Personal Futures

Mathematics

Essential Mathematics 2A
COURSE DOCUMENT

PHASE 4
DRAFT FOR
CONSULTATION

Catholic
Education
Tasmania

INDEPENDENT
SCHOOLS
TASMANIA

Years 9 to 12 Learning

Table of Contents

Essential Mathematics Size 150 hours – Level 2A

This course is a Level 2 component of the proposed Essential Mathematics suite.

Focus Area – Personal Futures

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.

Essential Mathematics Level 2A is a Personal Futures course.

Personal Futures courses prepare students to be independent young adults, able to lead healthy, fulfilled and balanced lives. Learning is highly personalised. Students develop strategies to optimise learning, make decisions, solve problems, set career and life goals, and pursue areas of strong personal interest. Personal Futures supports students to develop the required knowledge, skills and understandings to make informed choices that enhance their own and others' health and wellbeing. The inclusion of Personal Futures as a focus area responds to a range of contemporary research findings highlighting the importance of students having broad educational goals that include individual and collective wellbeing and opportunities for student agency as they navigate a complex and uncertain world.

Personal Futures courses have three key features that guide teaching and learning:
- theory and dialogue
- informed action
- reflection and dialogue.
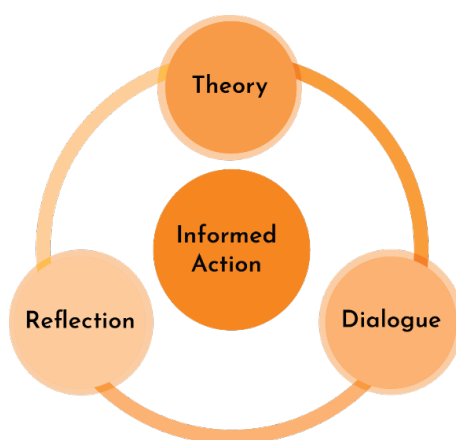
In this course learners will do this by:

- engaging with theory and concepts to build the theoretical understanding, background knowledge, rules and conventions of mathematics

- interacting and working with other people and engaging in mathematical discourse to explore ideas, reasoning and approaches

- identifying challenges and problems and using problem solving and mathematical reasoning to test and refine ideas take informed action and compare solutions

- reflecting on their own understanding, integrating prior knowledge and sharing solutions with others.

Rationale

Essential Mathematics Level 2A is one of two proposed Level 2 offerings in the Essential Mathematics suite of courses. Its pair, the proposed *Essential Mathematics* Level 2B provides learners with an alternate set of topics. The two courses provide breadth rather than progression of complexity and as such there is no defined order for completion of these courses and learners may choose to do one or both according to their personal interest and needs.

The *Essential Mathematics* Level 2A course enables students to develop their understanding of concepts and techniques drawn from strands of number, algebra, statistics, measurement and geometry which will assist them in making informed personal decisions in their daily lives including in workplace contexts. By undertaking *Essential Mathematics* Level 2A, learners will develop their ability to identify and solve problems in real contexts, in a range of workplace, personal, further learning and community settings. Learners will work collaboratively with others to generate ideas, and to find innovative approaches to engaging with mathematics. Learners will reflect on their ability to interpret, understand and apply these concepts and techniques in a variety of contexts.

This course will enable learners to develop their mathematical proficiency to the standard required to enter the workforce and participate effectively. This is a key factor in ensuring Tasmania and Australia's current and emerging needs are met as an economy where competing globally requires substantial numbers of proficient workers able to learn, adapt, create, interpret, analyse and apply mathematical information.

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

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

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

Learning Outcomes

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

1. communicate thinking, strategies and solutions using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply numeric techniques and algebraic processes to represent situations and solve problems
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems
5. act as creative, critical and reflective thinkers to assess ideas and take informed action
6. understand concepts and apply techniques involving proportion, finance and money management
7. understand concepts and apply techniques involving graphs and representations of data
8. understand concepts and apply techniques involving measurement of energy and mass, and time and motion.

Integration of General Capabilities and Cross-Curriculum Priorities

The general capabilities addressed specifically in this course are:

- Critical and creative thinking
- 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

Essential Mathematics Level 2A enables learners to develop essential mathematical skills and understanding. They will study percentages, rates and ratio, data representation and interpretation, and measurement of energy and mass, and time and motion.

Learners will solve problems, explain their reasoning and investigate, explore and model situations.

By discussing ideas with others, learners will reflect and extend their own thinking. They will apply their learning to make informed decisions and take on further challenges.

Pathways

The *Essential Mathematics* Level 2A course enables learning continuity from Year 10 Australian Curriculum: Mathematics, for learners who have achieved a 'D' rating or higher. Learners who have successfully undertaken the TASC-accredited course *Essential Skills - Maths* – MTN210114 or the Level 1 component of the proposed Essential Mathematics suite of courses could progress into Level 2 of this course. Additionally, learners who have completed the proposed *Essential Mathematics* Level 2B and wish to broaden their essential mathematical knowledge and understanding could enrol in this course.

Essential Mathematics Level 2A will provide the foundational technical knowledge that may be sufficient for further vocational education and training.

Course Requirements

Access
This course requires learners to collaborate with others.

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

Course Structure and Delivery

Structure

This course consists of three 50-hour modules.

Modules Available
Core Module 1: Application of percentages, rates and ratio, and budgeting
Core Module 2: Interpreting graphs, representing and comparing data
Core Module 3: Measurement of energy and mass, and time and motion

Delivery

There is no specific recommended delivery sequence for the modules

Course Content

Module 1 – Application of percentages, rates and ratio, and budgeting

This module contains two topics:

- Percentages, rates and ratio
- Budgeting and spreadsheets

'Percentages, rates and ratio' enables learners to engage with applications of percentages. This will support them to calculate, compare and interpret costs associated in varied practical contexts and engage with and use rates and ratios as a tool for comparison to solve problems in contexts including health, personal finance and travel.

'Budgeting and spreadsheets' builds on this knowledge and requires learners to consider the personal domestic expenses associated with purchasing and maintaining a vehicle, household utilities and to consider how they may establish a budget to account for these and other discretionary expenses from a given income.

Module 1 Learning Outcomes

The following Learning Outcomes are a focus of this module:

1. communicate thinking, strategies and solutions using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply numeric techniques and algebraic processes to represent situations and solve problems
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems
5. act as creative, critical and reflective thinkers to assess ideas and take informed action
6. understand concepts and apply techniques involving proportion, finance and money management.

Module 1 Content

Key knowledge and skills

Topic 1 - Percentages, rates and ratio:

- calculate a percentage of a given amount
- determine one amount expressed as a percentage of another
- apply percentage increase or decrease in various contexts – for example, calculating the goods and services tax (GST) payable on a range of goods and services, and calculating profit or loss in absolute and percentage terms

- identify common usage of rates – for example, km/h as a rate to describe speed, beats/minute as a rate to describe pulse
- convert units of rates occurring in practical situations to solve problems
- use rates to make comparisons – for example, using unit prices to compare best buys, comparing heart rates after exercise
- determine the overall change in a quantity following repeated percentage changes – for example, an increase of 10% followed by a decrease of 10%
- use, simplify and convert between units of rates, for example km/h and m/s, mL/min and L/h
- use rates to solve and describe practical work-based problems
  - use rates to make comparisons – for example, using unit prices to compare best buys, working with speed, comparing heart rates after exercise and considering target heart rate ranges during training
  - use rates to determine costs – for example, calculating the cost of a trade professional using rates per hour and call-out fees
  - work with speed as a rate, including interpreting distance-time graphs (travel graphs) and use them to solve problems related to speed, distance and time
  - calculate the amount of fuel used on a trip, given the fuel consumption rate, and compare fuel consumption statistics for various vehicles
- solve problems involving measurement of heart rates and blood pressure
  - describe heart rate as a rate expressed in beats per minute
  - measure and graph a person's heart rate over time under different conditions and identify mathematical trends
  - calculate target heart rate ranges during training
  - express blood pressure using measures of systolic pressure and diastolic pressure
  - measure blood pressure over time and under different conditions
  - use a blood pressure chart and interpret the 'healthiness' of a reading
- solve practical problems involving expressing a ratio in simplest form, finding the ratio of two quantities and dividing a quantity in a given ratio
  - calculating mixtures for building materials or cost per item
  - scaling recipes for use in a commercial setting.

Topic 2 - Budgeting and spreadsheets:
- interpret and use information about a household's electricity, water or gas usage and related charges and costs from household bills
- plan for the purchase of a car
  - investigate on-road costs for new and used vehicles, including sale price (or loan repayments), registration, insurance and stamp duty at current rates
  - consider sustainability when choosing a vehicle to purchase – for example, fuel consumption rates
  - calculate and compare the cost of purchasing different vehicles using a spreadsheet
- plan for the running and maintenance of a car
  - describe the different types of insurance available, including compulsory and non-compulsory third-party insurance, and comprehensive insurance
  - investigate other running costs associated with ownership of a vehicle – for example, cost of servicing, repairs and tyres
  - calculate and compare the cost of running different vehicles using a spreadsheet
- prepare a personal budget for a given income taking into account fixed and discretionary spending.

Module 1 Work Requirements Summary

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

This module includes a connected series of short responses that investigate many different aspects of proportion and finance as work requirements.

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

Module 1 Assessment

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

Module 2 – Interpreting graphs, representing and comparing data

This module contains two topics:

- Reading, interpreting and drawing graphs
- Data representation and interpretation

'Reading, interpreting and drawing graphs' will enable students to develop their ability to read and interpret information contained in two-way tables and different graph types, and to draw graphs. They will discuss and validate information portrayed in the media and routine texts.

'Data representation and interpretation' will enable learners to identify and display numerical and categorical statistical information and to identify and compare the suitability of different data representations according to the context. They will calculate and compare averages, investigate measures of central tendency and use informal language to describe the variation or range of data.

Module 2 Learning Outcomes

The following Learning Outcomes are a focus of this module:

1. communicate thinking, strategies and solutions using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply numeric techniques and algebraic processes to represent situations and solve problems
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems
5. act as creative, critical and reflective thinkers to assess ideas and take informed action
7. understand concepts and apply techniques involving graphs and representations of data

Module 2 Content

Key knowledge and skills

Topic 1 - Reading, interpreting and drawing graphs:

- interpret information presented in graphs, such as conversion graphs, line graphs, step graphs, column graphs and picture graphs
- interpret information presented in two-way tables
- discuss and interpret graphs found in the media and in factual texts
- determine which type of graph is best used to display a dataset
- use spreadsheets to tabulate and graph data
- draw a line graph to represent any data that demonstrates a continuous change, such as hourly temperature.

Topic 2 - Data representation and interpretation:

- identify examples of categorical data
- identify examples of numerical data
- display categorical data in tables and column graphs
- display numerical data as frequency distributions, dot plots, stem-and-leaf plots and histograms
- recognise and identify outliers
- compare the suitability of different methods of data presentation in real-world contexts
- identify the mode
- calculate measures of central tendency, the arithmetic mean and the median
- investigate the suitability of measures of central tendency in various real-world contexts
- investigate the effect of outliers on the mean and the median
- calculate and interpret quartiles, deciles and percentiles
- use informal ways of describing spread, such as spread out/dispersed, tightly packed, clusters, gaps, more/less dense regions, outliers
- calculate and interpret statistical measures of spread, such as the range, interquartile range and standard deviation
- investigate real-world examples from the media illustrating inappropriate uses, or misuses, of measures of central tendency and spread
- compare back-to-back stem-and-leaf plots for different datasets
- complete a five-number summary for different datasets
- construct box plots using a five-number summary
- compare the characteristics of the shape of histograms using symmetry, skewness and bimodality.

Module 2 Work Requirements Summary
The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes a series of connected short responses as work requirements.

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

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

Module 3 – Measurement of energy and mass, and time and motion
This module consists of two topics which should be taught concurrently:

- Practicalities of measurement
- Measurement of energy and mass, and time and motion

'Practicalities of measurement' provides opportunities to conduct measurements in practical situations and to calculate, compare and solve problems relating to these measurements. Implications regarding the practicalities of measurement including estimation, precision and accuracy will be investigated and analysed.

'Measurement of energy and mass, and time and motion' enables learners to use units of measure to describe, compare and calculate energy, mass, time, speed and distance and to interpret information in practical situations including these measurements. They will use appropriate units, convert between

units and investigate or compare alternative possibilities and discuss implications of human error involved in measurements.

Module 3 Learning Outcomes
The following Learning Outcomes are a focus of this module:

1. communicate thinking, strategies and solutions using appropriate mathematical or statistical language
2. plan, organise and manage learning in order to complete tasks and evaluate progress
3. apply numeric techniques and algebraic processes to represent situations and solve problems
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems
5. act as creative, critical and reflective thinkers to assess ideas and take informed action
8. understand concepts and apply techniques involving measurement of energy and mass, and time and motion

Module 3 Content
Key knowledge and skills
Topic 1 - Practicalities of measurement:
- review the use of different metric units of measurement including units of area, take measurements, and calculate conversions between common units of measurement, for example kilometres to metres or litres to millilitres
- calculate the absolute error of a reported measurement using
  $\text{Absolute error} = 1/2 \times \text{Precision}$ and state the corresponding limits of accuracy
  - find the limits of accuracy as given by:
    $\text{Upper bound} = \text{Measurement} + \text{Absolute error}$
    $\text{Lower bound} = \text{Measurement} - \text{Absolute error}$
  - investigate types of errors, eg human error or device limitations
  - calculate the percentage error of a reported measurement using:
    $$\text{Percentage error} = \frac{\text{Absolute error}}{\text{Measurement}} \times 100\%$$
- use standard form and standard metric prefixes in the context of measurement, with and without a required number of significant figures
  - standard prefixes include nano-, micro-, milli-, centi-, kilo-, mega-, giga- and tera-
- explore implications of human error / device limitations

Topic 2 - Measurement of energy and mass, and time and motion
This topic has two subtopics:

- Units of energy and mass
- Time and motion

Units of energy and mass:
- use units of energy to describe consumption of electricity, such as kilowatt hours
- use units of energy used for foods, including calories
- use units of energy to describe the amount of energy in activity, such as kilojoules
- convert from one unit of energy to another
- use metric units of mass, their abbreviations, conversions between them and appropriate choices of units including consideration of the importance of accuracy
- estimate and measure the mass of different objects

- solve problems involving household energy running costs and efficiency ratings
  - know that a watt (W) is the International System of Units (SI) derived unit of power and is equal to one joule per second
  - interpret the energy rating of household appliances and compare running costs of different models of the same type of appliance, considering costs of domestic electricity – for example, calculate the cost of running a 200-watt television for six hours if the average peak rate for domestic electricity is $0.15/kWh
  - investigate local council requirements for energy-efficient housing.

Time and motion:
- use units of time including conversion between units and fractional, digital and decimal representations
- represent time using 12-hour and 24-hour clocks
- calculate time intervals, such as time between, time ahead, time behind
- interpret timetables, such as bus, train and ferry timetables
- use several timetables and electronic technologies to plan the most time-efficient routes
- interpret complex timetables, such as tide charts, sunrise charts and moon phases
- compare the time taken to travel a specific distance with various modes of transport
- use scales to find distances, such as on maps – for example, road maps, street maps, bushwalking maps, online maps and cadastral maps
- optimise distances through trial-and-error and systematic methods – for example, shortest path, routes to visit all towns, and routes to use all roads
- identify the appropriate units for different activities, such as walking, running, swimming and flying
- calculate speed, distance or time using the formula speed = distance/time
- calculate the time or costs for a journey from distances estimated from maps
- interpret distance-versus-time graphs
- calculate and interpret average speed; for example, a 4-hour trip covering 250 km.

Module 3 Work Requirements Summary
The work requirements of a course are processes, products or performances that provide a significant demonstration of achievement that is measurable against the course's standards. Work requirements need not be the sole form of assessment for a module.

This module includes a module test as a work requirement.

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

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

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

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

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

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

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

Criteria

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

The assessment for *Essential Mathematics* Level 2A 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 numeric and algebraic techniques and processes to investigate and represent real-world situations and solve problems
4. apply mathematical reasoning to interpret information, justify chosen approaches and explain the reasonableness of solutions
5. create, apply and reflect on mathematical strategies to solve problems, refine personal decisions and take informed action
6. interpret concepts and apply mathematical techniques to solve problems involving proportion, finance and money management
7. interpret concepts and apply mathematical techniques to solve problems involving graphs and representations of data
8. interpret concepts and apply mathematical techniques to solve problems involving measurement of energy and mass, and time and motion

Standards

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

Standard Element	Rating C	Rating B	Rating A
E1 – communicates observations and judgements	communicates observations and judgements using appropriate mathematical and statistical terminology and language	communicates clear observations and judgements using appropriate mathematical and statistical terminology and language	communicates clear and reasoned observations and judgements using appropriate mathematical and statistical terminology and language

Standard Element	Rating C	Rating B	Rating A
E2 – uses conventions	uses mathematical conventions, systems and constructs based on definitions and rules when prompted	uses mathematical conventions, systems and constructs including manipulation and use of symbolic expressions and rules appropriately on most occasions	uses mathematical conventions, systems and constructs including manipulation and use of symbolic expressions, rules and formal systems accurately and purposefully
E3 – uses units and notation	uses correct units and notation when prompted to include them in an answer	presents the final answer with correct use of units and notation as required	presents work with correct use of units and notation throughout calculations to convey mathematical information
E4 – identifies solutions	presents work with the final answer apparent.	presents work with the final answer clearly identified.	presents work with the final answer clearly identified and articulated in terms of the questions where necessary.

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

Standard Element	Rating C	Rating B	Rating A
E1 – self-awareness	identifies own personal traits that promote and inhibit learning performance and understanding	recognises learning strengths and weaknesses and establishes processes to plan, monitor and assess understanding and performance	analyses learning strengths and weaknesses in order to establish processes used to plan, monitor and assess understanding and performance
E2 – time management	sets goals and timelines and monitors with support	sets goals and timelines and monitors progress	monitors and analyses progress towards meeting goals and timelines
E3 – planning and organisation	with support uses some tools to organise and plan in order to manage resources and complete set tasks	applies organisational, planning and self-management skills to manage resources and consistently complete tasks	selects and applies effective organisational, planning and self-management skills to manage resources and complete all learning tasks

Standard Element	Rating C	Rating B	Rating A
E4 - completion of individual and collaborative tasks	performs tasks as directed to contribute to the completion of individual and collaborative activities	performs tasks and demonstrates initiative when contributing to the completion of individual and collaborative activities	performs tasks, demonstrates initiative, and guides others in their contribution to the completion of individual and collaborative activities
E5 – self-monitoring	identifies own contribution to completion of collaborative activities.	describes own contribution to completion of collaborative activities.	explains own and other learners' contributions to completion of collaborative activities.

Criterion 3: apply numeric and algebraic techniques and processes to investigate and represent real-world situations and solve problems

Standard Element	Rating C	Rating B	Rating A
E1 – represents real-world situations	explores simple familiar real-world situations and frames them in mathematical terms	interprets complex familiar real-world situations and frames them in mathematical terms	interprets complex familiar and non-familiar real-world situations and frames them in mathematical terms
E2 – represents numbers and applies numeric techniques	identifies fractions, decimals, percentages and ratios and the relationships between them, and uses them accurately in simple calculations	converts between fractions, decimals, percentages and ratios, and uses them accurately in complex familiar calculations	moves flexibly between representations of fractions, decimals, percentages and ratios, and uses them accurately in complex unfamiliar calculations
E3 - uses standard algorithms and algebraic techniques to solve problems	uses standard algorithms for the four basic number operations correctly, and accurately substitutes variables into simple familiar equations to find an unknown that is the subject of the equation.	applies order of operations correctly, and accurately substitutes variables into complex familiar equations to find an unknown that is the subject of the equation.	applies order of operations correctly, and accurately substitutes variables into complex familiar equations to find an unknown that is not the subject of the equation by transposition.

Criterion 4: apply mathematical reasoning to interpret information, justify chosen approaches and explain the reasonableness of solutions

Standard Element	Rating C	Rating B	Rating A
E1 – makes inferences	identifies problem elements and makes inferences that may be able to be tested mathematically	identifies and explains problem elements to make informed inferences that can be tested mathematically	explores and links problem elements to make logical inferences that can be tested mathematically
E2 – analyses results	compares experimental findings to expected results in familiar contexts, and identifies possible reasons for differences	relates experimental findings to real-world phenomena, noting differences and identifying possible reasons for these differences	relates experimental findings to real-world phenomena, describing differences and analysing possible reasons for these differences
E3 – justifies chosen approaches	describes the mathematical applications and processes used to solve problems	describes and explains how the mathematical applications and processes used were appropriate for the context	justifies why the mathematical applications and processes used were appropriate for the context
E4 - explains reasonableness of solutions	describes the reasonableness of the results and solutions to routine problems.	explains the reasonableness of the results and solutions to routine and non-routine problems.	evaluates and explains the reasonableness of the results and solutions to routine and non-routine problems in a variety of contexts.

Criterion 5: create, apply and reflect on mathematical strategies to solve problems, refine personal decisions and take informed action

Standard Element	Rating C	Rating B	Rating A
E1 – creates mathematical strategies	generates ideas and approaches to solve problems	generates ideas and refines chosen approaches to solve problems	generates ideas and refines and tests chosen approaches to solve problems

Standard Element	Rating C	Rating B	Rating A
E2 – reflects and builds understanding	uses reflective thinking strategies to describe their own understanding of a situation in mathematical terms	uses reflective thinking strategies to identify other ideas or opinions and asks clarifying questions to build understanding about situations	uses reflective thinking strategies to assess ideas or opinions and responds to clarifying questions to build understanding about situations
E3 - reflects and refines personal thinking	describes when their thinking has changed	explains how their thinking has changed over time	evaluates why their thinking has changed over time
E4 –plans and takes informed action	plans and takes action in a given context.	plans and takes informed action in given contexts.	plans and takes informed action effectively in given and chosen contexts.

Criterion 6: interpret concepts and apply mathematical techniques to solve problems involving proportion, finance and money management

Standard Element	Rating C	Rating B	Rating A
E1 – calculate using percentages	calculates percentages of a given amount and determines one amount expressed as a percentage of another	determines the overall change in a quantity following multiple percentage increases and decreases to solve complex familiar problems	determines the overall change in a quantity following multiple percentage increases and decreases to solve complex unfamiliar problems
E2 – use rates and ratios to solve practical problems	uses rates to make comparisons and identifies and converts between units of rates to solve simple familiar problems	uses rates and ratios to calculate and solve simple familiar problems including, where relevant, converting between different forms	uses rates and ratios to calculate and solve complex familiar problems and makes comparisons between different quantities
E3 – investigate personal domestic expenses	calculates income from salary or wages, and identifies and calculates upfront and ongoing personal domestic expenses[†] in a chosen or given situation.	compares and calculates upfront and ongoing personal domestic expenses[†] by investigating different products and ways of purchasing.	prepares a personal budget for a given income and describes how personal domestic expenses[†] will be made, accounting for savings and discretionary spending.

[†] personal domestic expenses in this course include household electricity, water or gas usage and costs from household bills and purchase, running and ongoing maintenance costs of a vehicle

Criterion 7: interpret concepts and apply mathematical techniques to solve problems involving graphs and representations of data

Standard Element	Rating C	Rating B	Rating A
E1 – interpret information and graphs	identifies and describes information presented in two-way tables and graphs	interprets information presented in two-way tables and graphs and compares suitability of displays of datasets	interprets information presented in two-way tables and graphs and justifies which type of graph is best used to display a dataset
E2 – represent statistical information	represents statistical information in tables, plots and charts	represents statistical information accurately in tables, plots and charts	represents statistical information accurately in tables and detailed plots and charts
E3 – describes and compares spread or shape of data	uses informal language to describe spread and identifies outliers	calculates statistical measures of spread and describes the shape of histograms using formal terms	calculates and interprets statistical measures of spread and compares the shape of histograms using formal terms across multiple datasets
E4 – justify interpretation of data	calculates measures of central tendency, the arithmetic mean and median and statistical measures of spread.	investigates the suitability of measures of central tendency, and the effect of outliers on the mean and median and compares suitability of approaches.	interprets data using measures of central tendency, the arithmetic mean and median and statistical measures of spread, acknowledges the effect of outliers and justifies chosen methods.

Criterion 8: interpret concepts and apply mathematical techniques to solve problems involving measurement of energy and mass, and time and motion

Standard Element	Rating C	Rating B	Rating A
E1 – practicalities of measurement	calculates the absolute error of reported measurements and identifies possible causes of error	investigates types of errors, calculates errors as a percentage and identifies what percentage error is acceptable in a given context	describes possible implications of error, and explains what level of error is acceptable or not, in a given context

Standard Element	Rating C	Rating B	Rating A
E2 – use and convert between units	uses units of time, distance, speed, energy, and mass to describe and represent situations	uses and converts between units of energy, time and speed, and metric units of mass to solve simple problems	uses and converts between units of energy, time and speed, and metric units of mass to solve complex familiar problems
E3 – interpret and use timetables, graphs and charts	interprets timetables and maps to solve simple problems in situations involving energy or time and motion	interprets timetables, maps, graphs and charts to solve complex familiar problems including calculating cost of consumption (energy) or speed (time and motion)	interprets timetables, maps, graphs and charts to solve complex familiar problems including comparison and optimisation in situations involving consumption (energy) or travel (time and motion)
E4 – use scales to interpret and use maps	uses scales, and identifies key features of maps to calculate distance and solve simple problems involving cost or speed of travel.	use scales, and analyses key features of maps to calculate and compare distance of multiple routes and solve complex familiar problems involving cost or speed of travel.	uses scales, and systematic methods to calculate distance, speed and time taken, to solve complex familiar problems involving comparison and optimisation of travel.

Quality Assurance

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

Qualifications and Award Requirements

Level 2

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

The minimum requirements for an award are as follows:

EXCEPTIONAL ACHIEVEMENT (EA)
6 'A' ratings, 2 'B' 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 rating for a CA (Commendable Achievement) or SA (Satisfactory Achievement) award but who fails to show any evidence of achievement in one or more criteria ('z' notation) will be issued with a PA (Preliminary Achievement) award.

Course Evaluation

- This will be confirmed by time of accreditation.

Course Developer

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

Accreditation and Version History

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

Appendix 1 - Line of Sight
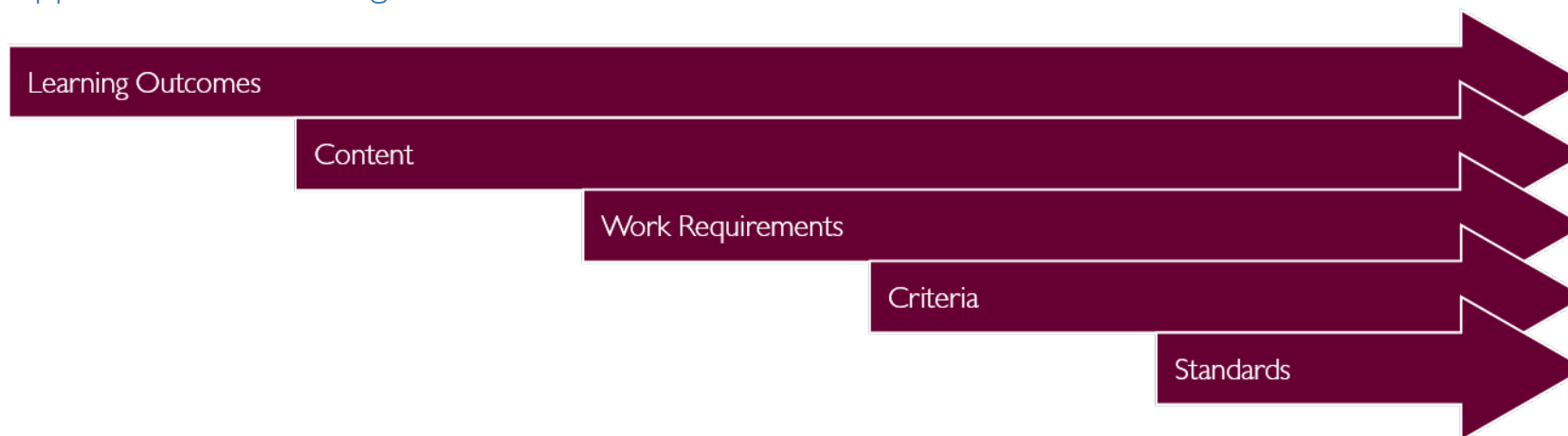
Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
1. communicate thinking, strategies and solutions using appropriate mathematical or statistical language	Module 1, 2, 3	Module 1, 2, 3	C 1	E 1, 2, 3, 4	GC:
2. plan, organise and manage learning in order to complete tasks and evaluate progress	Module 1, 2, 3	Module 1, 2, 3	C 2	E 1, 2, 3, 4, 5	GC:
3. apply numeric techniques and algebraic processes to represent situations and solve problems	Module 1, 2, 3	Module 1, 2, 3	C 3	E 1, 2, 3	GC:
4. apply reasoning skills to interpret mathematical and statistical information, and ascertain the reasonableness of solutions to problems	Module 1, 2, 3	Module 1, 2, 3	C 4	E 1, 2, 3, 4	GC:

Learning Outcomes	Course Content	Work Requirements	Criteria	Standards	General Capabilities (GC)
5. act as creative, critical and reflective thinkers to assess ideas and take informed action	Module 1, 2, 3	Module 1, 2, 3	C 5	E 1, 2, 3, 4	GC:
6. understand concepts and apply techniques involving proportion, finance and money management	Module 1	Module 1	C 6	E 1, 2, 3	GC:
7. understand concepts and apply techniques involving graphs and representations of data	Module 2	Module 2	C 7	E 1, 2, 3, 4	GC:
8. understand concepts and apply techniques involving measurement of energy and mass, and time and motion	Module 3	Module 3	C 8	E 1, 2, 3, 4	GC:

Appendix 2 - Alignment to Curriculum Frameworks

Links to Foundation to Year 10:

For all content areas of Essential 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. For all content areas, practice allows students to develop fluency in their skills. They will encounter opportunities for problem solving, such as finding the volume of a solid to enable the amount of liquid that is held in the container to be compared with what is written on the label, or finding the interest on an amount in order to be able to compare different types of loans. In Essential Mathematics, reasoning includes critically interpreting and analysing information represented through graphs, tables and other statistical representations to make informed decisions. The ability to transfer mathematical skills between contexts is a vital part of learning in this subject. For example, familiarity with the concept of a rate enables students to solve a wide range of practical problems, such as fuel consumption, travel times, interest payments, taxation and population growth.

Alignment to Australian Curriculum Senior Secondary Framework:

Almost all content in this course is drawn from the Australian Curriculum Senior Secondary Framework: Essential Mathematics. The content selected for this course comes from Units 1 and 2 and in most cases content descriptors are used verbatim. The content covered in the subtopic 'Calculations' from Essential Mathematics Unit 1 Topic 1 and 'Algebra' in Essential Mathematics Unit 1 Topic 3 is embedded throughout the course and is assessed across the course content under Criterion 3.

Summary of Aligned Content:

Module	Topics	Australian Curriculum Framework Source or otherwise
Module 1	Percentages, rates and ratio	Essential Mathematics Unit 1 Topic 1 and Essential Mathematics Unit 2 Topic 2 and 3
	Budgeting and spreadsheets	NSW Mathematics Standard Year 11
Module 2	Reading, interpreting and drawing graphs	Essential Mathematics Unit 1 Topic 4
	Data representation and interpretation	Essential Mathematics Unit 2 Topic 1
Module 3	Practicalities of measurement	NSW Mathematics Standard Year 11
	Measurement of energy and mass, and time and motion	Essential Mathematics Unit 1 Topic 2 and Essential Mathematics Unit 2 Topic 4

Appendix 3 - Work Requirements

Module 1 Work Requirements Specifications

Focus Area: Personal Futures

Title of Work Requirement: Proportion and Finance

Format: Connected series of short responses

Description: This series of short responses will focus on the interpretation, analysis, examination and evaluation of ideas and information in response to questions, situations or stimuli relating to percentages, rates and ratio, finance and money management.

Learners will be tasked with analysing and calculating percentage changes, including calculating goods and service tax. They will identify and use rates and ratio to solve practical problems and make comparisons using different rates or ratios. To demonstrate mathematical reasoning, learners will make recommendations to address problems asked in given situations.

Learners will take informed action by applying knowledge of percentages, rates and ratio to a given context involving comparison and calculation of costs associated with upfront and ongoing personal domestic expenses.

Learners should be given opportunities to work collaboratively to generate, refine and test ideas and strategies and must reflect on how their own thinking has changed after engaging in collaborative discussion. Learners may complete the work requirement in collaborative groups; however, in this situation they must clearly define which work is their own.

Size: 8-10 hours of class time

Timing: Devoted class time should be provided throughout the module at the teachers' discretion

External Agencies: At provider discretion

Relevant Criteria:

- Criterion 1: all elements
- Criterion 2: E1, E2, E3 and where relevant E4 and E5
- Criterion 3: all elements
- Criterion 4: E1, E3
- Criterion 5: all elements
- Criterion 6: all elements

Module 2 Work Requirements Specifications

Focus Area: Personal Futures

Title of Work Requirement: Data representation and interpretation

Format: Connected series of short responses

Description: Learners will work individually or in small groups to provide a series of connected short responses to statistical questions around a given or chosen context. The series of responses must enable each individual learner to demonstrate their ability to represent, compare and analyse situations involving both numerical and categorical data.

Additionally, learners should record reflections on how their thinking was challenged and/or confirmed through collaborative discussion and problem-solving, and in response to their results. This reflection can take any format but must be submitted as part of the work requirement for assessment.

Size: 6-8 hours of class time

Timing: Devoted class time should be provided throughout the module at the teachers' discretion.

External Agencies: At provider discretion

Relevant Criteria:

- Criterion 1: all elements
- Criterion 2: chosen elements at teacher discretion
- Criterion 3: all elements
- Criterion 4: E1, E3
- Criterion 5: all elements
- Criterion 7: all elements

Module 3 Work Requirements Specifications

Focus Area: Personal Futures

Title of Work Requirement: Measurement Test

Format: Short responses

Description: Learners will complete a series of connected short responses to investigate, interpret and use timetables, graphs and charts and to use scales to interpret and use maps. Within the series of responses, learners will calculate, solve problems and convert between units of energy, time and speed and metric units of mass. Learners will calculate errors in measurement and use mathematical reasoning to describe the possible implications of these errors and what is acceptable or not in given contexts.

Size: 2 hours of class time

Timing: Devoted class time should be provided throughout the module at the teachers' discretion.

External Agencies: At provider discretion

Relevant Criteria:

- Criterion 1: all elements
- Criterion 3: all elements
- Criterion 4: all elements
- Criterion 8: all elements

Appendix 4 – General Capabilities and Cross-Curriculum Priorities

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

General Capabilities:

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

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

The general capabilities include:

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

Cross-Curriculum Priorities:

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

The cross-curriculum priorities include:

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

Appendix 5 – Glossary

Term	Definition	Source Acknowledgement	Course Context
absolute error	The absolute error of a measurement is half of the smallest unit on the measuring device. The smallest unit is called the precision of the device.	NESA	Essential Mathematics 2A: • Module 3 – Practicalities of measurement Essential Mathematics 2B: • Module 3 – Perimeter, area, volume and capacity
accuracy	The condition or quality of being true, correct or exact; freedom from error or defect; precision or exactness; correctness; in science, the extent to which a measurement result represents the quantity it purports to measure; an accurate measurement result includes an estimate of the true value and an estimate of the uncertainty	QCAA	Essential Mathematics 2A: • Module 3 – Practicalities of measurement Essential Mathematics 2B: • Module 3 – Perimeter, area, volume and capacity
algorithm	An algorithm is a precisely defined routine procedure that can be applied and systematically followed through to a conclusion.	ACARA	Essential Mathematics 1, 2A and 2B
association	A general term used to describe the relationship between two (or more) variables. The term association is often used interchangeably with the term correlation. The latter tends to be usedwhen referring to the strength of a linear relationship between two numerical variables.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis

Term	Definition	Source Acknowledgement	Course Context
associative operations	Operations are associative if the order in which operations take place does not affect the result. For example, addition of numbers is associative, since the order in which they are added does not change their sum. The corresponding associative law is: $(a + b) + c = a + (b + c)$ for all numbers a, b and c. Multiplication is also associative, as the product of the numbers does not vary with the order of their multiplication. The corresponding associative law is: $(ab)c = a(bc)$ for all numbers a, b and c. Subtraction and division are not associative, as the order of operations changes the value of the expression.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value
average speed	Average speed is the total distance travelled divided by the total time taken.	ACARA	Essential Mathematics 2A: • Module 3 – Units of energy and mass, time and motion
array	An ordered collection of objects or numbers	QCAA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
back-to-back stem-and-leaf plots	A back-to-back stem and leaf plot is a method for comparing two data distributions attaching two sets of 'leaves' to the same 'stem' in a stem and leaf plot.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation

Term	Definition	Source Acknowledgement	Course Context
bias	Bias generally refers to a systematic favouring of certain outcomes more than others, due to unfair influence (knowingly or otherwise).	NESA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
bimodality	A dataset is bimodal if it has two modes; this means that there is not a single data value that occurs with the highest frequency, but two data values have the same and highest frequency	QCAA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
break-even point	The break-even point is the point at which revenue begins to exceed the cost of production.	ACARA	Essential Mathematics 2B: • Module 2 – Graphs and modelling
calculates	Determine or find (e.g. a number, answer) by using mathematical processes; obtain a numerical answer showing the relevant stages in the working; ascertain/determine from given facts, figures or information	QCAA	Essential Mathematics 1, 2A and 2B
Cartesian plane	Two intersecting number lines are taken intersecting at right angles at their origins to form the axes of the coordinate system; the plane is divided into four quadrants by these perpendicular axes, called the x-axis (horizontal line) and the y-axis (vertical line); the position of any point in the plane can be represented by an ordered pair of numbers (x, y); these ordered pairs are called the coordinates of the point; this is called the Cartesian coordinate system; the plane is called the Cartesian plane	QCAA	Essential Mathematics 2B: • Module 2 – Graphs and modelling

Term	Definition	Source Acknowledgement	Course Context
categorical data	Data associated with a categorical variable is called categorical data.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
categorical variable	A categorical variable is a variable whose values are categories. Examples include blood group (A, B, AB or O) or house construction type (brick, concrete, timber, steel, other). Categories may have numerical labels, e.g. the numbers worn by player in a sporting team, but these labels have no numerical significance, they merely serve as labels.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
census	A population is the complete set of individuals, objects, places etc. that we want information about. A census is an attempt to collect information about the entire population.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis

Term	Definition	Source Acknowledgement	Course Context
commutative operations	Operations are commutative if the order in which terms are given does not affect the result. The commutative law for addition is: $a + b = b + a$, for all numbers a and b. For example, 3+5=5+3. The commutative law for multiplication is: $ab = ba$, for all numbers a and b. For example, 4×7=7×4. Subtraction and division are not commutative because for example 5-3≠3-5 and 12÷4≠4÷12.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value
conversion	A change in the form or units of an expression	QCAA	Essential Mathematics 2B: • Module 2 – Graphs and modelling

Term	Definition	Source Acknowledgement	Course Context
compound interest	The interest earned when each successive interest payment is added to the principal for the purpose of calculating the next interest payment. e.g. if the principal (P) earns compound interest (A) at the interest rate (i) expressed as a percentage per period, then after (n) compounding periods the total amount accrued is: $$A = P(1 + i)^n$$ When plotted on a graph, the total amount accrued is shown to grow exponentially.	QCAA	Essential Mathematics 2B: • Module 1 – Earning and managing money
correlation	Correlation is a measure of the strength of the linear relationship between two variables.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
correlation coefficient	The correlation coefficient (r) is a measure of the strength of the liner relationship between a pair of variables.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
decile	Any of the nine values that divide a ranked dataset into ten equal parts	QCAA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation

Term	Definition	Source Acknowledgement	Course Context
distributive law	Multiplication of numbers is said to be 'distributive over addition', because the product of one number with the sum of two others equals the sum of the products of the first number with each of the others. For example: the product of 3 with (4+5) gives the same result as the sum of 3×4 and 3×5: 3×(4+5)=3×9=27 and 3×4+3×5=12+15=27 This distributive law is expressed algebraically as follows: $a(b + c) = ab + ac$, for all numbers a, b and c.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value
elevation views	Elevation views are scale drawings showing what a building looks like from the front, back and sides.	NESA	Essential Mathematics 2B: • Module 3 – Scales, plans and models
equivalence	Two expressions are said to be equivalent if they are equal in value.		Essential Mathematics 1: • Module 1 – Number and place value
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 quiteerroneous predictions.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
face (shape)	Any of the individual flat surfaces of a solid object.	mathsisfun.com	Essential Mathematics 2B: • Module 3 – Scales, plans and models

Term	Definition	Source Acknowledgement	Course Context
five-number summary	A five-number summary is a method of summarising a set of data using the minimum value, the lower or first-quartile (Q_1), the median, the upper or third-quartile (Q_3) and the maximum value. Forms the basis for a boxplot.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
Goods and Services Tax (GST)	The Goods and Services Tax (GST) is a broad sales tax of 10% on most goods and services and other items sold or consumed in Australia.	QCAA	Essential Mathematics 2B: • Module 1 – Earning and managing money
gradient (slope)	The gradient or slope of a line describes its steepness, incline, or grade. Gradient is normally described by the ratio of the "rise" divided by the "run" between two points on a line.	ACARA	Essential Mathematics 2B: • Module 2 – Graphs and modelling
histogram	A histogram is a statistical graph for displaying the frequency distribution of continuous data. A histogram is a graphical representation of the information contained in a frequency table. In a histogram, class frequencies are represented by the areas of rectangles centred on each class interval. The class frequency is proportional to the rectangle's height when the class intervals are all of equal width.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
integer	The integers are the ''whole numbers'' including those with negative sign ····-3, -2, -1, 0, 1, 2, 3····. In Latin, the word integer means ''whole.'' The set of integers is usually denoted by Z. Integers are basic building blocks in mathematics.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value

Term	Definition	Source Acknowledgement	Course Context
interpolation	In the context of fitting a linear relationship between two variables, interpolation occurs when the fitted model is used to make predictions using values of the explanatory variable that lie within the range of the original data.	ACARA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
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.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
kilowatt hour (kWh)	The kilowatt hour is a unit of energy equal to 1000 watt hours or 3.6 megajoules. The kilowatt hour is most commonly known as a billing unit for energy delivered to consumers by electric utilities.	ACARA	Essential Mathematics 2A: • Module 3 – Units of energy and mass, time and motion
megajoule (MJ)	A joule is the SI unit of work. The megajoule (MJ) is equal to one million joules.	ACARA	Essential Mathematics 2A: • Module 3 – Units of energy and mass, time and motion
mean	The arithmetic mean, $\bar{x}$, of a list of numbers is the sum of the data values divided by the number of values in the list. In everyday language, the arithmetic mean is commonly called the average.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation

Term	Definition	Source Acknowledgement	Course Context
measures of central tendency	Measures of central tendency are the values about which the set of data values for a particular variable are scattered. They are a measure of the centre or location of the data. The two most common measures of central tendency are the mean and the median.	NESA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
measures of spread	Measures of spread describe how similar or varied the set of data values are for a particular variable. Common measures of spread include the range, combinations of quantiles (deciles, quartiles, percentiles), the interquartile range, variance and standard deviation.	NESA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
median	The median is the value in a set of ordered set of data values that divides the data into two parts of equal size. When there are an odd number of data values, the median is the middle value. When there is an even number of data values, the median is the arithmetic mean of the two central values.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
mode	The mode is the most frequently occurring value is a data set.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation

Term	Definition	Source Acknowledgement	Course Context
order of operations	The order of performing mathematical operations: 1. evaluate brackets or grouping symbols first 2. evaluate any powers and roots 3. working left to right, evaluate any multiplication and division 4. working left to right, evaluate any addition or subtraction (may also be known as BODMAS, BIDMAS, BEDMAS, etc.)	QCAA	Essential Mathematics 1, 2A and 2B
outlier	An outlier in a set of data is an observation that appears to be inconsistent with the remainder of that set of data. An outlier is a surprising observation.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
parallel box plots	Parallel box plots are used to visually compare the five-number summaries of two or more datasets;	QCAA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
partitioning	Partitioning means dividing a quantity into parts. In the early years, it commonly refers to the ability to think about numbers as made up of two parts, such as, 10 is 8 and 2. In later years it refers to dividing both continuous and discrete quantities into equal parts.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value
percentage error	The percentage error of a measurement is the absolute error expressed as a percentage of the recorded measurement.	NESA	Essential Mathematics 2A: • Module 3 – Practicalities of measurement Essential Mathematics 2B: • Module 3 – Perimeter, area, volume and capacity

Term	Definition	Source Acknowledgement	Course Context
picture graph	A picture graph is a statistical graph for organising and displaying categorical data.	ACARA	Essential Mathematics 1: • Module 2 – Data collection, representation and interpretation
piecework	Piecework is employment where a worker is paid a fixed rate for each item produced or action performed regardless of the time taken.	NESA	Essential Mathematics 2B: • Module 1 – Earning and managing money
place value	Place value refers to the value of a digit as determined by its position in a number, relative to the ones (or units) place. For integers, the ones place is occupied by the rightmost digit in the number. The value of the next column (the first after the decimal point) represents tenths of ones and this continues with the value of each corresponding digit being representative of a value 10 times smaller than the previous. For example, in the number 2 594.6 the 4 denotes 4 ones, the 9 denotes 90 ones or 9 tens, the 5 denotes 500 ones or 5 hundreds, the 2 denotes 2000 ones or 2 thousands, and the 6 denotes $\frac{6}{10}$ of a one or 6 tenths.	ACARA	Essential Mathematics 1: • Module 1 – Number and place value
precision	Precision refers to how close the measured values are **to each other**. Precision does not account for how close the measured values are to the actual (expected) value.	mathsisfun.com	Essential Mathematics 2A: • Module 3 – Practicalities of measurement Essential Mathematics 2B: • Module 3 – Perimeter, area, volume and capacity

Term	Definition	Source Acknowledgement	Course Context
probability	The likelihood or chance of something; the relative frequency of the occurrence of an event as measured by the ratio of the number of cases or alternatives favourable to the event to the total number of cases or alternatives	QCAA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
quartile	The quartiles of a ranked set of data values are the three points that divide the dataset into four equal groups.	QCAA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
radial survey	A radial survey can be used to measure the area of an irregular block of land. In a radial survey, a central point is chosen within the block of land and measurements are taken along intervals from this point to each vertex. The angles between these intervals at the central point are also measured and recorded.	NESA	Essential Mathematics 2B: • Module 3 – Scales, plans and models
range	The range is the difference between the largest and smallest observations in a data set.	ACARA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation
rate	A particular kind of ratio in which the two quantities are measured in different units; for example, the ratio of distance to time, known as speed, is a rate because distance and time are measured in different units (such as kilometres and hours); the value of the rate depends on the units in which the quantities are expressed	QCAA	Essential Mathematics 1, 2A and 2B
ratio	A comparison of two quantities of the same kind; for example, if a recipe uses 2 cups of milk and 3 cups of flour, the ratio of milk to flour is 2 is to 3. This can also be written with a colon, 2:3, or as a fraction, $\frac{2}{3}$	QCAA	Essential Mathematics 1, 2A and 2B

Term	Definition	Source Acknowledgement	Course Context
ray	A ray is the part of a line that starts at a point and continues in a particular direction to infinity. Rays are usually depicted with an arrow-head, which indicates the direction in which the line continues to infinity.	ACARA	Essential Mathematics 2B: • Module 3 – Scales, plans and models
reaction time	The time a person takes to react to a situation. For example: time taken for a person to press the brake when a situation requires them to stop	ACARA	Essential Mathematics 2A: • Module 3 – Units of energy and mass, time and motion
recurrence relation	A recurrence relation is an equation that recursively defines a sequence; that is, once one or more initial terms are given, each further term of the sequence is defined as a function of the preceding terms.	NESA	Essential Mathematics 2B: • Module 1 – Interest and depreciation
recurring decimal	Non-terminating decimals may be recurring, that is, contain a pattern of digits that repeats indefinitely after a certain number of places.	ACARA	Essential Mathematics 1: • Module 1 – Fractions, decimals and percentages
reducing balance loan	A reducing balance loan is a compound interest loan where the loan is repaid by making regular payments and the interest paid is calculated on the amount still owing (the reducing balance of loan) after each payment is made.	NESA	Essential Mathematics 2B: • Module 1 – Interest and depreciation
reflection	To reflect the point A in an axis of reflection, a line is drawn at right angles to the axis of reflection and the point A' is marked at the same distance from the axis of reflection as A, but on the other side. The point A' is called the reflection image of A. A reflection is a transformation that moves each point to its reflection image.	ACARA	Essential Mathematics 1: • Module 3 – Geometric reasoning

Term	Definition	Source Acknowledgement	Course Context
relative frequency	The number of items of a certain type divided by the number of all the items considered	QCAA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
sample	Part of a population; a subset of the population, often randomly selected for the purpose of estimating the value of a characteristic of the population as a whole	QCAA	Essential Mathematics 2B: • Module 2 – Data collection and analysis
sample space	The sample space of a chance experiment is the set of all possible outcomes for that experiment.	NESA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
sampling	Sampling is the selection of a subset of data from a statistical population. Methods of sampling include: 1. systematic sampling - sample data is selected from a random starting point and using a fixed periodic interval 2. self-selecting sampling - non-probability sampling where individuals volunteer themselves to be part of a sample 3. simple random sampling - sample data is chosen at random where each member has an equal probability of being chosen 4. stratified sampling - after dividing the population into separate groups or strata, a random sample is then taken from each group/strata in an equivalent proportion to the size of that group/strata in the population. A sample can be used to estimate the characteristics of the statistical population.	NESA	Essential Mathematics 2B: • Module 2 – Data collection and analysis

Term	Definition	Source Acknowledgement	Course Context
scale	a graduated line, as on a map, representing proportionate size	QCAA	Essential Mathematics 2B: • Module 3 – Scales, plans and models
simple interest	Simple interest is the interest (I) accumulated when the interest payment in each period is a fixed fraction of the principal, e.g. if the principle P earns simple interest at the rate (R) expressed as a percentage per period, then after (T) periods the accumulated simple interest is: $$I = PRT$$ When plotted on a graph, the total amount accrued is shown to grow linearly.	QCAA	Essential Mathematics 2B: • Module 1 – Interest and depreciation
sketch	execute a drawing or painting in simple form, giving essential features but not necessarily with detail or accuracy; in mathematics, represent by means of a diagram or graph; the sketch should give a general idea of the required shape or relationship and should include features	QCAA	Essential Mathematics 2B: • Module 3 – Scales, plans and models
standard deviation	The standard deviation is a measure of the variability or spread of a data set. It gives an indication of the degree to which the individual data values are spread around their mean. The standard deviation of n observations $x_1, x_2, \ldots, x_n$ is: $$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$$	QCAA	Essential Mathematics 2A: • Module 2 – Data representation and interpretation

Term	Definition	Source Acknowledgement	Course Context
stopping distances	The distance a car travels before it comes to rest after the driver has applied the brake given speed of the vehicle and/or conditions of the road which can be found using formulas or tables. Stopping distance = braking distance + reaction time (seconds) × speed	ACARA	Essential Mathematics 2A: • Module 3 – Units of energy and mass, time and motion
straight-line method of depreciation	In straight-line method of depreciation, the value of the depreciating asset decreases by the same amount during each time period. Also known as the 'Prime Cost method'.	NESA	Essential Mathematics 2B: • Module 1 – Interest and depreciation
symmetry	A plane figure f has line symmetry in a line m, if the image of f under the reflection in m is f itself. The line m is called the axis of symmetry. A plane figure f has rotational symmetry about a point O if there is a rotation such that the image of f under the rotation is f itself.	ACARA	Essential Mathematics 1: • Module 3 – Geometric reasoning
terminating decimal	A terminating decimal is a decimal that contains a finite number of digits		Essential Mathematics 1: • Module 1 – Fractions, decimals and percentages
translation	Shifting a figure in the plane without turning it is called translation. To describe a translation in the plane, it is enough to say how far left or right and how far up or down the figure is moved. A translation is a transformation that moves each point to its translation image.		Essential Mathematics 1: • Module 3 – Geometric reasoning

Term	Definition	Source Acknowledgement	Course Context
trapezoidal rule	The trapezoidal rule uses trapezia to approximate the area of an irregular shape, often with a curved boundary. The rule for a single application is: $A \approx \frac{h}{2}(x_1 + x_2)$	NESA	Essential Mathematics 2A: • Module 3 – Practicalities of measurement Essential Mathematics 2B: • Module 3 – Perimeter, area, volume and capacity
travel graph	Travel graphs are line graphs that are used to describe the motion of objects such as cars, trains, walkers and cyclists. The distance travelled is represented on the vertical axis and the time taken to travel that distance is represented on the horizontal axis.	NESA	Essential Mathematics 2B: • Module 2 – Graphs and modelling
tree diagram	A tree diagram is a diagram that can be used to determine the outcomes of a multistep random experiment. A probability tree diagram has the probability for each stage written on the branches.	NESA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
two-way table	Commonly used for displaying the two-way frequency distribution that arises when a group of individuals or objects are categorised according to two criteria	QCAA	Essential Mathematics 2B: • Module 2 – Probability and relative frequency
vertex (in shape)	A vertex is a point in which edges intersect.	NESA	Essential Mathematics 2B: • Module 3 – Scales, plans and models

Appendix 6 – Degree of difficulty of problems

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

Simple familiar

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

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

Complex familiar

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

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

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

Complex unfamiliar

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

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

Students interpret, clarify and analyse problems to develop responses.