DEPARTMENT OF EDUCATION
learners first

Discipline-based study

Mathematics

General Mathematics 2

Course document

independent schools tasmania

Catholic Education Tasmania

Years 9-12 Learning

Tasmanian Government

Table of Contents

General Mathematics, 150 hours – Level 2

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
- methodology and terminology.

Figure 1: Discipline-based Study diagram (developed by Years 9-12 Learning)

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 learners 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 learners 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 modelling, problem solving and mathematical reasoning to interpret, represent and justify the reasonableness of solutions to problems and answers to statistical questions
4. choose and use technology appropriately and effectively
5. apply concepts and techniques to model and solve problems involving algebra and matrices
6. apply concepts and techniques to model and solve problems involving linear equations and finance
7. apply the statistical investigation process in situations involving univariate data analysis
8. apply 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 Level 2 enables learners to broaden their mathematical experience beyond Year 10. It provides different scenarios for incorporating mathematical arguments and problem solving.

They will study:

- linear algebra and 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 *General Mathematics* Level 3 and additionally provides foundational knowledge to support students undertaking other non-STEM TASC-accredited Level 2 and Level 3 courses, , requiring mathematical competence. It may also provide a pathway to 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.

Module 1: Mathematical modelling, problem solving and reasoning

Module 2: Algebra, matrices and finance

Module 3: Univariate data analysis, right-angled trigonometry, shape and measurement

Delivery

Module 1 should be delivered concurrently with module 2 and module 3. Modules 2 and 3 can be taught in any order and are most effectively taught concurrently with module 1.

Course content

Module 1: Mathematical modelling, problem solving and reasoning

Within this module, students will apply mathematical processes and reasoning in contexts with open-ended aspects that require problem-solving and modelling. Students will apply, analyse and discuss these applications and their results. Additionally, students will apply computational thinking and use technology to develop mathematical ideas, calculate results and analyse their outputs.

Module 1 learning outcomes

The following learning outcomes are a focus of this module:

1. communicate their 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 modelling, problem solving and mathematical reasoning to interpret, represent and justify the reasonableness of solutions to problems and answers to statistical questions
4. choose and use technology appropriately and effectively.

Module 1 content

Key knowledge and skills

Apply mathematical processes in contexts that require problem-solving, modelling or both

- formulate the concepts, technique and models required to solve and interpret mathematical problems
- select and apply the mathematical concepts, models and techniques needed to represent, analyse and solve problems involving algebra and matrices
- select and apply standard financial models to investigate and analyse financial situations
- identify, select and apply facts, concepts, models and techniques needed to investigate and analyse statistical features of univariate data sets
- select and apply the mathematical concepts, models and techniques needed to represent, analyse and solve problems involving measurement and trigonometry
- interpret and report the results of statistical investigations and mathematical modelling or problem-solving tasks in terms of the context under consideration, including:
  - assessing the reasonableness of results
  - discussing any assumptions in application of these models and any limitations of the model
  - drawing conclusions in light of the results obtained.

Use technology and other sources to develop ideas and find solutions

- access and manage information from digital and non-digital sources to develop mathematical ideas
- validate information taken from digital and non-digital sources through secondary sources or experimentation
- use technology to carry out numerical, graphical and symbolic computation as applicable
- use appropriate domain and range specifications to illustrate key features of graphs
- apply constraints and conditions, as applicable, to carry out required computations
- identify the relationship between numerical, graphical and symbolic forms of information about models and equations and the corresponding features of those models and equations
- distinguish between exact and approximate presentations of mathematical results produced by technology and interpret these results to a specified degree of accuracy in terms of a given number of decimal places or significant figures
- produce tables of values, families of graphs and collections of other results using technology, which support general analysis in problem-solving, investigative and modelling contexts
- specify the similarities and differences between formal mathematical expressions and their representation by technology
- relate the results from a particular technology application to the nature of a particular mathematical task, investigation, problem solving or modelling and verify these results
- specify the process used to develop a solution to a problem using technology and communicate the key stages of mathematical reasoning, formulation, solution and interpretation used in this process.

Module 1 work requirements

This module includes the following work requirements:

- one investigation: statistics
- one extended response: mathematical modelling, problem solving or both.

It is expected that the extended response will reflect content drawn from module 2 topic 1 or 2, or module 3 topic 2 and address criteria 5,6 or 8 or a combination of these.

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 and 4.

Module 2: Algebra, matrices and finance

This module contains three topics:

- algebra and matrices
- linear equations and their graphs
- 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 and 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 solve problems including those that involve networks.

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

'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 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 learning in order to complete tasks and evaluate progress
5. apply concepts and techniques to model and solve problems involving algebra and matrices
6. apply concepts and techniques to model and solve problems involving linear equations and finance

Module 2 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 – linear equations and their graphs

Subtopics:

- linear equations and graphs
- simultaneous linear equations
- piecewise-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 between two points in a number plane both algebraically and graphically
- determine the gradient and intercepts of a straight-line graph from both its equation and its plot
- interpret, in context, the gradient 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 algebraically and graphically, 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.

Piecewise-linear graphs and step graphs

- sketch piecewise-linear graphs and step graphs, using technology when appropriate
- interpret piecewise-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 3 – 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 2 work requirements

This module includes the following work requirement:

- one connected series of short responses – application of concepts and techniques: consumer arithmetic, linear equations and their graphs and matrices.

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, 5 and 6.

Module 3: Univariate data analysis, right-angled trigonometry, shape and measurement

This module contains three topics:

- univariate data analysis and the statistical investigation process
- shape and measurement
- Pythagoras' theorem and trigonometry.

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.

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

'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 their learning in order to complete tasks and evaluate progress

7. apply the statistical investigation process in situations involving univariate data analysis
8. apply concepts and techniques in right-angled trigonometry, shape and measurement.

Module 3 content

Topic 1 – 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, 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, demonstrating an awareness 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 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, 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?

Topic 2 – 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 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; such as cultural mappings, 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 3 – 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

This module includes the following work requirement:

- one connected series of short responses: application of concepts and techniques: univariate data analysis, right-angled trigonometry, shape and measurement.

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, 7 and 8.

Assessment

Criterion-based assessment is a form of outcomes assessment that identifies the extent of learner achievement at an appropriate endpoint 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 endpoint 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

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, represent and analyse real-world situations and solve problems
4. use digital technology and other sources to develop mathematical ideas and find solutions to mathematical problems
5. interpret concepts and apply mathematical techniques to solve problems involving algebra and matrices
6. interpret concepts and apply mathematical techniques to model and solve problems involving linear equations and finance in a variety of contexts
7. interpret concepts and apply mathematical techniques to solve problems involving 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.

	Module 1	Module 2	Module 3
Criteria focus	1,2,3,4	1,2,5,6	1,2,7,8

Standards

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

Criterion elements	Rating A	Rating B	Rating C
E1 - Communicates arguments	communicates reasoned mathematical and statistical judgments and arguments using appropriate mathematical terminology and concise language	communicates reasoned mathematical and statistical judgments and arguments using appropriate mathematical terminology and language	communicates mathematical and statistical arguments using appropriate mathematical terminology and language
E2 - Uses conventions	uses mathematical conventions, systems and constructs, including manipulation and use of symbolic expressions, rules and formal systems accurately	uses mathematical conventions, systems and constructs, including manipulation and use of symbolic expressions and rules appropriately	uses mathematical conventions, systems and constructs based on definitions and rules in familiar situations
E3 - Uses units and notation	presents work with correct use of units and notation throughout calculations to convey mathematical information	presents the final answer with correct use of units and notation as required	uses correct units and notation when prompted to include them in an answer
E4 - Identifies solutions	presents work with the final answer clearly identified and articulated in terms of the questions where necessary.	presents work with the final answer clearly identified.	presents work with the final answer apparent.

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

Criterion elements	Rating A	Rating B	Rating C
E1 - Reflects on Performance	analyses own learning strengths and weaknesses in order to establish processes used to plan, monitor and assess understanding and performance	recognises own learning strengths and weaknesses and establishes processes to plan, monitor and assess understanding and performance	identifies personal traits that promote or inhibit learning performance and understanding
E2 - Manages time	monitors and analyses progress towards meeting own goals and timelines	sets own goals and timelines and monitors progress	Selects goals from a given range and monitors progress
E3 - Plans and organises	selects and applies effective organisational, planning and self-management skills to manage resources and complete all learning tasks	applies organisational, planning and self-management skills to manage resources and consistently complete tasks	uses a limited range of tools to organise and plan in order to manage resources and complete set tasks
E4 - Works individually and collaboratively	performs tasks, demonstrates initiative and guides others in their contribution 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 as directed to contribute to the completion of individual and collaborative activities
E5 - Monitors task contributions	explains own and other learners' contributions to completion of collaborative activities.	describes own and others' contribution to completion of collaborative activities.	identifies own and others' contribution to completion of collaborative activities.

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

Criterion elements	Rating A	Rating B	Rating C
E1 - Makes inferences	explores and links problem elements to make logical inferences that can be tested mathematically	identifies and explains problem elements to make informed inferences that can be tested mathematically	identifies problem elements and makes inferences that may be able to be tested mathematically
E2 - Applies mathematical and statistical models to solve problems	selects and applies mathematical and statistical models to solve complex unfamiliar problems in a variety of contexts	selects and applies mathematical and statistical models to solve complex familiar problems	applies mathematical and statistical models to solve simple familiar problems
E3 - Analyses results	relates experimental findings to real-world phenomena, describing differences and analysing possible reasons for these differences	relates experimental findings to real-world phenomena, identifying differences and possible reasons for these differences	compares experimental findings to expected results in familiar contexts and identifies possible reasons for differences
E4 - Explains reasonableness of solutions	Assesses the reasonableness of results and evaluates the models used to solve complex unfamiliar problems	explains the reasonableness of results and identifies the limitations of models used to solve complex familiar problems	describes the reasonableness of results and identifies the limitations of models used to solve simple familiar problems
E5 - Draws conclusions	draws valid evidence-based conclusions showing perception and insight that is appropriate to the context.	draws plausible conclusions with supporting evidence that provides some insight appropriate to the context.	draws conclusions that are plausible but have limited supporting evidence.

Criterion 4: use digital technology and other sources to develop mathematical ideas and find solutions to mathematical problems

Criterion elements	Rating A	Rating B	Rating C
E1 - Uses technology to solve 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	selects and applies appropriate calculator techniques or other digital technologies to solve a range of routine and non-routine problems	uses given calculator techniques or other digital technology to solve routine problems
E2 - Uses technology to represent mathematical information	uses digital technologies effectively to move flexibly between different representations of mathematical and statistical information	uses digital technologies appropriately to graph, display and organise mathematical and statistical information	follows given processes on digital technologies to graph, display and organise mathematical and statistical information
E3 - Accesses and manages information	evaluates authenticity, reliability and validity of information taken from a variety of 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	accesses, manages and acknowledges information from digital and non-digital sources to develop mathematical ideas
E4 - Evaluates technology	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.	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.	identifies and describes how the use of technology can affect outcomes obtained in routine contexts.

Criterion 5: interpret concepts and apply mathematical techniques to solve problems involving algebra and matrices

Criterion elements	Rating A	Rating B	Rating C
E1 - Works flexibly with algebraic formulas to solve problems	transposes a formula to make an alternative variable the subject and solves linear equations	substitutes variables into given linear and non-linear formulas to find an unknown that may not be the subject and solves linear equations	substitutes variables into given formulas to find the subject and solves linear equations
E2 - Represents situations using matrices or spreadsheets and identifies size of matrices	models and analyses information accurately in matrices and determines the size of matrices	models information accurately in matrices or spreadsheet and determines the size of matrices	represents information in a matrix or spreadsheet and identifies the size of a matrix
E3 - Applies matrix calculations and techniques	applies matrix addition, subtraction and multiplication by a scalar, simple 'two by two' matrix multiplication with accuracy and uses technology to perform complex matrix calculations.	applies matrix addition, subtraction and multiplication by a scalar, and simple 'two by two' matrix multiplication with accuracy.	applies matrix addition, subtraction and multiplication by a scalar.

Criterion 6: interpret concepts and apply mathematical techniques to model and solve problems involving linear equations and finance in a variety of contexts

Criterion elements	Rating A	Rating B	Rating C
E1 - Solves problems involving wages, budgeting and unit cost	selects and applies formulas and techniques to calculate and solve complex unfamiliar financial problems involving wages, budgeting and unit cost and compares outcomes of alternative financial decisions	applies given formulas and techniques to calculate and solve complex familiar financial problems involving wages, budgeting and unit cost	uses given formulas and techniques to perform simple familiar financial calculations involving wages, budgeting and unit cost

Criterion elements	Rating A	Rating B	Rating C
E2 - Solves problems involving currency exchange rates and price to earnings ratios	selects and applies formulas and techniques to calculate and solve complex unfamiliar financial problems involving currency exchange rates and price to earnings ratios and compares outcomes of alternative financial decisions	applies given formulas and techniques to calculate and solve complex familiar financial problems involving currency exchange rates and price to earnings ratios	uses given formulas and techniques to perform simple familiar financial calculations involving currency exchange rates and price to earnings ratios
E3 - Solves problems involving simple and compound interest	selects and applies formulas and techniques to calculate and solve complex unfamiliar financial problems involving interest and compares outcomes of alternative financial decisions	applies given formulas and techniques to calculate and solve complex familiar financial problems involving interest	uses given formulas and techniques to perform simple familiar financial calculations involving interest
E4 - Models real-world situations with linear equations and solves simultaneous linear equations	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	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	forms a linear relationship from given data, constructs linear graphs, determines the gradient of a straight-line between two points and uses technology to solve simultaneous equations
E5 - Interpolates and extrapolates results graphically and algebraically	interpolates and extrapolates results both graphically and algebraically to make predictions of both variables.	interpolates and extrapolates results graphically to make predictions, and uses algebra to find y given x.	uses the equation of a straight line to calculate the result of one variable given another.

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

Criterion elements	Rating A	Rating B	Rating C
E1 - Collects, organises and classifies data	selects and applies an appropriate statistical process to collect and organise data and classifies data systematically and accurately 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	uses a statistical process to collect and organise data and classifies data as nominal, ordinal, discrete or continuous
E2 - Represents statistical information and performs associated calculations and techniques	represents statistical information accurately in tables and detailed plots and charts, performs associated techniques correctly and interprets results appropriately in context	represents statistical information accurately in tables, plots and charts, performs associated calculations and techniques and describes results in context	represents statistical information in tables, plots and charts and performs associated calculations and techniques
E3 - Interprets, explains 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.	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.	identifies the key features of graphs, recognises distribution of data sets in terms of shape and compares relationships between variables using appropriate techniques.

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

Criterion elements	Rating A	Rating B	Rating C
E1 - Solves real-world problems involving Pythagoras' theorem	solves complex problems involving Pythagoras' theorem, perimeters and areas, including composite shapes	solves problems involving Pythagoras' theorem, perimeters and areas	solves simple familiar problems involving Pythagoras' theorem, perimeters and areas
E2 - Selects and applies trigonometry concepts to solve problems	produces appropriate and clear diagrams, selects and correctly applies multiple formulas to derive information and solve complex problems involving length, angle, bearings and area of right-angled triangles	produces appropriate diagrams, selects and applies the correct formula to solve routine problems involving length, angle, bearings and area of right-angled triangles	uses given formulas, rules and diagrams to calculate length, angle and area of right-angled triangles
E3 - Solves problems involving perimeter, area, surface area and volume	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	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 problems involving perimeter and area of standard two-dimensional shapes and surface area and volume of standard three-dimensional objects
E4 - Applies linear scale factor to solve problems involving similarity	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.	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 a given scale factor to solve linear scale problems including obtaining measurements from and constructing scale diagrams.

Quality assurance

The following processes will be facilitated by TASC to ensure there is:

- a match between the standards of achievement specified in the course and the skills and knowledge demonstrated by individual learners
- community confidence in the integrity and meaning of the qualification.

Process

Each provider will submit bodies of learners' work sufficient to allow an assessment against a nominated range of criteria and the overall award to an annual review meeting organised by TASC. The work, while not necessarily be fully resolved, will be assessed by the provider against the range of nominated assessment criteria and the overall award. TASC will give each provider guidance regarding the selection of learners and the nominated criteria.

Each body of work that providers submit to the meeting will include sufficient and appropriate material for judgements to be made about the learner's standard of numeracy. The review meeting will give advice regarding the provider's interpretation and application of the selected criteria's standards to the evidence of student work. Providers are expected to act on this advice.

TASC may require providers to supply further samples of individual learners' work to determine that standards have been applied appropriately and/or undertake audits. The nature and scope of such requirements will be risk-based.

Qualifications and award requirements

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

Years 9-12 Learning will develop and regularly review and revise the curriculum. Course evaluation is informed by the experience of the course's implementation, delivery and assessment. More information about course evaluation can be found on the Years 11 and 12 website.

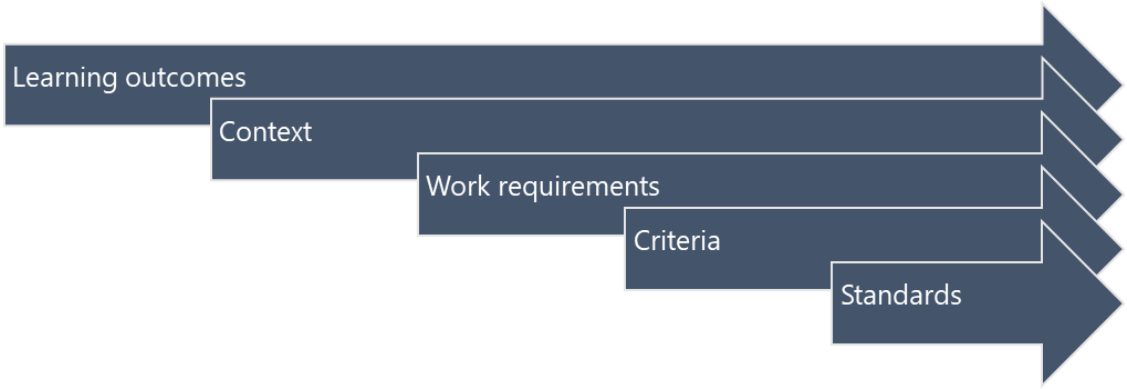
Course developer

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

Accreditation and version history

Version 1. Accredited on 14 April 2022 for use from 1 January 2023 to 31 December 2027.

Appendix 1 – Line of sight



Learning outcomes	Course content: module	Work requirements: module	Criterion	Criterion elements	General capabilities
1. communicate arguments and strategies, when solving mathematical and statistical problems, using appropriate mathematical or statistical language	1, 2, 3	1, 2, 3	1	1, 2, 3, 4	
2. plan, organise and manage learning in order to complete tasks and evaluate progress	1, 2, 3	1, 2, 3	2	1, 2, 3, 4, 5	
3. apply modelling, problem solving and mathematical reasoning to interpret, represent and justify the reasonableness of solutions to problems and answers to statistical questions	1	1	3	1, 2, 3, 4, 5	
4. choose and use technology appropriately and effectively	1	1	4	1, 2, 3, 4	
5. understand and apply concepts and techniques to model and solve problems involving algebra and matrices	2	2	5	1, 2, 3	
6. understand and apply concepts and techniques to model and solve problems involving linear equations and finance	2	2	6	1, 2, 3, 4, 5	
7. understand and apply the statistical investigation process in situations involving univariate data analysis	3	3	7	1, 2, 3	
8. understand and apply concepts and techniques in right-angled trigonometry, shape and measurement	3	3	8	1, 2, 3, 4	

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: Mathematics.

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. A small number of additional content descriptors has been added to provide greater opportunities for application of knowledge in the shape and measurement topic and the consumer arithmetic topic.

Summary of aligned content

Module	Topics	Australian Curriculum Framework Source
Module 1	Mathematical proficiencies of problem solving and reasoning	AC: Mathematics
Module 2	Consumer arithmetic Algebra and matrices Linear equations and their graphs	General Mathematics Unit 1 General Mathematics Unit 1 General Mathematics Unit 2
Module 3	Univariate data analysis and the statistical investigation process Shape and measurement Applications of trigonometry, right-angled trigonometry only	General Mathematics Unit 2 General Mathematics Unit 1 General Mathematics Unit 2

Appendix 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.

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

Module 1 work requirements specifications

Work requirement 1 of 2

Title of work requirement: Statistical investigation
Mode or 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 sets, or both. 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 one or multiple sets of data
- representing and analysing the data
- communication of drawn conclusions including describing any limitations or assumptions made.

The statistical investigation report response is to be a single handwritten or 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
- includes acknowledgements of information sourced from digital and non-digital sources and raw data as appendices, excluded from page count.

Size: 6-8 hours of dedicated class time in scope and sequence
Timing: This will be dependent upon the delivery of module 3, topic 1 in the scope and sequence
External agencies: involvement at teacher discretion
Relevant criteria:

- Criterion 1: E1, 2, 3, 4
- Criterion 2: E1, 2, 3, 4, 5
- Criterion 3: E1, 2, 3, 4, 5
- Criterion 4: E1, 2, 3, 4
- Criterion 7: E1, 2, 3

Work requirement 2 of 2

Title of work requirement: Mathematical modelling, problem solving task or both
Mode or format: extended response
Description: Learners will engage in problem solving or mathematical modelling or both, of one or more real-world contexts involving content drawn from module 2 topic 1 or 2, or module 3 topic 2. 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 also be used. These are designed to support the depth of understanding and engagement in the extended response.

Providers will determine the process for submission and timing of the mathematical modelling or problem solving task. As a guide, it is suggested that the extended response is to be submitted as a single handwritten or 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
- includes acknowledgements of information sourced from digital and non-digital sources and raw data as appendices, excluded from page count.

Size: 4-6 hours of dedicated class time in scope and sequence
Timing: This will be dependent upon the chosen context of the task and align with delivery of the contextually appropriate content in the scope and sequence.
External agencies: involvement at teacher discretion
Relevant criteria:

- Criterion 1: E1, 2, 3, 4
- Criterion 2: E1, 2, 3, 4, 5
- Criterion 3: E1, 2, 3, 4, 5
- Criterion 4: E1, 2, 3, 4

To reflect content drawn from module 2 topic 1 or 2, or module 3 topic 2, one or more of the following criteria will be relevant:

- Criterion 5: chosen elements as applicable to the context
- Criterion 6: chosen elements as applicable to the context
- Criterion 8: chosen elements as applicable to the context

Module 2 work requirements specifications

Work requirement 1 of 1

Title of work requirement: Application of concepts and techniques
Mode or format: connected series of short responses
Description: Learners will demonstrate their understanding of concepts and application of techniques to model and solve problems involving consumer arithmetic, linear equations and their graphs and matrices.
Size: 4-6 hours of class time
Timing: Spaced assessment opportunities are to be aligned to teaching and learning of specified content as outlined in the scope and sequence.
External agencies: involvement at teacher discretion
Relevant criteria:

- Criterion 1: E1, 2, 3, 4
- Criterion 2: E1, 2, 3, 4, 5
- Criterion 5: E1, 2, 3
- Criterion 6: E1, 2, 3, 4, 5

Module 3 work requirements specifications

Work requirement 1 of 1

Title of work requirement: Application of concepts and techniques
Mode or format: connected series of short responses

Description: Learners will demonstrate their understanding of concepts and application of techniques to model and solve problems, univariate data analysis, right-angled trigonometry, shape and measurement.
Size: 4-6 hours of class time
Timing: Spaced assessment opportunities aligned to teaching and learning of specified content as outlined in the scope and sequence.
External agencies: involvement at teacher discretion
Relevant criteria:

- Criterion 1: E1, 2, 3, 4
- Criterion 2: E1, 2, 3, 4, 5
- Criterion 7: E1, 2, 3
- Criterion 8: E1, 2, 3, 4

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
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.
algorithm	An algorithm is a precisely defined routine procedure that can be applied and systematically followed through to a conclusion.
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.
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.
bearing	The direction of a fixed point or the path of an object from the point of observation.
break-even point	The break-even point is the point at which revenue begins to exceed the cost of production.
categorical data	Data associated with a categorical variable is called categorical data.

Term	Definition
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.
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.
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.
continuous data	Data associated with a continuous variable is called continuous data.
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.

Term	Definition
cosine ratio	In any right-angled triangle, $$\cos\theta = \frac{adjacent}{hypotenuse}$$
discrete data	Discrete data is data associated with a discrete variable. Discrete data is sometimes called count data.
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.
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: $$i_{effective} = (1 + \frac{i}{n})^n - 1$$
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.
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.
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.

Term	Definition
Gradient	The gradient 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.
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.
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.
interquartile range	The interquartile range (IQR) is a measure of the spread within a numerical data set. It is equal to the upper quartile (Q_3) minus the lower quartile (Q_1); that is IQR = $Q_3 - Q_1$ The IQR is the width of an interval that contains the middle 50%, approximately, of the data values. To be exactly 50% the sample size must be a multiple of four.
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.
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.

Term	Definition
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. $x - y + 5 = 0$
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 gradient of the linear graph.
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.
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 $m \times q$.
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.

Term	Definition
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.
mode	The mode is the most frequently occurring value in a data set.
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.
piecewise-linear graph	A graph consisting of one or more none overlapping line segments. Sometimes called a line segment graph.
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.
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}.

Term	Definition
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.
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.
similar figures	Two geometric figures are similar if they are of the same shape but not necessarily of the same size
sine ratio	In any right-angled triangle, $\sin\theta = \frac{opposite}{hypotenuse}$
singular matrix	A matrix is singular if det A = 0. A singular matrix does not have a multiplicative inverse.

Term	Definition
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.
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.
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: $$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$$
step graph	A graph consisting of one or more non---overlapping horizontal line segments that follow a step-like pattern.
tangent ratio	In any right-angled triangle, $$\tan\theta = \frac{opposite}{adjacent}$$
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.

Term	Definition
zero matrix	A zero matrix is a matrix where all of its entries are zero.

Appendix 6 – Degree of difficulty of problems

Acknowledgement: The following material has been sourced with approval from the Queensland Curriculum and Assessment Authority curriculum.

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.