DEPARTMENT OF EDUCATION
learners first

Discipline-based Study

Mathematics

General Mathematics 2

COURSE DOCUMENT

PHASE 4

DRAFT FOR CONSULTATION

Catholic Education Tasmania

INDEPENDENT SCHOOLS TASMANIA

Years 9 to 12 Learning

Tasmanian Government

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General Mathematics, 150 hours – Level 2

This course is the Level 2 component of the proposed *General Mathematics* suite.

Focus Area – Discipline-based Study

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.

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
- linear algebra and matrices
- measurement including right-angled trigonometry
- statistics including univariate data analysis.

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.

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 professionals 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.

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 is built on 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 flexible range of learning opportunities suited to their level of readiness, interests and aspirations.

Learning Outcomes

On successful completion of this course learners will be able to:

1. communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply techniques to solve practical problems and implement the statistical investigation process to answer questions
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems and answers to statistical questions
5. choose and use technology appropriately and effectively
6. understand the concepts and techniques in algebra, matrices and finance
7. understand the concepts and techniques involving linear equations and univariate data analysis
8. understand the concepts and techniques in right-angled trigonometry, shape and measurement

Integration of General Capabilities and Cross-Curriculum Priorities

The general capabilities addressed specifically in this course are:

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

The cross-curriculum priorities enabled through this course are:

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

Course Description

General Mathematics 2 enables learners to broaden their mathematical experience beyond Grade 10. It provides different scenarios for incorporating mathematical arguments and problem solving in linear algebra, matrices, finance, univariate data analysis, right-angled trigonometry, shape and measurement.

Learners will apply mathematical concepts and techniques to communicate arguments, solve problems and explain reasonableness of solutions.

In this course, learners will model and investigate situations with and without the use of technology. By working collaboratively, they will reflect upon and broaden their own thinking.

Pathways

- *General Mathematics* Level 2 provides a clear pathway from Australian Curriculum Mathematics F-10.
- *General Mathematics* Level 2 provides a clear pathway to study the proposed *General Mathematics* Level 3 and additionally provides foundational knowledge to support students undertaking other TASC-accredited Level 2 and Level 3 courses (non-STEM) requiring mathematical competence and/or vocational training courses requiring mathematical competence.

Course Requirements

Access

This course requires learners to collaborate with others.

Resource Requirements

Learners will require access to scientific calculators in this course. On occasions, computers and the internet will be required to enable learners' access to information and data sources.

Course Structure and Delivery

Structure

This course consists of three 50-hour modules.

Modules available:

- Core Module 1: Algebra, matrices and finance
- Core Module 2: Linear equations and univariate data analysis
- Core Module 3: Right-angled trigonometry, shape and measurement

Delivery

There is no specific recommended delivery sequence for the modules.

Course Content

Module 1 – Algebra, matrices and finance

This module contains two topics:

- Algebra and matrices
- Consumer arithmetic

Within this module learners will apply algebra and arithmetic to represent and store information, perform calculations, solve problems and make informed decisions about personal finances amongst other contexts.

'Algebra and matrices' enables learners to evaluate and use linear and non-linear expressions and introduces matrices as a tool for storing information in databases, and solving problems including those that involve networks.

'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.

Module 1 Learning Outcomes

The following Learning Outcomes are a focus of this module:

1. communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply techniques to solve practical problems and implement the statistical investigation process to answer questions
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems and answers to statistical questions
5. choose and use technology appropriately and effectively
6. understand the concepts and techniques in algebra, matrices and finance

Module 1 Content

Topic 1 – Algebra and matrices

Subtopics:

- Linear and non-linear expressions
- Matrices and matrix arithmetic

Key knowledge and skills:

Linear and non-linear expressions:

- substitute numerical values into linear algebraic and simple non-linear algebraic expressions, and evaluate

- find the value of the subject of the formula, given the values of the other pronumerals in the formula
- transpose a formula to make an alternative variable the subject
- use a spreadsheet or an equivalent technology to construct a table of values from a formula, including two-by-two tables for formulas with two variable quantities; for example, a table displaying the body mass index (BMI) of people of different weights and heights.

Matrices and matrix arithmetic:

- use spreadsheets as an introduction to matrices where a number of repeated calculations occur
- use matrices for storing and displaying information that can be presented in rows and columns; for example, databases, links in social or road networks
- recognise different types of matrices (row, column, square, zero, identity) and determine their size
- perform matrix addition, subtraction, multiplication by a scalar, and matrix multiplication of size two x two matrices
- determine the power of a matrix using technology with matrix arithmetic capabilities when appropriate
- use matrices, including matrix products and powers of matrices, to model and solve problems using technology with matrix arithmetic capabilities when appropriate; 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.

Topic 2 – Consumer arithmetic

Key knowledge and skills:

- review rates and percentages
- 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
- calculate payments based on government allowances and pensions
- prepare a personal budget for a given income taking into account fixed and discretionary spending
- compare prices and values using the unit cost method
- 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
- calculate simple and compound interest
- 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
- 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
- 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.

Module 1 Work Requirements Summary

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 one (1) extended response as the work requirement.

See Appendix 3 for the full specifications of the Work Requirements of this course.

Module 1 Assessment

This module has a focus on criteria 1, 2, 3, 4, 5 and 6.

Module 2 – Linear equations and univariate data analysis

This module contains two topics:

- Linear equations and their graphs
- Univariate data analysis and the statistical investigation process

Within this module learners will apply techniques to collect, organise and represent data and perform calculations in order to model and analyse practical situations from varied contexts.

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

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

Module 2 Learning Outcomes

The following Learning Outcomes are a focus of this module:

1. communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language
2. plan, organise and manage their learning in order to complete tasks and evaluate progress
3. apply techniques to solve practical problems and implement the statistical investigation process to answer questions
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems and answers to statistical questions
5. choose and use technology appropriately and effectively
7. understand the concepts and techniques involving linear equations and univariate data analysis

Module 2 Content

Topic 1 – Linear equations and their graphs

Subtopics:

- Linear equations and graphs
- Simultaneous linear equations
- Piece-wise linear graphs and step graphs.

Key knowledge and skills:

Linear equations and graphs:

- identify and solve linear equations
- develop a linear formula from a word description
- construct straight-line graphs both with and without the aid of technology

- determine the gradient (slope) between two points in a number plane both algebraically and graphically
- determine the gradient (slope) and intercepts of a straight-line graph from both its equation and its plot
- interpret, in context, the gradient (slope) and intercept of a straight-line graph used to model and analyse a practical situation
- 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
- construct scatterplots and determine the linear relationship between variables using a 'line of best fit' by sight or by using calculator regression technique.
- use linear functions to make predictions (interpolation and extrapolation) and determine the implication that this has on reliability.

Simultaneous linear equations:

- solve a pair of simultaneous linear equations, using technology when appropriate
- 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.

Piece-wise linear graphs and step graphs:

- sketch piece-wise linear graphs and step graphs, using technology when appropriate
- 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.

Topic 2 – Univariate data analysis and the statistical investigation process

Subtopics:

- The statistical investigation process
- Data classification and representation
- Data comparison

Key knowledge and skills:

The statistical investigation process:

- 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.

Data classification and representation:

- 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
- classify a numerical variable as discrete, such as the number of rooms in a house, or continuous, such as the temperature in degrees Celsius
- 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

- 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.

Data comparison:

- construct and use parallel box plots (including the use of the 'Q1 – 1.5 x IQR' and 'Q3 + 1.5 x 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
- 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
- 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?

Module 2 Work Requirements Summary

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 one (1) investigation as the work requirement.

See Appendix 3 for the full specifications of the Work Requirements of this course.

Module 2 Assessment

This module has a focus on criteria 1, 2, 3, 4, 5 and 7.

Module 3 - Right-angled trigonometry, shape and measurement

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' enables students to apply their knowledge of trigonometry to solve practical problems involving 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

The following Learning Outcomes are a focus of this module:

1. communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply techniques to solve practical problems and implement the statistical investigation process to answer questions
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems and answers to statistical questions
5. choose and use technology appropriately and effectively

8. understand the concepts and techniques in right-angled trigonometry, shape and measurement

Module 3 Content

Topic 1 – Shape and measurement

This topic has two subtopics:

- Mensuration
- Ratio, similarity and scale factors

Key knowledge and skills:

Mensuration:

- solve practical problems requiring the calculation of perimeters and areas of circles, sectors of circles, triangles, rectangles, parallelograms and composites
- 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
- 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
- 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.

Ratio, similarity and scale factors:

- 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
- use the scale factor for two similar figures to solve linear scaling problems
- 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
- obtain a scale factor and use it to solve scaling problems involving the calculation of surface areas and volumes of similar solids.

Topic 2 – 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
- 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

- determine the area of a triangle either given the height and the base length, or given two sides and an included angle by using the rule $Area = 1/2absinC$, and solve related practical problems
- solve practical problems involving the trigonometry of right-angled triangles, including angles of elevation and depression and using bearings in navigation.

Module 3 Work Requirements Summary

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 one (1) extended response or an equivalent series of connected short responses as the work requirements.

See Appendix 3 for the full specifications of the Work Requirements of this course.

Module 3 Assessment

This module has a focus on criteria 1, 2, 3, 4, 5 and 8.

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
Criteria Assessed	1,2,3,4,5,6	1,2,3,4,5,7	1,2,3,4,5,8

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

1. communicate mathematical ideas and information and apply mathematical conventions
2. manage and take responsibility for learning and evaluate mathematical development
3. apply mathematical and statistical models to investigate and represent real-world situations and solve problems
4. apply mathematical reasoning to interpret information, explain the reasonableness of solutions and draw conclusions from mathematical results
5. use digital technology to develop mathematical ideas and find solutions to mathematical problems
6. interpret concepts and apply mathematical techniques to solve problems involving algebra, matrices and finance in a variety of contexts
7. interpret concepts and apply mathematical techniques to solve problems involving linear equations and to perform univariate data analysis using the statistical investigation process
8. interpret concepts and apply mathematical techniques to solve problems involving right-angled trigonometry, shape and measurement in a variety of contexts

Standards

Criterion 1: communicate mathematical ideas and information and apply mathematical conventions

Standard Element	Rating C	Rating B	Rating A
E1 – communicates arguments	communicates mathematical and statistical arguments using appropriate mathematical terminology and language	communicates reasoned mathematical and statistical judgments and arguments using appropriate mathematical terminology and language	communicates reasoned mathematical and statistical judgments and arguments using appropriate mathematical language and concise language
E2 – uses conventions	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
E3 – uses units and notation	uses correct units and notation when prompted to include them in an answer	presents the final answer with correct use of units and notation as required	presents work with correct use of units and notation throughout calculations to convey mathematical information

Standard Element	Rating C	Rating B	Rating A
E4 – identifies solutions	presents work with the final answer apparent.	presents work with the final answer clearly identified.	presents work with the final answer clearly identified and articulated in terms of the questions where necessary.

Criterion 2: manage and take responsibility for learning and evaluate mathematical development

Standard Element	Rating C	Rating B	Rating A
E1 – self-awareness	identifies own personal traits that promote and inhibit learning performance and understanding	recognises own learning strengths and weaknesses and establishes processes to plan, monitor and assess understanding and performance	analyses own learning strengths and weaknesses in order to establish processes used to plan, monitor and assess understanding and performance
E2 – time management	sets goals and timelines and monitors progress with support	sets goals and timelines and monitors progress	monitors and analyses progress towards meeting goals and timelines
E3 – resource management	uses some tools to organise and plan in order to manage resources and complete set tasks	applies organisational, planning and self-management skills to manage resources and consistently complete tasks	selects and applies effective organisational, planning and self-management skills to manage resources and complete all learning tasks
E4 - completion of individual and collaborative tasks	performs tasks as directed to contribute to the completion of individual and collaborative activities	performs tasks and demonstrates initiative when contributing to the completion of individual and collaborative activities	performs tasks, demonstrates initiative, and guides others in their contribution to the completion of individual and collaborative activities
E5 – self-monitoring	identifies own contribution to completion of collaborative activities.	describes own contribution to completion of collaborative activities.	explains own and other learners' contributions to completion of collaborative activities.

Criterion 3: apply mathematical and statistical models to investigate and represent real-world situations and solve problems

Standard Element	Rating C	Rating B	Rating A
E1 – represents real-world situations	explores routine familiar real-world situations and frames them in mathematical terms	interprets complex familiar real-world situations and frames them in mathematical terms	interprets complex familiar and non-familiar real-world situations and frames them in mathematical terms
E2 – applies mathematical and statistical models to solve problems	applies mathematical and statistical models to solve simple familiar problems	selects and applies mathematical and statistical models to solve complex familiar problems	selects and applies mathematical and statistical models to solve complex unfamiliar problems in a variety of contexts
E3 – applies techniques to investigate situations and find solutions	follows mathematical processes to generate solutions to practical problems or investigations	uses given 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
E4 – identifies limitations of models	identifies limitations of models used when developing solutions or results to simple familiar problems or prescribed investigations.	identifies and explains limitations of models used when developing solutions or results to complex familiar problems or prescribed investigations.	identifies and explains the validity and limitations of models used when developing solutions or results to complex unfamiliar problems or investigations.

Criterion 4: apply mathematical reasoning to interpret information, explain the reasonableness of solutions and draw conclusions from mathematical results

Standard Element	Rating C	Rating B	Rating A
E1 – makes inferences	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

Standard Element	Rating C	Rating B	Rating A
E2 – analyses results	compares experimental findings to expected results in familiar contexts, and identifies possible reasons for differences	relates experimental findings to real-world phenomena, noting differences and identifies possible reasons for these differences	relates experimental findings to real-world phenomena, describing differences and analysing possible reasons for these differences
E3 – explains reasonableness of solutions	describes the reasonableness of the results and solutions to simple familiar problems	explains the reasonableness of the results and solutions to complex familiar problems	evaluates and explains the reasonableness of the results and solutions to complex unfamiliar problems in a variety of contexts
E4 – draws conclusions	draws conclusions that are plausible but lack detailed supporting evidence.	draws plausible conclusions with supporting evidence that provides some insight appropriate to the context.	draws valid evidence-based conclusions showing perception and insight that is appropriate to the context.

Criterion 5: use digital technology to develop mathematical ideas and find solutions to mathematical problems

Standard Element	Rating C	Rating B	Rating A
E1 – uses technology to solve problems	uses given calculator techniques or other digital technology to solve routine problems	selects and applies appropriate calculator techniques or other digital technologies to solve a range of routine and non-routine problems	explores and applies effective calculator techniques or other digital technologies to solve a range of routine and non-routine problems in a variety of contexts
E2 - uses technology to represent mathematical information	follows given processes on digital technologies to graph, display and organise mathematical and statistical information	uses digital technologies appropriately to graph, display and organise mathematical and statistical information	uses digital technologies effectively to move flexibly between different representations of mathematical and statistical information

Standard Element	Rating C	Rating B	Rating A
E3 - accesses and manages information	accesses, manages and acknowledges information from digital and non-digital sources to develop mathematical ideas	accesses, synthesises and appropriately acknowledges 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
E4 – evaluates technology	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: interpret concepts and apply mathematical techniques to solve problems involving algebra, matrices and finance in a variety of contexts

Standard Element	Rating C	Rating B	Rating A
E1 - works flexibly with algebraic formulas to solve problems involving finance	substitutes variables into given formulas to find the subject and solves linear equations that model financial events	substitutes variables into given linear and non-linear formulas to find an unknown that may not be the subject and solves linear equations	transposes a formula to make an alternative variable the subject and solves linear equations, including in complex situations such as 'days between' interest cases
E2 - represents situations using matrices or spreadsheets and performs associated calculations and techniques	represents information in a matrix or spreadsheet and performs associated calculations and techniques	models information accurately in matrices or spreadsheet and performs associated techniques	models and analyses information accurately in matrices and performs associated calculations and techniques with and without technology to solve problems or provide possible solutions to complex situations

Standard Element	Rating C	Rating B	Rating A
E3 - solves problems involving standard financial models	uses given formulas and techniques to perform simple familiar financial calculations.	applies given formulas and techniques to calculate and solve complex familiar financial problems.	selects and applies formulas and techniques to calculate and solve complex unfamiliar financial problems and compares outcomes of alternative financial decisions.

Criterion 7: interpret concepts and apply mathematical techniques to solve problems involving linear equations and to perform univariate data analysis using the statistical investigation process

Standard Element	Rating C	Rating B	Rating A
E1 - collects, organises and classifies data	uses a statistical process to collect and organise data and classifies data as nominal, ordinal, discrete or continuous	selects and applies an appropriate statistical process to collect and organise data and classifies data accurately as nominal, ordinal, discrete or continuous	selects and applies an appropriate statistical process to collect and organise data and classifies data systematically and accurately as ordinal, discrete or continuous
E2 - represents statistical information and performs associated calculations and techniques	represents statistical information in tables, plots and charts and performs associated calculations and techniques	represents statistical information accurately in tables, plots and charts, performs associated calculations and techniques and describes results in context	represents statistical information accurately in tables and detailed plots and charts, performs associated techniques correctly and interprets results appropriately in context
E3 - models real-world situations with linear equations and solves simultaneous linear equations	forms a linear relationship from given data, constructs linear graphs, determines the slope of a straight-line between two points and uses technology to solve simultaneous equations	develops a linear equation to model real-world situations, determines the equations of a straight line between two points and solves simultaneous equations both graphically and algebraically	explains significance of key features when developing a linear equation or determining the equation of a straight line using 'line of best fit' and models, prepares and solves simultaneous equations both graphically and algebraically

Standard Element	Rating C	Rating B	Rating A
E4 - interpolates and extrapolates results graphically and algebraically and discusses reliability	interpolates and extrapolates results graphically to make predictions, and uses algebra to find y given x	interpolates and extrapolates results both graphically and algebraically to make predictions of both variables, recognising limitations of this method	interpolates and extrapolates results both graphically and algebraically to make predictions of both variables and, using a templated approach, explains the reliability and validity of results
E5 - interprets, explains and communicates findings	identifies the key features of graphs, recognises distribution of data sets in terms of shape and/or compares relationships between variables using appropriate techniques.	interprets key features of graphs, recognises distribution of data sets in terms of shape, location and spread, describes relationships between variables, makes predictions based on data and communicates findings.	interprets key features of graphs, recognises and explains outliers in distribution of data sets, explains relationships between variables, makes logical inferences based on data and communicates findings in a concise and systematic manner.

Criterion 8: interpret concepts and apply mathematical techniques to solve problems involving right-angled trigonometry, shape and measurement in a variety of contexts

Standard Element	Rating C	Rating B	Rating A
E1 - solves problems involving Pythagoras' theorem	solves straight forward practical problems involving Pythagoras' Theorem, perimeters and areas	solves practical problems involving Pythagoras' Theorem, perimeters and areas	solves complex practical problems involving Pythagoras' Theorem, perimeters and areas, including composite shapes
E2 - selects and applies trigonometry concepts to solve problems	uses given formulas, rules and diagrams to calculate length, angle and/or area of right-angled triangles	produces appropriate diagrams, selects and applies the correct formula to solve routine problems involving length, angle, bearings and/or area of right-angled triangles	produces appropriate and clear diagrams, selects and correctly applies multiple formulas to derive information and solve complex problems involving length, angle, bearings and/or area of right-angled triangles

Standard Element	Rating C	Rating B	Rating A
E3 - solves problems involving perimeter, area, surface area and volume	solves routine problems involving perimeter and area of standard two-dimensional shapes and surface area and volume of standard three-dimensional objects	solves routine and non-routine problems involving perimeter and area of standard two-dimensional shapes and surface area and volume of standard three-dimensional objects	solves routine and non-routine problems involving perimeter and area of composite two-dimensional shapes and surface area and volume of composite three-dimensional objects
E4 – applies linear scale factor to solve problems involving similarity	applies a given scale factor to solve linear scale problems including obtaining measurements from and constructing scale diagrams.	applies scale factor to solve practical linear scale factor problems including obtaining measurements from and constructing scale diagrams and calculating surface areas of similar figures.	applies scale factor to solve practical linear scale factor problems including obtaining measurements from and constructing scale diagrams and calculating surface areas and volume of similar solids.

Quality Assurance

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

Qualifications and Award Requirements

Level 2

The final award will be determined by the Office of Tasmanian Assessment, Standards and Certification from 8 ratings

The minimum requirements for an award are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
6 'A' ratings, 2 'B' ratings

HIGH ACHIEVEMENT (HA)
3 'A' ratings, 4 'B' ratings, 1 'C' rating

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

SATISFACTORY ACHIEVEMENT (SA)
6 'C' ratings

PRELIMINARY ACHIEVEMENT (PA)
4 'C' ratings

A learner who otherwise achieves the rating for a CA (Commendable Achievement) or 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.

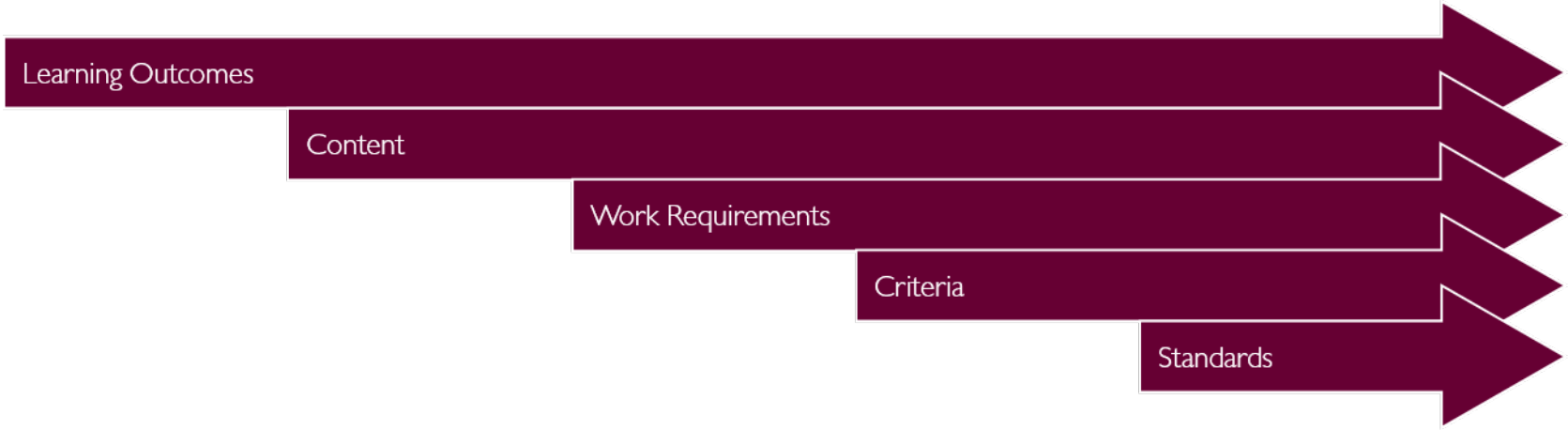
Course Developer

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. Communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language.	Module 1, 2, 3	Module 1, 2, 3	C 1	E 1, 2, 3, 4	GC:
2. Plan, organise and manage learning in order to complete tasks and evaluate progress.	Module 1, 2, 3	Module 1, 2, 3	C 2	E 1, 2, 3, 4, 5	GC:
3. Apply techniques to solve practical problems and implement the statistical investigation process to answer questions.	Module 1, 2, 3	Module 1, 2, 3	C 3	E 1, 2, 3, 4	GC:
4. Apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems and answers to statistical questions.	Module 1, 2, 3	Module 1, 2, 3	C 4	E 1, 2, 3, 4	GC:
5. Choose and use technology appropriately and effectively.	Module 1, 2, 3	Module 1, 2, 3	C 5	E 1, 2, 3, 4	GC:
6. Understand the concepts and techniques in algebra, matrices and finance.	Module 1	Module 1	C 6	E 1, 2, 3	GC:

Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
7. Understand the concepts and techniques involving linear equations and univariate data analysis.	Module 2	Module 2	C 7	E 1, 2, 3, 4, 5	GC: 
8. Understand the concepts and techniques in right-angled trigonometry, shape and measurement.	Module 3	Module 3	C 8	E 1, 2, 3, 4	GC: 

Appendix 2 - Alignment to Curriculum Frameworks

Links to Foundation to Year 10:

The proposed *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.

For all content areas of *General Mathematics*, the proficiency strands of Understanding, Fluency, Problem solving and Reasoning from the F–10 curriculum are still very much applicable and should be inherent in students' learning of the subject. Each strand is essential, and all are mutually reinforcing.

Alignment to Australian Curriculum Senior Secondary Framework:

Almost all content in this course is drawn from the Australian Curriculum Senior Secondary Framework: General Mathematics. The content selected for this course comes from Units 1 and 2 and in most cases, content descriptors are used verbatim. In one instance, the content descriptor has been split as only right-angled trigonometry will be covered in this course, with the remaining content covered in the proposed *General Mathematics* Level 3. The first two content descriptors from Topic 3: Linear equations and their graphs have been moved to preclude the content descriptors in algebra and matrices. Additionally, a small number of additional content descriptors have been added to provide greater opportunities for application of knowledge in the Shape and measurement topic and the Consumer arithmetic topic. This is in line with the Mathematics Standard Year 11 course from NSW.

Summary of Aligned Content:

Module	Topics	Australian Curriculum Framework Source
Module 1	Consumer arithmetic Algebra and matrices	General Mathematics Unit 1 General Mathematics Unit 1
Module 2	Linear equations and their graphs Univariate data analysis and the statistical investigation process	General Mathematics Unit 2 General Mathematics Unit 2
Module 3	Shape and measurement Applications of trigonometry (right-angled trigonometry only)	General Mathematics Unit 1 General Mathematics Unit 2

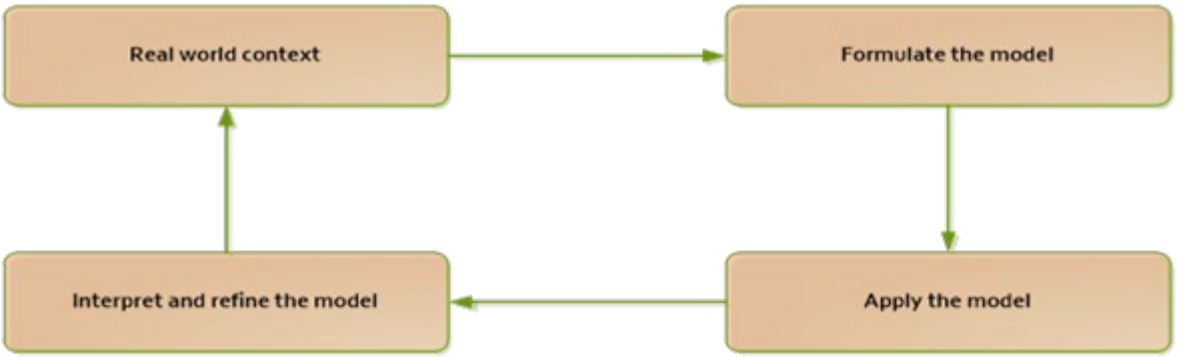
Appendix 3 - Work Requirements

Some of the work requirements in this course require learners to employ mathematical modelling and/or problem-solving processes to investigate open-ended contexts.

These processes are defined as follows:

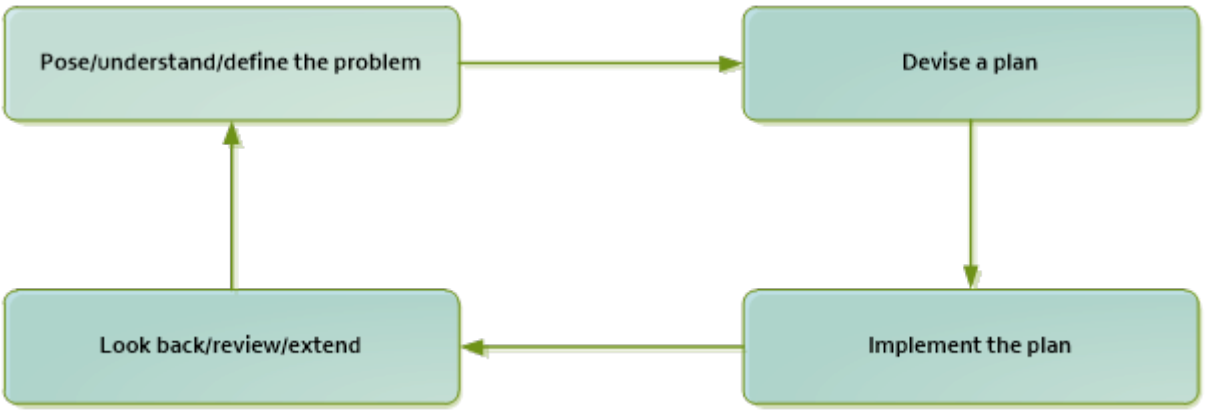
Mathematical modelling

- 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.

Module 1 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Mathematical modelling and/or problem-solving task
Mode/Format: Extended response
Description: Learners will engage in problem solving and/or mathematical modelling of a real-world context involving algebra, matrices and/or finance. Learners' responses to the chosen stimulus will focus on interpretation of the context, selection and application of mathematical techniques, analysis of results or solutions and communication of drawn conclusions including describing any limitations or assumptions made. 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. The extended response should be submitted as a single word-processed document of no more than 5 pages which:

- may include photos of hand-written work (including mathematical calculations)
- may include photographs or embedded diagrams or representations taken from graphical software packages.
- must be submitted as a single PDF in digital format and no larger than 8 MB.

Time allowance: 4 to 6 hours of class time including support tasks.
Timing: No specified timing.
External agencies: Involvement at teacher discretion.
Relevant criteria:

Criterion 1: all standard elements

- Criterion 2: elements 1, 2, 3 and where relevant 4 and 5
- Criterion 3: all standard elements
- Criterion 4: all standard elements
- Criterion 5: chosen elements as applicable to the context
- Criterion 6: chosen elements as applicable to the context

Module 2 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Statistical investigation
Mode/Format: Investigation
Description: Learners will engage in a statistical investigation to respond to a specific problem, question, issue or hypothesis evidenced by the collection, analysis, and synthesis of primary and/or secondary data set. The investigation will use investigative practices and mathematical techniques as outlined in the course content of this module, supported by research as appropriate. The investigation should occur over an extended and defined timeframe.

Learners' responses to the chosen stimulus will focus on:

- identifying a problem and posing a statistical question
- collecting or obtaining data (multiple sets)
- representing and analysing the data
- communication of drawn conclusions including describing any limitations or assumptions made.

The Statistical Investigation Report response must be a single word-processed document of no more than 6 pages (plus appendices) which:

- may include photos of hand-written work (including mathematical calculations) written format with the exception of mathematical calculations
- may include photographs, screenshots or embedded data representations taken from graphical software packages.

- must include references and raw data as appendices (excluded from page count)
- must be submitted as a single PDF in digital format and no larger than 6 MB.

The Harvard referencing style is recommended to be used for this work requirement.

- Refer to Academic Integrity information on the TASC website for information about referencing styles, frequently asked questions, and tips and hints for correct referencing.
- A list of works cited must be shown in the Reference List.

Time allowance: 6 – 8 hours of class time.
Timing: No specified timing.
External agencies: Involvement at teacher discretion.
Relevant criteria:

- Criterion 1: all standard elements
- Criterion 2: elements 1, 2, 3 and where relevant 4 and 5
- Criterion 3: all standard elements
- Criterion 4: all standard elements
- Criterion 5: chosen elements as applicable to the context
- Criterion 7: chosen elements as applicable to the context

Module 3 Work Requirements Specifications

Focus Area: Discipline-based study
Title of Work Requirement: Mathematical modelling and/or problem-solving task
Mode/Format: Extended response
Description: Learners will engage in problem solving and/or mathematical modelling of one or more real-world contexts involving right-angled trigonometry, ratio, similarity and mensuration of shape. In this module, an extended response may be a series of connected short responses to multiple contexts. Learners' responses to the chosen stimulus will focus on interpretation of the context(s), selection and application of mathematical techniques, analysis of results or solutions and communication of drawn conclusions including describing any limitations or assumptions made. 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. The extended response should be submitted as a single word-processed document of no more than 5 pages which:

- may include photos of hand-written work (including mathematical calculations) written format with the exception of mathematical calculations
- may include photographs or embedded diagrams or representations taken from graphical software packages.
- must be submitted as a single PDF in digital format and no larger than 8 MB.

Time allowance: 4 to 6 hours of class time including support tasks.
Timing: No specified timing.
External agencies: Involvement at teacher discretion.
Relevant criteria:

- Criterion 1: all standard elements
- Criterion 2: elements 1, 2, 3 and where relevant 4 and 5
- Criterion 3: all standard elements
- Criterion 4: all standard elements
- Criterion 5: chosen elements as applicable to the context
- Criterion 8: chosen elements as applicable to the context

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

Term	Definition	Source Acknowledgement	Course Context
adjacency matrix	An adjacency matrix for a non-directed graph with n vertices is a $n \times n$ matrix in which the entry in row i and column j is the number of edges joining the vertices i and j. In an adjacency matrix a loop is counted as one edge. For a directed graph, the entry in row i and column j is the number of directed edges (arcs) joining the vertex i and j in the direction i to j.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
algorithm	An algorithm is a precisely defined routine procedure that can be applied and systematically followed through to a conclusion.	ACARA	General Mathematics 2
angle of depression	When an observer looks at an object that is lower than the eye of the observer, the angle between the line of sight and the horizontal is called the angle of depression.	ACARA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry
angle of elevation	When an observer looks at an object that is higher than the eye of the observer, the angle between the line of sight and the horizontal is called the angle of elevation.	ACARA	General Mathematics 3: • Module 3 – Pythagoras' theorem and trigonometry
bearing	The direction of a fixed point, or the path of an object, from the point of observation.	QCAA	General Mathematics 2: • Module 3 - Pythagoras' theorem and trigonometry

Term	Definition	Source Acknowledgement	Course Context
break-even point	The break-even point is the point at which revenue begins to exceed the cost of production.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs
categorical data	Data associated with a categorical variable is called categorical data.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
categorical variable	A categorical variable is a variable whose values are categories. Examples include blood group (A, B, AB or O) or house construction type (brick, concrete, timber, steel, other). Categories may have numerical labels, e.g. the numbers worn by player in a sporting team, but these labels have no numerical significance, they merely serve as labels.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
compass bearings	Compass bearings are specified as angles either side of North or South, that describe the direction of a fixed point, or the path of an object. For example: a compass bearing of N50°E is found by facing North and moving through an angle of 50° towards East.	ACARA	General Mathematics 2: • Module 3 - Pythagoras' theorem and trigonometry

Term	Definition	Source Acknowledgement	Course Context
compound interest	The interest earned when each successive interest payment is added to the principal for the purpose of calculating the next interest payment. e.g. if the principal (P) earns compound interest (A) at the interest rate (i) expressed as a percentage per period, then after (n) compounding periods the total amount accrued is: $$A = P(1 + i)^n$$ When plotted on a graph, the total amount accrued is shown to grow exponentially.	QCAA	General Mathematics 2: • Module 1 – Consumer arithmetic
continuous data	Data associated with a continuous variable is called continuous data.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
continuous variable	A continuous variable is a numerical variable that can take any value that lies within an interval. In practice, the values taken are subject to accuracy of the measurement instrument used to obtain these values. Examples include height, reaction time, temperature and systolic blood pressure.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
cosine ratio	In any right-angled triangle, $$\cos\theta = \frac{adjacent}{hypotenuse}$$	QCAA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry

Term	Definition	Source Acknowledgement	Course Context
discrete data	Discrete data is data associated with a discrete variable. Discrete data is sometimes called count data.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
discrete variable	A discrete variable is a numerical variable that can take only integer values. Examples include the number of people in a car, the number of decayed teeth in an 18 year-old male etc.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
effective annual rate of interest	The effective annual rate of interest $i_{effective}$ is used to compare the interest paid on loans (or investments) with the same nominal annual interest rate i but with different compounding periods (daily, fortnightly, monthly, quarterly, annually, other). If the number of compounding periods per annum is n, then: $$i_{effective} = (1 + \frac{i}{n})^n - 1$$	ACARA	General Mathematics 2: • Module 1 – Consumer arithmetic
extrapolation	In the context of fitting a linear relationship between two variables, extrapolation occurs when the fitted model is used to make predictions using values of the explanatory variable that are outside the range of the original data. Extrapolation is a dangerous process as it can sometimes lead to quite erroneous predictions.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs

Term	Definition	Source Acknowledgement	Course Context
five-number summary	A five---number summary is a method of summarising a set of data using the minimum value, the lower or first---quartile (Q1), the median, the upper or third---quartile (Q3) and the maximum value. Forms the basis for a boxplot.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
Goods and Services Tax (GST)	The Goods and Services Tax (GST) is a broad sales tax of 10% on most goods and services and other items sold or consumed in Australia.	QCAA	General Mathematics 2: • Module 1 – Consumer arithmetic
gradient (slope)	The gradient or slope of a line describes its steepness, incline, or grade. Gradient is normally described by the ratio of the "rise" divided by the "run" between two points on a line.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs
identity matrix	A square matrix in which all of the elements in the leading diagonal are 1s and the remaining elements are 0s; identity matrices are designated by the letter I. There is an identity matrix for each size (or order) of a square matrix	QCAA	General Mathematics 2: • Module 1 – Algebra and matrices
interpolation	In the context of fitting a linear relationship between two variables, interpolation occurs when the fitted model is used to make predictions using values of the explanatory variable that lie within the range of the original data.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs

Term	Definition	Source Acknowledgement	Course Context
inverse of a square matrix	The inverse of a square matrix A is written as A^{-1} and has the property that $AA^{-1} = A^{-1}A = I$ Not all square matrices have an inverse. A matrix that has an inverse is said to be invertible.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
leading diagonal	The leading diagonal of a square matrix is the diagonal that runs from the top left corner to the bottom right corner of the matrix.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
linear equation	A linear equation in one variable x is an equation of the form: $ax + b = 0$, e.g. $3x + 1 = 0$ A linear equation in two variables x and y is an equation of the form: $ax + by + c = 0$ e.g. $x - y + 5 = 0$	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
linear graph	A linear graph is a graph of a linear equation with two variables. If the linear equation is written in the form $y = a + bx$, then a represents the y---intercept and b represents the slope (or gradient) of the linear graph.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices

Term	Definition	Source Acknowledgement	Course Context
matrix (matrices)	A matrix is a rectangular array of elements or entities displayed in rows and columns. Matrices are described as $m \times n$, where m is the number of rows and n is the number of columns. A square matrix has the same number of rows and columns. A column matrix (or vector) has only one column. A row matrix (or vector) has only one row.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
matrix multiplication	Matrix multiplication is the process of multiplying a matrix by another matrix. The product AB of two matrices A and B of size $m \times n$ and $p \times q$ respectively is defined if $n = p$. If $n = p$ the resulting matrix has size $m \times q$.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
mean	The arithmetic mean, $\bar{x}$, of a list of numbers is the sum of the data values divided by the number of values in the list. In everyday language, the arithmetic mean is commonly called the average.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
median	The median is the value in a set of ordered set of data values that divides the data into two parts of equal size. When there are an odd number of data values, the median is the middle value. When there is an even number of data values, the median is the arithmetic mean of the two central values.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process

Term	Definition	Source Acknowledgement	Course Context
mode	The mode is the most frequently occurring value in a data set.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
outlier	An outlier in a set of data is an observation that appears to be inconsistent with the remainder of that set of data. An outlier is a surprising observation.	ACARA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
piecewise-linear graph	A graph consisting of one or more none overlapping line segments. Sometimes called a line segment graph.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs
Pythagoras' theorem	The square of the hypotenuse of a right-angled triangle equals the sum of the squares of the lengths of the other two sides. As a rule: $c^2 = a^2 + b^2$, where c is the length of the hypotenuse.	ACARA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry
scalar multiplication (of a matrix)	Scalar multiplication is the process of multiplying a matrix by a scalar (number). In general, for the matrix A with elements a_{ij} the elements of kA are ka_{ij}.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices

Term	Definition	Source Acknowledgement	Course Context
scale factor	A number that scales, or multiplies, some quantity. In the equation $y = kx$, k is the scale factor for x; if two or more figures are similar, their sizes can be compared. The scale factor is the ratio of the length of one side on one figure to the length of the corresponding side on the other figure. It is a measure of magnification; the change of size.	ACARA	General Mathematics 2: • Module 3 – Shape and measurement
sequence	A sequence is an ordered list of numbers (or objects). For example: 1, 3, 5, 7 is a sequence of numbers that differs from the sequence 3, 1, 7, 5 as order matters. A sequence maybe finite, for example, 1, 3, 5, 7 (the sequence of the first four odd numbers), or infinite, for example, 1, 3, 5, … (the sequence of all odd numbers).	ACARA	General Mathematics 2
similar figures	Two geometric figures are similar if they are of the same shape but not necessarily of the same size	QCAA	General Mathematics 2: • Module 3 – Shape and measurement
sine ratio	In any right-angled triangle, $\sin\theta = \frac{opposite}{hypotenuse}$	QCAA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry
singular matrix	A matrix is singular if det A = 0. A singular matrix does not have a multiplicative inverse.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices

Term	Definition	Source Acknowledgement	Course Context
simple interest	Simple interest is the interest (I) accumulated when the interest payment in each period is a fixed fraction of the principal, e.g. if the principle P earns simple interest at the rate (R) expressed as a percentage per period, then after (T) periods the accumulated simple interest is: $$I = PRT$$ When plotted on a graph, the total amount accrued is shown to grow linearly.	QCAA	General Mathematics 2: • Module 1 – Consumer arithmetic
size (of a matrix)	Two matrices are said to have the same size (or order) if they have the same number of rows and columns. A matrix with m rows and n columns is said to be a $m \times n$ matrix.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices
standard deviation	The standard deviation is a measure of the variability or spread of a data set. It gives an indication of the degree to which the individual data values are spread around their mean. The standard deviation of n observations $x_1, x_2, \ldots, x_n$ is: $$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$$	QCAA	General Mathematics 2: • Module 2 – Univariate data analysis and the statistical investigation process
step graph	A graph consisting of one or more non---overlapping horizontal line segments that follow a step---like pattern.	ACARA	General Mathematics 2: • Module 2 – Linear equations and their graphs

Term	Definition	Source Acknowledgement	Course Context
tangent ratio	In any right-angled triangle, $\tan\theta = \frac{opposite}{adjacent}$	QCAA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry
true bearings	True bearings are measured in degrees in a clockwise direction from the North line. Three figures are used to specify the direction. Thus, North is specified as 000°T, East is specified as 090°T, South-East is specified as 135°T.	ACARA	General Mathematics 2: • Module 3 – Pythagoras' theorem and trigonometry
zero matrix	A zero matrix is a matrix where all of its entries are zero.	ACARA	General Mathematics 2: • Module 1 – Algebra and matrices

Appendix 6 – Degree of difficulty of problems

Within this course, the degree of difficulty of problems a learner can answer correctly is a defining feature of their understanding. Within the criteria and standards, the expected depth of knowledge is described using the following terms.

Simple familiar

Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation where:

- relationships and interactions are obvious and have few elements; and
- all of the information to solve the problem is identifiable; that is
    - the required procedure is clear from the way the problem is posed, or
    - in a context that has been a focus of prior learning.

Complex familiar

Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation where:

- relationships and interactions have a number of elements, such that connections are made with subject matter within and/or across the domains of mathematics; and
- all of the information to solve the problem is identifiable; that is
    - the required procedure is clear from the way the problem is posed, or -
    - in a context that has been a focus of prior learning.

Some interpretation, clarification and analysis will be required to develop responses.

Complex unfamiliar

Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation where:

- relationships and interactions have a number of elements, such that connections are made with subject matter within and/or across the domains of mathematics; and
- all the information to solve the problem is not immediately identifiable; that is
    - the required procedure is not clear from the way the problem is posed, and
    - in a context in which students have had limited prior experience.

Students interpret, clarify and analyse problems to develop responses.