key knowledge and skills:

- review Pythagoras' Theorem and use it to solve practical problems in two dimensions and for simple applications in three dimensions. (ACMGM017)
- review the use of the trigonometric ratios to find the length of an unknown side or the size of an unknown angle in a right-angled triangle (ACMGM034)
- determine the area of a triangle given two sides and an included angle by using the rule $Area = 1/2absinC$, or given three sides by using Heron's rule, and solve related practical problems (ACMGM035)

Module 3 Work Requirements

The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

The work requirement for this module is an extended application of knowledge through a problem solving and/or mathematical modelling task.

See Appendix 3 for summary of Work Requirement specifications for this course.

Module 3 Assessment

This module will assess criteria 1, 2, 3, 6.

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate end-point of study. Although assessment – as part of the learning program – is continuous, much of it is formative, and is done to help learners identify what they need to do to attain the maximum benefit from their study of the course. Therefore, assessment for summative reporting to TASC will focus on what both teacher and learner understand to reflect end-point achievement.

The standard of achievement each learner attains on each criterion is recorded as a rating 'A', 'B', or 'C', according to the outcomes specified in the standards section of the course.

A 't' notation must be used where a learner demonstrates any achievement against a criterion less than the standard specified for the 'C' rating.

A 'z' notation is to be used where a learner provides no evidence of achievement at all.

Internal assessment of all criteria will be made by the provider. Providers will report the learner's rating for each criterion to TASC.

Criteria

	Module 1	Module 2	Module 3	Notes
Criteria assessed	1,2,3,4	1,2,3,5	1,2,3,6	Three common in all modules and one focus criterion per module.

The assessment for *General Mathematics* Level 2 will be based on the degree to which the learner can:

1. define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems from a range of everyday and real-life contexts
2. select and apply mathematical processes to open-ended practical contexts, analyse and discuss the obtained results
3. apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions
4. communicate and represent mathematical information and apply mathematical conventions
5. interpret mathematical objects and information in a variety of contexts and evaluate the effectiveness of its use
6. manage self, take responsibility for their own learning and evaluate their mathematical development.

Standards

Criterion 1: define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems

Rating C	Rating B	Rating A
selects, recalls and uses some mathematical facts, rules and definitions to describe mathematical situations	consistently selects, recalls and uses facts, rules, definitions and procedures correctly to describe mathematical situations	consistently selects, recalls and uses facts, rules, definitions and procedures correctly to describe and explain mathematical situations
comprehends and applies aspects of mathematical concepts and techniques to solve some problems in simple familiar situations	comprehends and applies mathematical concepts and techniques to solve problems in simple familiar and complex familiar situations	comprehends and applies mathematical concepts and techniques to solve problems in simple familiar, complex familiar and complex unfamiliar situations
applies mathematical and statistical models to routine problems	selects and applies mathematical and statistical models to routine and non-routine problems	develops, selects and applies mathematical and statistical models to routine and non-routine problems in a variety of contexts
uses digital technologies to graph, display and organise mathematical and statistical information to solve routine problems.	uses digital technologies appropriately to graph, display and organise mathematical and statistical information to solve a range of routine and non-routine problems.	uses digital technologies effectively to graph, display and organise mathematical and statistical information to solve a range of routine and non-routine problems in a variety of contexts.

Criterion 2: select and apply mathematical processes to open-ended practical contexts^, analyse, discuss and draw conclusions from the results obtained

Rating C	Rating B	Rating A
recognises how mathematics is used in everyday situations, making some connections between mathematics and open-ended practical contexts	identifies and describes how mathematics is used in everyday situations and formulates mathematical approaches to explore open-ended practical contexts	describes and explains the mathematics embedded in everyday situations and formulates mathematical approaches to explore open-ended practical contexts
follows mathematical processes to generate solutions to practical problems or investigations	uses mathematical applications and processes to find solutions or results to open-ended practical problems or investigations	selects and applies a range of mathematical applications and processes to find accurate solutions or results to open-ended practical problems or investigations
follows agreed conventions to represent results, describes results and draws conclusions that may be plausible but lack any supporting evidence and do not address the context	follows agreed conventions to represent results, explains why results are significant and draws conclusions that may be plausible but lack detailed supporting evidence that address the context	selects appropriate mathematical representations, analyses and explains results and draws plausible conclusions with strong supporting evidence that address the context
identifies the mathematical applications and processed used and the outcomes obtained.	describes how the mathematical applications and processes used and the outcomes obtained were suitable for the context.	critically reflects and justifies selected mathematical applications and processes and the outcomes obtained relative to personal, contextual and real-world implications.

^open-ended practical contexts require problem-solving, modelling or investigative techniques or approaches.

Criterion 3: apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions

Rating C	Rating B	Rating A
identifies problem elements and makes inferences that may be able to be tested mathematically	identifies and explains problem elements to make informed inferences that can be tested mathematically	explores and links problem elements to make logical inferences that can be tested mathematically
forms arguments based on some mathematical ideas to support or refute claims and identifies possible responses	develops logical mathematical arguments to support or refute conclusions and outlines a chosen response	develops logical mathematical arguments to evaluate conclusions and justify a response
describes the reasonableness of the results and solutions to routine problems	explains the reasonableness of the results and solutions to routine and non-routine problems	evaluates and explains the reasonableness of the results and solutions to routine and non-routine problems in a variety of contexts
identifies limitations of models used when developing solutions to routine problems.	identifies and explains limitations of models used when developing solutions to routine problems.	identifies and explains the validity and limitations of models used when developing solutions to routine and non-routine problems.

Criterion 4: communicate and represent mathematical information and apply mathematical conventions

Rating C	Rating B	Rating A
communicates mathematical and statistical arguments using appropriate language	communicates reasoned mathematical and statistical judgments and arguments using appropriate language	communicates reasoned mathematical and statistical judgments and arguments using appropriate and concise language
uses mathematical conventions, systems and constructs based on definitions and rules when prompted	uses mathematical conventions, systems and constructs including manipulation and use of symbolic expressions and rules appropriately on most occasions	uses mathematical conventions, systems and constructs including manipulation and use of symbolic expressions, rules and formal systems accurately and purposefully
represents and explains mathematical and statistical information in numerical, graphical and symbolic form in routine problems with and without the aid of technology	represents and interprets mathematical and statistical information in numerical, graphical and symbolic form in routine and non-routine problems with and without the aid of technology	represents, models and analyses mathematical and statistical information in numerical, graphical and symbolic form in routine and non-routine problems in a variety of contexts with and without the aid of technology
selects and uses language to express ideas and listens to the perspectives of others.	selects, uses and refines language to respond to multiple perspectives when expressing ideas.	purposefully selects, uses and refines language to effectively connect with address multiple perspectives when expressing ideas.

Criterion 5: interpret mathematical objects and information in a variety of contexts and evaluate the effectiveness of its use

Rating C	Rating B	Rating A
explores routine familiar practical problems or scenarios and frames them in mathematical terms	interprets routine familiar and complex familiar practical problems or scenarios and frames them in mathematical terms	interprets complex familiar and non-familiar practical problems or scenarios and frames them in mathematical terms
identifies situations where mathematical information has been used to support decision-making within cultural, environmental, political or economic systems	analyses various ways that mathematical information has been used to support decision-making within cultural, environmental, political or economic systems	evaluates how mathematical information has been used to support decision-making within cultural, environmental, political or economic systems
accesses and manages information from digital and non-digital sources to develop mathematical ideas	accesses and synthesises information taken from a variety of digital and non-digital sources to develop mathematical ideas	evaluates authenticity, reliability and validity of information taken from a variety of digital and non-digital sources to develop mathematical ideas
identifies and describes how the use of technology can affect outcomes obtained in routine contexts.	identifies and discusses the inputs and outputs of technology and describes how the use of technology can affect outcomes obtained in simple non-routine contexts.	interprets and evaluates the inputs and outputs of technology, including critically reflecting on and evaluating the technology used and the outcomes obtained relative to personal, contextual and real-world implications.

Criterion 6: manage self, take responsibility for their own learning and evaluate their mathematical development

Rating C	Rating B	Rating A
identifies personal traits that promote and inhibit learning performance and understanding	recognises own learning strengths and weaknesses and establishes processes to plan, monitor and assess one's understanding and performance	analyses own learning strengths and weaknesses in order to establish processes used to plan, monitor and assess one's understanding and performance
sets goals and timelines and monitors with support	sets goals and timelines and monitors progress	monitors and analyses progress towards meeting goals and timelines
shows some ability to organise and plan in order to manage resources and complete set tasks	displays organisational, planning and self-management skills to manage resources and consistently complete tasks	selects and displays effective organisational, planning and self-management skills to manage resources and complete all learning tasks
is generally positive and with support will persevere through challenges.	demonstrates a positive disposition, can adapt to new situations and generally displays perseverance and resilience and seeks help as required.	demonstrates optimism, flexibility and resilience when adapting to new situations and transitions including persevering through challenges and seeking help appropriately as required.

Quality Assurance

- This will be determined by TASC at time of accreditation.

Qualifications and Award Requirements

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 6 ratings.

The minimum requirements for an award in *General Mathematics* Level 2 are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
5 'A' ratings, 1 'B' rating

HIGH ACHIEVEMENT (HA)
3 'A' ratings, 2 'B' ratings, 1 'C' rating

COMMENDABLE ACHIEVEMENT (CA)
3 'B' ratings, 3 'C' ratings

SATISFACTORY ACHIEVEMENT (SA)
5 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)
3 'C' ratings

A learner who otherwise achieves the ratings for an SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

- This will be confirmed by time of accreditation.

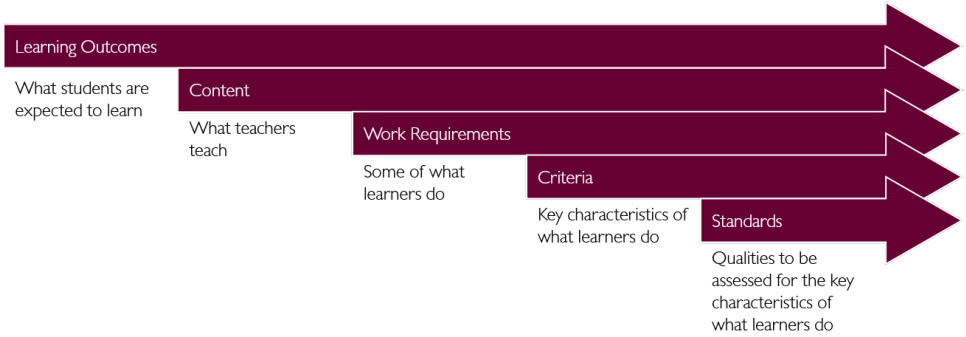
Course Developer

This course has been developed by the Department of Education's Years 9 to 12 Learning Unit in collaboration with Catholic Education Tasmania and Independent Schools Tasmania.

Accreditation and Version History

- Details to be determined by TASC at time of accreditation.

Appendix 1 - Line of Sight



Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
1. Define and explain key knowledge and concepts and apply a range of related mathematical techniques and procedures to solve practical problems from a range of everyday and real-life contexts	Module 1, 2, 3	Module 1, 2, 3	C 1	E 1, 2, 3, 4	GC:
2. Select and apply mathematical processes to open-ended practical contexts, analyse and discuss the obtained results.	Module 1, 2, 3	Module 1, 2, 3	C 2	E 1, 2, 3, 4	GC:
3. Apply mathematical reasoning to develop logical arguments, explain and justify the reasonableness of solutions	Module 1, 2, 3	Module 1, 2, 3	C 3	E 1, 2, 3, 4	GC:
4. Communicate and represent mathematical information and apply mathematical conventions.	Module 1	Module 1	C 4	E 1, 2, 3	GC:
5. Interpret mathematical objects and information in a variety of contexts and evaluate the effectiveness of its use.	Module 2	Module 2	C 5	E 1, 2, 3, 4	GC:

					
6. Manage self, take responsibility for their own learning and evaluate their mathematical development.	Module 3	Module 3	C 6	E 1, 2, 3, 4	GC: 

Appendix 2 - Alignment to Curriculum Frameworks

Links to Foundation to Year 10:

The General Mathematics suite provides students with a breadth of mathematical and statistical experience that encompasses and builds on all three strands of the F-10 curriculum.

Alignment to Australian Curriculum Senior Secondary Framework:

A vast majority of content in this course is drawn from Unit 1 and Unit 2 of the Australian Curriculum Framework: General Mathematics.

Unit 1 has three topics: 'Consumer arithmetic', 'Algebra and matrices', and 'Shape and measurement'. 'Consumer arithmetic' reviews the concepts of rate and percentage change in the context of earning and managing money, and provides fertile ground for the use of spreadsheets. 'Algebra and matrices' continues the F-10 study of algebra and introduces the new topic of matrices. 'Shape and measurement' extends the knowledge and skills students developed in the F-10 curriculum with the concept of similarity and associated calculations involving simple and compound geometric shapes. The emphasis in this topic is on applying these skills in a range of practical contexts, including those involving three-dimensional shapes.

Unit 2 has three topics: 'Univariate data analysis and the statistical investigation process', 'Linear equations and their graphs', and 'Applications of trigonometry'. 'Univariate data analysis and the statistical investigation process' develops students' ability to organise and summarise univariate data in the context of conducting a statistical investigation. . 'Applications of trigonometry' 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 in navigation 'Linear equations and their graphs' uses linear equations and straight-line graphs, as well as linear-piecewise and step graphs, to model and analyse practical situations.

Additionally, some content is derived from Unit 3 of the Australian Curriculum Framework: General Mathematics in order to introduce students to the language of graphs and the way in which graphs, represented as a collection of points and intersecting lines, can be used to analyse everyday situations. At this point in time, this content is not covered in the Australian Curriculum: F-10 Mathematics, however, it is an expected inclusion as a result of the current refinements in which case the need to includes in this course will be reviewed by the course developer.

Appendix 3 - Work Requirements

Module 1 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Statistical investigation of a financial situation
Mode /Format: Investigation
Learning Outcomes: 1,2,3,4
Description: Learners will engage in a statistical investigation of a financial situation with several data sets comprising both numerical and categorical variables. Learners will:

- Identify a problem and pose a statistical question
- Collect or obtain data (multiple sets)
- Represent and analyse the data
- Interpret and communicate results
- Justify their results and identify any limitations or constraints

Size: Maximum of 1500 words (and supporting mathematical calculations) or 1000 word and 8-minute multimodal presentation – 10 -12 hours of class time
Timing: No specified timing
External agencies: Involvement at teacher discretion
Relevant Criterion/criteria:

- Criterion 1: all standard elements
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 4: all standard elements

Module 2 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Mathematical modelling and/or problem-solving task 1
Mode /Format: Extended response
Learning Outcomes: 1,2,3,5
Description: Learners will engage in problem solving and/or mathematical modelling of a real-world context involving algebra, matrices or graphs and networks. In preparation and alongside this task it is likely that shorter practical activities will be engaged. These are designed to support the depth of understanding and engagement in the extended response.
Size: Maximum of 1000 words (and supporting mathematical calculations and diagrams) – 6 to 8 hours of class time including support tasks.
Timing: No specified timing
External agencies: Involvement at teacher discretion
Relevant Criterion/criteria:

- Criterion 1: elements 1, 2, 3 and where relevant 4
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 5: all standard elements

Module 3 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Mathematical modelling and/or problem-solving task 2
Mode /Format: Extended response
Learning Outcomes: 1,2,3,5
Description: Learners will engage in problem solving and/or mathematical modelling of a real-world context involving similarity, trigonometry and/or mensuration. In preparation and alongside this task it is likely that shorter practical activities will be engaged. These are designed to support the depth of understanding and engagement in the extended response.
Size: Maximum of 1000 words (and supporting mathematical calculations and diagrams) – 6 to 8 hours of class time including support tasks.
Timing: No specified timing
External agencies: Involvement at teacher discretion
Relevant Criterion/criteria:

- Criterion 1: elements 1, 2, 3 and where relevant 4
- Criterion 2: all standard elements
- Criterion 3: all standard elements
- Criterion 5: all standard elements

Combined Modules 2 and 3 Work Requirements Specifications

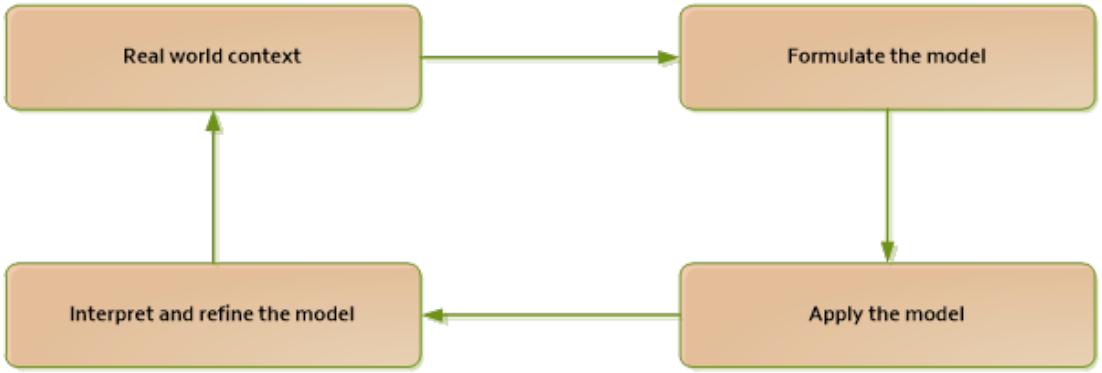
The work requirements for Modules 1 and 2 require learners to employ mathematical modelling and/or problem-solving processes to investigate open-ended contexts.

These processes are defined as follows:

- Mathematical modelling

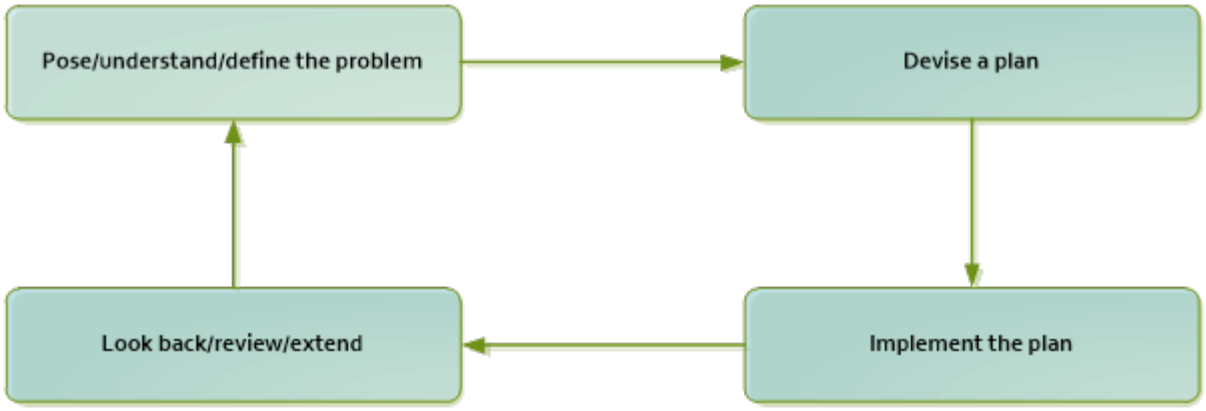
  Mathematical modelling is the process of using mathematical constructs, structures and techniques to represent and describe a real-world context or system, in a simple and concise way that enables one to investigate features and characteristics of its behaviour, analyse particular aspects or solve problems of interest, and to make predictions related to the context or system.

  A simple diagrammatic representation of the mathematical modelling process is shown below.



- Problem-solving

  Problem solving is a process that occurs in a context where a question, task or issue needs to be solved or resolved, and there is a motivation, but not yet the means, to do so.
  Questions or tasks for which there are already recognised methods or approaches for solution or resolution, do not require problem-solving in this sense.
  In mathematics problems are generated from questions, conjectures and hypotheses within and across areas of study. New problems may arise in their own right, or as a variation, re-formulation, extension or generalisation of a known problem or class of problems.
  A simple diagrammatic representation of the problem-solving process, adapted from *How to Solve It* (Polya, 1945, Princeton University Press) follows.



- Mathematical modelling and problem-solving are complementary processes. Developing a model may be a strategy that is employed to solve a problem, and problem-solving may be required in developing and applying aspects of a model.

Appendix 4 – General Capabilities and Cross-Curriculum Priorities

Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the *Alice Springs (Mparntwe) Education Declaration (December 2019)*.

General Capabilities:

The general capabilities play a significant role in the Australian Curriculum in equipping young Australians to live and work successfully in the twenty-first century.

In the Australian Curriculum, capability encompasses knowledge, skills, behaviours and dispositions. Students develop capability when they apply knowledge and skills confidently, effectively and appropriately in complex and changing circumstances, in their learning at school and in their lives outside school.

The general capabilities include:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Intercultural understanding
- Literacy
- Numeracy
- Personal and social capability

Cross-Curriculum Priorities:

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face, for their own benefit and for the benefit of Australia as a whole. The priorities provide national, regional and global dimensions which will enrich the curriculum through development of considered and focused content that fits naturally within learning areas. Incorporation of the priorities will encourage conversations between students, teachers and the wider community.

The cross-curriculum priorities include:

- Aboriginal and Torres Strait Islander Histories and Cultures
- Asia and Australia's Engagement with Asia
- Sustainability

Appendix 5 – Glossary

- A central glossary will be added to the final draft of the course for consultation.