General Mathematics - Foundation

LEVEL 2	15 TCE CREDIT POINTS
COURSE CODE	MTG215114
COURSE SPAN	2019 — 2022
READING AND WRITING STANDARD	NO
MATHEMATICS STANDARD	YES
COMPUTERS AND INTERNET STANDARD	NO

This course was delivered in 2017. Use A-Z Courses to find the current version (if available).

Studying General Mathematics - Foundation provides the student with a breadth of mathematical experience that enables the recognition and application of mathematics to real-world situations

General Mathematics - Foundation is also designed for those learners who want to extend their mathematical skills beyond Year 10 level and provides the foundation for the further study of mathematics and related subjects.

Rationale

Mathematics is the study of order, relation and pattern. From its origins in counting and measuring, it has evolved in highly sophisticated and elegant ways to become the language used to describe much of the physical world. Mathematics also involves the study of ways of collecting and extracting information from data and of methods of using that information to describe and make predictions about the behaviour of aspects of the real world, in the face of uncertainty. Mathematics provides a framework for thinking and a means of communication that is powerful, logical, concise and precise. It impacts upon the daily life of people everywhere and helps them to understand the world in which they live and work.

Studying General Mathematics – Foundation provides the learner with a breadth of mathematical experience that enables the recognition and application of mathematics to real-world situations. General Mathematics – Foundation is also designed for those learners who want to extend their mathematical skills beyond Year 10 level and provides the foundation for the further study of mathematics and related subjects.

Aims

General Mathematics – Foundation aims to develop learners' understanding of the use to solve applied problems of concepts and techniques drawn from the content areas of linear equations, measurement and right angle trigonometry, consumer arithmetic, matrices, graphs and networks, and univariate data analysis. Skills in communicating mathematical arguments and strategies when solving problems, using appropriate mathematical and statistical language, will be developed. Learners will develop the capacity to choose and use technology appropriately.

Learning Outcomes

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

1. plan, organise and implement strategies to complete activities including practical tasks
2. understand the concepts and techniques used in consumer arithmetic, algebra, shape and measurement, univariate data analysis, matrices, graphs and networks
3. apply reasoning skills and solve practical problems in consumer arithmetic, algebra, shape and measurement, univariate data analysis, matrices, graphs and networks
4. implement the statistical investigation process in contexts requiring the comparisons of data collected for two or more groups
5. communicate their arguments and strategies when solving mathematical and statistical problems using appropriate mathematical or statistical language
6. interpret mathematical and statistical information and ascertain the reasonableness, reliability and validity of their solutions to problems and answers to statistical questions
7. choose and use technology appropriately

Access

It is recommended that learners attempting this course will have previously achieved a Grade 10 'C' in *Australian Curriculum: Mathematics*.

Pathways

The successful completion of General Mathematics – Foundation provides the foundation for the study of General Mathematics Level 3, and for many VET fields.

Studying General Mathematics – Foundation provides suitable mathematical support to the study of other Level 3 courses; for example, Physical Sciences, Business Studies, Sports Science and Health Science.

Resource Requirements

It is recommended that in studying this course, learners will have access to graphics calculators and become proficient in their use. Graphics calculators can be used in all aspects of this course, both in the development of concepts and as a tool for solving problems. Refer to *'What can I take to my exam?'* for the current TASC Calculator Policy that applies to Level 3 courses.

The use of computers is strongly recommended as an aid to students' learning and mathematical development. A range of software packages is appropriate and, in particular, spreadsheets should be used.

Course Size And Complexity

This course has a complexity level of 2.

At Level 2, the learner is expected to carry out tasks and activities that involve a range of knowledge and skills, including some basic theoretical and/or technical knowledge and skills. Limited judgement is required, such as making an appropriate selection from a range of given rules, guidelines or procedures. VET competencies at this level are often those characteristic of an AQF Certificate II.

This course has a size value of 15.

Course Content

For the content areas of General Mathematics – Foundation, the proficiency strands – Understanding; Fluency; Problem Solving; and Reasoning – build on students' learning in F-10 *Australian Curriculum: Mathematics*. Each of these proficiencies is essential, and all are mutually reinforcing. They are still very much applicable and should be inherent in the study of five (5) general mathematics topics:

- Linear equations and their graphs
- Consumer arithmetic
- Shape and measurement
- Univariate data analysis
- Matrices, graphs and networks.

Each mathematics topic is **compulsory**, however the order of delivery is not prescribed. These mathematics topics relate directly to Criteria 4 – 8. Criteria 1 – 3 apply to all five topics of mathematics.

This course has a design time of 150 hours. The suggested percentage of design time to be spent on each of the five topics of mathematics is indicated under each heading.

Investigations

For each topic of study, learners are to undertake a series of investigations applicable to the real world that will reinforce, and extend upon, the content of the General Mathematics - Foundation course.

Linear equations and their graphs
(*Approximately 20% of course design time*)

Algebraic skills

- substitute numerical values into linear and non-linear algebraic expressions, and evaluate
- find the value of a subject of the formula, given the value of the other pronumerals in the formula
- transpose a formula to make an alternative variable the subject.

Linear equations

- identify and solve linear equations
- develop a linear formula from a word description.

Straight-line graphs and their applications

- construct straight-line graphs both with and without the aid of technology
- determine the slope between two points in a number plane both algebraically and graphically
- determine the equation of the line joining two points in a number plane
- determine a straight line equation ($y = mx + c$) from its plot
- interpret, in context, the 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 in a practical context
- understand the motions of independent and a dependent variable
- plot scatter graphs and determine line of best fit 'by sight' or by using calculator regression technique
- use linear functions to make predictions (interpolation and extrapolation), including the implication that this has on reliability.

Simultaneous linear equations and their applications

- solve a pair of simultaneous linear equations, graphically and algebraically, using technology when appropriate
- solve practical problems that involve finding the point of intersection of two straight-line graphs
- determine the break-even point where cost and revenue are represented by linear equations.

Piece-wise linear graphs and step graphs

- sketch and interpret piece-wise linear graphs and step graphs, using technology when appropriate; for example, graphs of taxation schedules and parking fees.

Possible investigations

Investigate:

- the relationship between the height of a person ('burglar') and their footprint size
- the relationship between the length of a spring and the weight attached to it
- the relationship between the length of a candle and the time that it has been burning
- how the length of a piece of rope changes according to the number of knots tied in it
- the relationship between the length of a rubber bungee and the depth plummeted using a constant weight; for example, a Barbie doll.

Consumer arithmetic
(*Approximately 20% of course design time*)

Review of percentages

- arithmetic skills associated with percentages.

Applications of rates and percentages

- calculate weekly or monthly wage from a salary and 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 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
- calculate the dividend paid on a portfolio of shares and compare share values by calculating a price to earnings ratio.

Possible investigations

Investigate:

- wage sheets using spreadsheets
- a personal budget using spreadsheets
- costs of owning and running a car
- PAYG taxation
- consumer arithmetic applicable to catalogues, sales and discounts.

Shape and measurement
(*Approximately 20% of course design time*)

Pythagoras' Theorem

- review Pythagoras' Theorem and use to solve practical problems in two dimensions, and for simple applications in three dimensions.

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.

Similar figures and scale factors

- 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 such as maps and building plans to solve problems
- obtain a scale factor, and use to solve scaling problems involving the calculations of areas of similar figures
- obtain a scale factor, and use to solve scaling problems involving the surface areas and volumes of similar solids.

Applications of right angle trigonometry

- 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 two sides and an included angle $Area = \frac{1}{2}ab\sin C$
- solve practical problems involving the trigonometry of right-angled triangles, including angles of elevation and depression and using bearings in navigation.

Possible investigations

Investigate:

- maximising the volume of a tray cut from a single sheet of paper
- the amount of brass sheeting used to clad the Hobart Federation Hall
- perimeters and areas of real-world shapes; for example, tennis court, basketball/netball courts, running tracks, using estimation skills
- real-world ellipses
- my block of land
- trees height estimation.

Univariate data analysis
(*Approximately 20% of course design time*)

The statistical investigation process

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

Making sense of data relating to a single statistical variable

- classify a categorical variable as ordinal, such as income level (high, medium, low) or place of birth (Australia, overseas), and use tables and bar charts to organise and display ordinal data
- classify a numerical variable as discrete or continuous; for example, the number of rooms in a house is discrete, temperature in degrees Celsius is continuous
- with the aid of an appropriate graphical display (chosen from dot plot, stem plot, bar chart, or histogram), describe the distribution of a numerical data set in terms of shape (single versus multimodal, symmetric versus skewed, positive or negative), location and spread, and outliers, and interpret this information in the context of the data
- determine and interpret the mean, mode and median of a data set, being aware of the effect of extreme values
- determine the range, interquartile range (IQR) and standard deviation of a data set and use these statistics as measures of spread of a data distribution, being aware of their limitations.

Comparing data for a numerical variable across two or more groups

- construct and use single and parallel box plots (including the use of the $Q1 - 1.5 \times IQR$ and $Q3 + 1.5 \times IQR$ 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 differences observed in the context of the data, and report findings in a systematic and concise manner
- implement the statistical investigation process to answer questions that involve comparing data for a numerical variable across two or more groups.

Possible investigations

Investigate:

- reaction times to various stimuli; for example, knee jerk, catching reaction times, using box plots to compare male versus female

- world city weather using box plots to compare
- statistics by conducting a survey; for example, television or on-line viewing habits, phone usage, etc
- the age of people in the classroom, discussing the effect of including/excluding the teacher as a class member, by using statistics.

Matrices, graphs and networks
(*Approximately 20% of course design time*)

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, identify) and determine their size
- perform matrix addition, subtraction, multiplication by a scalar, and simple two-by-two matrix multiplication
- use technology to perform non-routine matrix calculations
- use technology to model and solve problems using matrices.

The definition of a graph, a network and associated terminology

- recognise and explain the meanings of the terms: graph, edge, vertex, loop, degree of a vertex, subgraph, simple graph, directed graph (digraph), arc, weighted graph and network
- identify practical situations that can be represented by a network and construct such networks
- construct an adjacency matrix from a given network or graph, and vice versa.

Planar graphs

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

Paths and cycles

- explain the meaning of the terms; walk, path/trail, closed walk, closed trail, cycle/circuit, connected path and bridge
- investigate and solve practical problems to determine the shortest path between two vertices in a weighted graph (trial-and-error methods only)
- explain the meaning of the terms; Eulerian graph, Eulerian trail, semi-Eulerian graph, semi-Eulerian trail and the conditions for their existence and use these concepts to investigate and solve practical problems; for example, the Konigsberg Bridge problem, planning a garbage collection route
- explain the meaning of the terms Hamiltonian paths, Hamiltonian cycles/circuits and semi-Hamiltonian graph, and use these concepts to investigate and solve practical problems.

Possible Investigations

Investigate:

- coding and decoding using matrices
- costing or pricing problems using matrices
- scoring scenarios in sports and talent competitions using matrices
- setting up a 'round robin' sporting competition as a network and matrix
- visiting the Melbourne Zoo, including certain attractions represented as a network, then analyse the distance walked
- European rail routes that include visiting certain cities, represented as a network, minimising the distance travelled.

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.

Providers offering this course must participate in quality assurance processes specified by TASC to ensure provider validity and comparability of standards across all awards. To learn more, see TASC's quality assurance processes and assessment information.

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

Quality Assurance Process

The following process 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 learners
- community confidence in the integrity and meaning of the qualification.

Process– TASC will verify that the provider's course delivery and assessment standards meet the course requirements and community expectations for fairness, integrity and validity of qualifications TASC issues. This will involve checking:

- learner attendance records; and
- course delivery plans (the sequence of course delivery/tasks and when assessments take place):
    - assessment instruments and rubrics (the 'rules' or marking guide used to judge achievement)
    - class records of assessment
    - examples of learner work that demonstrate the use of the marking guide
    - samples of current learner's work, including that related to any work requirements articulated in the course document
    - archived samples of individual learner's work sufficient to illustrate the borderline between that judged as 'Satisfactory Achievement' and 'Preliminary Achievement' award.

This process may also include interviews with past and present learners. It will be scheduled by TASC using a risk-based approach.

Criteria

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

1. communicate mathematical ideas and information
2. analysis: demonstrate mathematical reasoning, analysis and strategy in practical and problem solving situations
3. plan, organise and complete mathematical tasks
4. demonstrate knowledge and understanding of linear equations and graphs
5. demonstrate knowledge and understanding of consumer arithmetic
6. demonstrate knowledge and understanding of shape and measurement
7. demonstrate knowledge and understanding of univariate data analysis
8. demonstrate knowledge and understanding of matrices, graphs and networks

Standards

Criterion 1: communicate mathematical ideas and information

The learner:

Rating A	Rating B	Rating C
presents work that conveys a logical line of reasoning that has been followed between question and answer	presents work that conveys a line of reasoning that has been followed between question and answer	presents work that shows some of the mathematical processes that have been followed between question and answer
uses mathematical symbols correctly and follows mathematical conventions with precision to convey meaning	uses mathematical symbols and follows mathematical conventions	uses mathematical symbols and follows key mathematical conventions. There may be some errors or omissions in doing so
presents work with the final answer clearly identified, and articulated in terms of the question as required	presents work with the final answer clearly identified	presents work with the final answer apparent
presents work with correct use of units to convey mathematical information	presents final answer with correct use of units	presents final answer with use of units as required
presents detailed tables, graphs and diagrams that convey accurate meaning and precise information	presents detailed tables, graphs and diagrams that convey clear meaning	presents tables, graphs and diagrams that include some suitable annotations
adds a diagram to illustrate and explain a solution.	adds a diagram to illustrate a solution.	adds a diagram to a solution as directed.

Criterion 2: analysis: demonstrate mathematical reasoning, analysis and strategy in practical and problem solving situations

The learner:

Rating A	Rating B	Rating C
selects and applies an appropriate strategy, where several may exist, to solve routine and non-routine problems	selects and applies an appropriate strategy to solve routine and non-routine problems	identifies an appropriate strategy to solve routine problems
interprets solutions to routine and non-routine problems	interprets solutions to routine problems	describes solutions to routine problems
explains the reasonableness of results and solutions to routine and non-routine problems	describes the reasonableness of results and solutions to routine problems	describes the appropriateness of the results of calculations
uses calculator techniques as appropriate in routine and non-routine problems	chooses to use calculator techniques when appropriate to solve routine problems	uses calculator techniques to solve routine problems
given written instructions, sets up an experiment and gathers appropriate, accurate data	given written instructions, sets up an experiment and gathers appropriate data	given written/oral guidance, sets up an experiment and gathers data
describes the reliability and validity of solutions to problems and experimental results, stating possible causes of error	discusses the reliability and validity of solutions to problems and experimental results	recognises when a solution to a problem or an experimental result is grossly inappropriate
relates experimental findings to real-world phenomena,	relates experimental findings to	relates experimental findings

noting differences between the findings and what happens in the real world; draws conclusions with appropriate detail	real-world phenomena and draws conclusions using a template approach	to real-world phenomena
sources research data, and appropriately references it.	sources research data, and references it.	sources research data and references it by relating it to a given example.

Criterion 3: plan, organise and complete mathematical tasks

The learner:

Rating A	Rating B	Rating C
uses planning tools and strategies to achieve and manage activities within proposed times	uses planning tools to achieve objectives within proposed times	uses planning tools, with prompting, to achieve objectives within proposed times
divides a task into appropriate sub-tasks	divides a task into sub-tasks	divides a task into sub-tasks as directed
selects strategies and formulae to successfully complete complex problems	selects from a range of strategies and formulae to successfully complete problems	uses given strategies and formulae to successfully complete straight forward problems
monitors and analyses progress towards meeting goals and timelines, and plans future actions	monitors progress towards meeting goals and timelines	monitors progress towards meeting goals and timelines
meets specified timelines, and addresses all required elements of the task, mostly with a high degree of accuracy.	meets specified timelines, and addresses required task elements.	meets specified timelines, and addresses most elements of the required task.

Criterion 4: demonstrate knowledge and understanding of linear equations and graphs

The learner:

Rating A	Rating B	Rating C
identifies and solves linear equations, when given x or y	identifies and solves linear equations, when given x or y	solves linear equations for y, when given x
transposes a formula to make an alternative variable the subject	substitutes variables into given linear and non-linear formulae to find an unknown that may not be the subject	substitutes variables into given linear and non-linear formulae to find the subject
develops a linear equation that models a real-world situation, and explains the significance of the gradient and the y-intercept	develops a linear equation that models a real-world situation	forms a linear equation given the gradient and y-intercept
interprets and constructs simple step graphs and piecewise linear graphs, and considers problems involving comparisons with linear equations	interprets and constructs simple step graphs and piecewise linear graphs	interprets simple step graphs and piecewise linear graphs
graphically and algebraically interpolates and extrapolates to make predictions of both variables, and uses a templated approach to explain reliability and validity of results	graphically and algebraically interpolates and extrapolates to make predictions of both variables, recognising limitations of this method	graphically interpolates and extrapolates to make predictions, and uses algebra to find y given x
forms cost and revenue equations to graph and	forms cost and revenue equations to	uses cost and revenue

determine the break-even point, graphically and algebraically	graph and determine the break-even point	equations to graph and determine the break-even point
models, prepares and solves simultaneous equations both graphically and algebraically	solves simultaneous equations both graphically and algebraically	uses technology to solve simultaneous equations
determines the equation of a straight line between a scatter of points using the two points on the 'line of best fit'	determines the equation of a straight line between two points	determines the slope of a straight line between two points
draws a scatter plot of real-world data and uses a calculator to determine the regression line, understanding the significance of the gradient and the y-intercept.	draws a scatter plot of real-world data and uses a calculator to determine the regression line.	draws a scatter plot of real-world data.

Criterion 5: demonstrate knowledge and understanding of consumer arithmetic

The learner:

Rating A	Rating B	Rating C
calculates and compares routine and non-routine wages from a salary and from an hourly rate, and routine and non-routine payments from different government allowances and pensions	calculates and compares routine wages from a salary and from an hourly rate, and routine payments from different government allowances and pensions	calculates straight forward problems involving wages and government payments
prepares a personal budget involving a complex situation	prepares a personal budget taking into account fixed and discretionary spending	prepares a personal budget for a given income
calculates complex prices and values using the unit cost method	calculates prices and values using the unit cost method	calculates straight forward prices and values using the unit cost method
applies percentage increases and decreases in complex situations	expresses one number as a percentage of another, and increases or decreases an amount by a percentage (e.g. mark-ups and discounts)	converts between fractions, decimals and percentages, and finds the percentage of a given amount
performs simple interest calculations involving I, P, R and T in complex scenarios, such as 'days between' cases	performs simple interest calculations involving I, P, R and T, and the total amount in the account	performs simple interest calculations involving I
using technology, solves compound interest problems, where the periods are not annual, to find A, P, n, i, and the total interest added	solves compound interest problems, where the periods are not annual, to find A and P , and the total interest added	solves compound interest problems involving annual time periods to find A
uses currency exchange rates to determine the cost of a purchase involving currency exchange when the scenario involves fees and commission rates	uses currency exchange rates to determine and compare the cost of a purchase in different currencies	uses currency exchange rates to determine the cost of a purchase in another currency
calculates, compares and discusses the dividend on a range of portfolios of shares using price to earnings ratio.	calculates and compares the dividend on two or more portfolios of shares.	calculates the dividend paid on a portfolio of shares.

Criterion 6: demonstrate knowledge and understanding of shape and measurement

The learner:

Rating A	Rating B	Rating C
solves complex practical problems involving Pythagoras' Theorem, perimeters and areas, including composite shapes	solves practical problems involving Pythagoras' Theorem, perimeters and areas	solves straight forward practical problems involving Pythagoras' Theorem, perimeters and areas
obtains measurements from, and constructs, scale diagrams, including surface areas and volumes, using a variety of techniques	obtains measurements from, and constructs, scale diagrams, including maps, building plans, and areas of similar figures, using a variety of techniques	obtains measurements from, and constructs scale diagrams, in straight forward situations
obtains a scale factor and uses it to solve linear scale factor problems, including surface areas and volumes, using a variety of techniques	obtains a scale factor and uses it to solve linear scale factor problems, including maps, building plans and areas of similar figures, using a variety of techniques	given a scale factor, solves straight forward linear scale factor problems
solves routine and non-routine practical problems involving perimeters and areas of circles, sectors of circles, triangles, rectangles, parallelograms and composites	solves routine and non-routine practical problems involving perimeters and areas of circles, sectors of circles, triangles, rectangles and parallelograms	solves routine practical problems involving perimeters and areas of circles, triangles, rectangles and parallelograms
solves routine and non-routine practical problems involving the volume of three dimensional objects, including sphere, rectangular prisms, cones, and pyramids, including composites	solves routine and non-routine practical problems involving the volume of three dimensional objects, including sphere, rectangular prisms, cones, and pyramids	solves routine practical problems involving the volume of standard three dimensional objects
solves routine and non-routine problems, involving the surface areas of three dimensional objects, including sphere, rectangular prisms, cones, and pyramids, including composites	solves routine and non-routine problems, involving the surface areas of three dimensional objects, including sphere, rectangular prisms, cones, and pyramids	solves routine problems, involving the surface areas of standard three dimensional objects
constructs a diagram and uses right angled triangle trigonometry to calculate lengths and angles	given a complex diagram, uses right angled triangle trigonometry to calculate lengths and angles	given a straight forward diagram, uses right angled triangle trigonometry to calculate lengths (opposite or adjacent sides only) and angles
produces an accurate right angle triangle diagram to represent a complex scenario, including angles of elevation/depression and bearing problems	produces an accurate right angle triangle diagram to represent a scenario, including bearing problems	produces an accurate right angle triangle diagram to represent a straight forward scenario
selects and uses appropriate formulae to calculate the area of a triangle.	selects and uses appropriate formulae to calculate the area of a triangle.	uses a given formula and necessary information to calculate the area of a triangle.

Criterion 7: demonstrate knowledge and understanding of univariate data analysis

The learner:

Rating A	Rating B	Rating C
uses an appropriate statistical process to collect, organise and analyse data, and interprets and communicates results	uses an appropriate statistical process to collect, organise and analyse data	uses a statistical process to collect and organise data
classifies data as ordinal, discrete or continuous; prepares and analyses tables, dot plots, stem plots, bar charts and histograms	classifies data as ordinal, discrete or continuous; prepares tables, dot plots, stem plots, bar charts and histograms	classifies data as ordinal, discrete or continuous; prepare tables, given the appropriate form,

		prepares dot plots, stem plots, bar charts and histograms
given a graphical display, recognises the distribution of a data set is terms of shape, location and spread, and outliers, and interprets this in context of the data	given a graphical display, recognises the distribution of a data set is terms of shape, location and spread, and outliers	given a graphical display, recognises the distribution of a data set is terms of shape
calculates and interprets the mean, mode, median, standard deviation and range, and describes the effect of extreme values	calculates and interprets the mean, mode, median, standard deviation, and range	calculates the mean, mode, median, standard deviation and range
uses parallel box plots to compare groups in terms of median, IQR, range and outliers, interpreting and communicating the differences in context of the data	uses parallel box plots to compare groups in terms of median, IQR, range and outliers	constructs and scales single and parallel box plots
compares groups on a single numerical variable, using medians, means, IQRs, or standard deviations as appropriate, interpreting the differences in context. Reports the findings in a systematic and concise manner.	compares groups on a single numerical variable, using medians, means, IQRs, or standard deviations as appropriate, interpreting the differences in context	compares groups on a single numerical variable, using medians, means, IQRs, or standard deviations as appropriate
implements the statistical investigation process to compare the data for a numerical variable across two or more groups.	implements the statistical investigation process to compare the data for a numerical variable across two groups.	conducts a statistical investigation to compare the data for a numerical variable across two groups.

Criterion 8: demonstrate knowledge and understanding of matrices, graphs and networks

The learner:

Rating A	Rating B	Rating C
determines the size of a matrix, and performs matrix addition, subtraction and multiplication by a scalar, simple 'two by two' matrix multiplication, and uses technology to perform complex matrix calculations	determines the size of a matrix, and performs matrix addition, subtraction and multiplication by a scalar, and simple 'two by two' matrix multiplication	identifies the size of a matrix, and performs matrix addition, subtraction and multiplication by a scalar
models and solves a non-routine problem using matrices	models a non-routine situation involving matrices	represents a routine situation using matrices
explains the meanings of terms associated with graphs and networks	defines terms associated with graphs and networks	identifies terms associated with graphs and networks
constructs a network diagram that represents a real-world scenario, and calculates a series of path lengths	from given information, constructs a network diagram and calculates a series of path lengths	given a network diagram, calculates a series of path lengths
constructs networks from adjacency matrices, and vice versa, in complex scenarios	constructs networks from adjacency matrices, and vice versa, in non-directed network scenarios	constructs a network from an adjacency matrix in a straight forward problem
investigates and solves routine and non-routine practical problems that may involve Eulerian and/or Hamiltonian paths and circuits, using network concepts	investigates and solves routine practical problems that may involve Eulerian and/or Hamiltonian paths and circuits, using network concepts	investigates routine practical problems using network concepts
investigates complex problems involving weighted	investigates problems involving	investigates straight

graphs, including determining the shortest path between two vertices using trial and error techniques.	weighted graphs, including determining the shortest path between two vertices using trial and error techniques.	forward problems involving weighted graphs.

Qualifications Available

General Mathematics – Foundation Level 2 (with the award of):

EXCEPTIONAL ACHIEVEMENT

HIGH ACHIEVEMENT

COMMENDABLE ACHIEVEMENT

SATISFACTORY ACHIEVEMENT

PRELIMINARY ACHIEVEMENT

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 in General Mathematics – Foundation Level 2 are as follows:

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

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 ratings for a 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

The Department of Education's Curriculum Services will develop and regularly revise the curriculum. This evaluation will be informed by the experience of the course's implementation, delivery and assessment.

In addition, stakeholders may request Curriculum Services to review a particular aspect of an accredited course.

Requests for amendments to an accredited course will be forwarded by Curriculum Services to the Office of TASC for formal consideration.

Such requests for amendment will be considered in terms of the likely improvements to the outcomes for learners, possible consequences for delivery and assessment of the course, and alignment with Australian Curriculum materials.

A course is formally analysed prior to the expiry of its accreditation as part of the process to develop specifications to guide the development of any replacement course.

Expectations Defined By National Standards In Content Statements Developed by ACARA

The statements in this section, taken from documents endorsed by Education Ministers as the agreed and common base for course development, are to be used to define expectations for the meaning (nature, scope and level of demand) of relevant aspects of the sections in this document setting out course requirements, learning outcomes, the course content and standards in the assessment.

Unit 1 – Topic 1: Consumer Arithmetic

Applications of rates and percentages:

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

Use of spreadsheets:

- use a spreadsheet to display examples of the above computations when multiple or repeated computations are required; for example, preparing a wage-sheet displaying the weekly earnings of workers in a fast food store where hours of employment and hourly rates of pay may differ, preparing a budget, or investigating the potential cost of owning and operating a car over a year (ACMGM009)

Unit 1 – Topic 2: Algebra and Matrices

Linear and non-linear expressions:

- substitute numerical values into linear algebraic and simple non-linear algebraic expressions, and evaluate (ACMGM010)
- find the value of the subject of the formula, given the values of the other pronumerals in the formula (ACMGM011)
- use a spreadsheet 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 (ACMGM012)

Matrices and matrix arithmetic:

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

Unit 1 – Topic 3: Shape and Measurement

Pythagoras' Theorem:

- review Pythagoras' Theorem and use it to solve practical problems in two dimensions and for simple applications in three dimensions (ACMGM017)

Mensuration:

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

Similar figures and scale factors:

- review the conditions for similarity of two-dimensional figures, including similar triangles (ACMGM021)
- use the scale factor for two similar figures to solve linear scaling problems (ACMGM022)
- obtain measurements from scale drawings, such as maps or building plans, to solve problems (ACMGM023)
- obtain a scale factor and use it to solve scaling problems involving the calculation of the areas of similar figures (ACMGM024)
- obtain a scale factor and use it to solve scaling problems involving the calculation of surface areas and volumes of similar solids (ACMGM025)

Unit 2 – Topic 1: Univariate Data Analysis and the Statistical Investigation Process

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 (ACMGM026)

Making sense of data relating to a single statistical variable:

- classify a categorical variable as ordinal, such as income level (high, medium, low), or nominal, such as place of birth (Australia, overseas), and use tables and bar charts to organise and display the data (ACMGM027)
- classify a numerical variable as discrete, such as the number of rooms in a house, or continuous, such as the temperature in degrees Celsius (ACMGM028)
- with the aid of an appropriate graphical display (chosen from dot plot, stem plot, bar chart or histogram), describe the distribution of a numerical dataset in terms of modality (uni or multimodal), shape (symmetric versus positively or negatively skewed), location and spread and outliers, and interpret this information in the context of the data (ACMGM029)
- determine the mean and standard deviation of a dataset and use these statistics as measures of location and spread of a data distribution, being aware of their limitations (ACMGM030)

Comparing data for a numerical variable across two or more groups:

- construct and use parallel box plots (including the use of the $Q1 - 1.5 \times IQR$ and $Q3 + 1.5 \times IQR$
- 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 learners the fittest in the school? (ACMGM033)

Unit 2 – Topic 2: Applications of Trigonometry

Applications of trigonometry:

- review the use of the trigonometric ratios to find the length of an unknown side or the size of an unknown angle in a right-angled triangle (ACMGM034)
- determine the area of a triangle given two sides and an included angle by using the rule $Area = \frac{1}{2}ab\sin C,$ (.......) and solve related practical problems (ACMGM035)
- solve practical problems involving the trigonometry of right-angled (....) triangles, including problems involving angles of elevation and depression and the use of bearings in navigation (ACMGM037)

Unit 2 – Topic 3: Linear Equations and their Graphs

Linear equations:

- identify and solve linear equations (ACMGM038)
- develop a linear formula from a word description (ACMGM039)

Straight-line graphs and their applications:

- construct straight-line graphs both with and without the aid of technology (ACMGM040)
- determine the slope and intercepts of a straight-line graph from both its equation and its plot (ACMGM041)
- interpret, in context, the slope and intercept of a straight-line graph used to model and analyse a practical situation (ACMGM042)
- construct and analyse a straight-line graph to model a given linear relationship; for example, modelling the cost of filling a fuel tank of a car against the number of litres of petrol required (ACMGM043)

Simultaneous linear equations and their applications:

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

Piece-wise linear graphs and step graphs:

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

Unit 3 – Topic 3: Graphs and Networks

The definition of a graph and associated terminology:

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

Planar graphs:

- explain the meaning of the terms: planar graph, and face (ACMGM081)
- apply Euler's formula, $v + f - e = 2$, to solve problems relating to planar graphs (ACMGM082)

Paths and cycles:

- explain the meaning of the terms: walk, trail, path, closed walk, closed trail, cycle, connected graph, and bridge (ACMGM083)
- investigate and solve practical problems to determine the shortest path between two vertices in a weighted graph (by trial-and-error methods only) (ACMGM084)
- explain the meaning of the terms: Eulerian graph, Eulerian trail, semi-Eulerian graph, semi-Eulerian trail and the conditions for their existence, and use these concepts to investigate and solve practical problems; for example, the Königsberg Bridge problem, planning a garbage bin collection route (ACMGM085)
- explain the meaning of the terms: Hamiltonian graph and semi-Hamiltonian graph, and use these concepts to investigate and solve practical problems; for example, planning a sight-seeing tourist route around a city, the travelling-salesman problem (by trial-and-error methods only) (ACMGM086)

Accreditation

The accreditation period for this course is from 1 January 2019 until 31 December 2022.

During the accreditation period required amendments can be considered via established processes.

Should outcomes of the Years 9-12 Review process find this course unsuitable for inclusion in the Tasmanian senior secondary curriculum, its accreditation may be cancelled. Any such cancellation would not occur during an academic year.

Version History

Version 1 – Accredited on 7 August 2013 for use in 2014 to 2018. This course replaces Mathematics Applied – Foundation (MTA215109) that expired on 31 December 2013.

Version 1.a – Clarification of Aims section (24 March 2014).

Version 2 - Renewal of accreditation on 22 November 2018 for use from 1 January 2019 until 31 December 2021. Amendments to Version 1.a include refinements to standard elements in Criterion 1 and Criterion 2.

Version 2.a - Renewal of Accreditation on 14 July 2021 for the period 31 December 2021 until 31 December 2022, without amendments.

Appendix 1

GLOSSARY

Analyse
To examine, scrutinise, explore, review, consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences.

Communicates
Conveys knowledge and/or understandings to others.

Complex
Consisting of multiple interconnected parts or factors.

Data
The plural of datum; the measurement of an attribute, for example, the volume of gas or the type of rubber. This does not necessarily mean a single measurement: it may be the result of averaging several repeated measurements. Data may be quantitative or qualitative and be from primary or secondary sources.

Demonstrate
Give a practical exhibition as an explanation.

Describe
Give an account of characteristics or features.

Explain
Provide additional information that demonstrates understanding of reasoning and/or application.

Identify
Establish or indicate who or what someone or something is.

Investigate
Plan, collect and interpret data/information and draw conclusions.

Non-routine problems
Problems solved using procedures not previously encountered in prior.

Reasonableness
Reasonableness of conclusions or judgements: the extent to which a conclusion or judgement is sound and makes sense.

Recognise
Be aware of or acknowledge.

Reliability
The degree to which an assessment instrument or protocol consistently and repeatedly measures an attribute achieving similar results for the same population.

Routine problems
Problems solved using procedures encountered in prior learning activities.

Solve
Work out a correct solution to a problem.

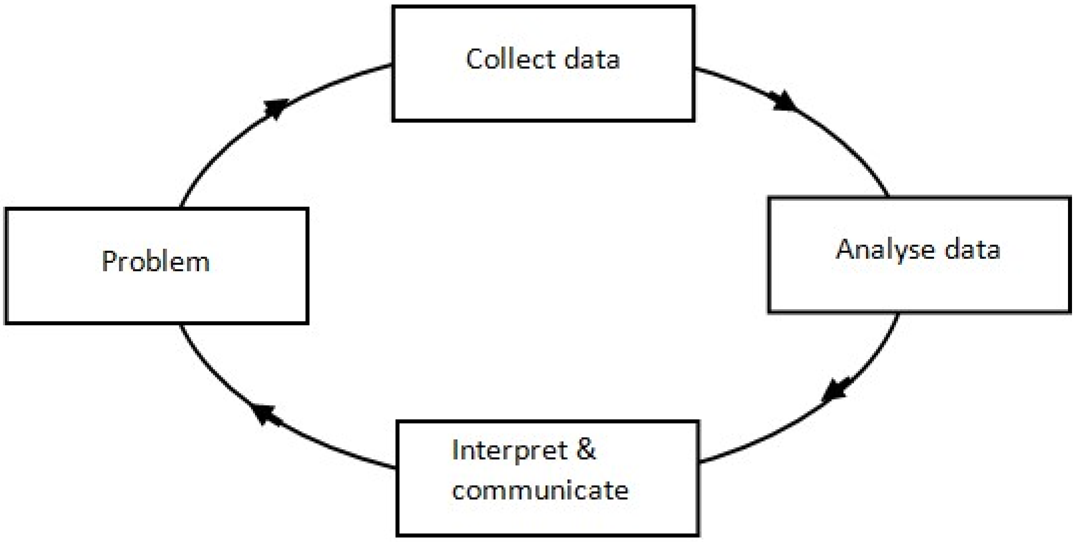
Statistical investigation process
The statistical investigation process is a cyclical process that begins with the need to solve a real world problem and aims to reflect the way statisticians work. One description of the statistical investigation process in terms of four steps is as follows.

Step 1. Clarify the problem and formulate one or more questions that can be answered with data.

Step 2. Design and implement a plan to collect or obtain appropriate data.

Step 3. Select and apply appropriate graphical or numerical techniques to analyse the data.

Step 4. Interpret the results of this analysis and relate the interpretation to the original question; communicate findings in a systematic and concise manner.



Understand
Perceive what is meant, grasp an idea, and to be thoroughly familiar with.

Validity
The extent to which tests measure what was intended; the extent to which data, inferences and actions produced from tests and other processes are accurate.

Supporting documents including external assessment material

- MTG215114CourseAccreditation.pdf (2017-07-21 01:05pm AEST)