Accreditation Period
2023–2027

VCE Vocational Major

Numeracy

STUDY DESIGN

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

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VCE Vocational Major

Numeracy

Important information

Accreditation period

1 January 2023 – 31 December 2027

Implementation of this study commences in 2023.

Other sources of information

The *VCAA Bulletin* is the only official source of changes to regulations and accredited studies. The *Bulletin* regularly includes advice on VCE studies, VCE VET programs and VCE Vocational Major (VM) studies. It is the responsibility of each teacher to refer to each issue of the *Bulletin*. The *Bulletin* is available as an e-newsletter via free subscription on the VCAA's website at: www.vcaa.vic.edu.au.

To assist teachers in developing courses, the VCAA publishes online Support materials (incorporating the previously known Advice for teachers), which provides:

- curriculum development and assessment advice
- examples of teaching and learning activities
- lists of resources
- advice on how to deliver the VCE Vocational Major and Victorian Pathways Certificate in the same classroom
- advice on how to integrate other Vocational Major units with the Literacy units
- advice on teaching students with additional needs, including adjustment advice for students with disabilities.

The *VCE Administrative Handbook* contains essential information on assessment processes and other procedures.

Providers

Throughout this study design the term ‘school’ is intended to include both schools and non-school providers.

Copyright

Schools may reproduce parts of this study design for use by teachers. The full VCAA Copyright Policy is available at: www.vcaa.vic.edu.au/Footer/Pages/Copyright.aspx.

Introduction

Scope of study

VCE Vocational Major Numeracy focuses on enabling students to develop and enhance their numeracy skills to make sense of their personal, public and vocational lives. Students develop mathematical skills with consideration of their local, national and global environments and contexts, and an awareness and use of appropriate technologies.

This study allows students to explore the underpinning mathematical knowledge of number and quantity, measurement, shape, dimensions and directions, data and chance, the understanding and use of systems and processes, and mathematical relationships and thinking. This mathematical knowledge is then applied to tasks which are part of the students' daily routines and practices, but also extends to applications outside the immediate personal environment, such as the workplace and community.

The contexts are the starting point and the focus, and are framed in terms of personal, financial, civic, health, recreational and vocational classifications. These numeracies are developed using a problem-solving cycle with four components: formulating; acting on and using mathematics; evaluating and reflecting; and communicating and reporting.

Rationale

Numeracy empowers students to use mathematics to make sense of the world and apply mathematics in a context for a social purpose. Numeracy gives meaning to mathematics, where mathematics is the tool (knowledge and skills) to be applied efficiently and critically. Numeracy involves the use and application of a range of mathematical skills and knowledge that arise in a range of different contexts and situations.

Numeracy enables students to develop logical thinking and reasoning strategies in their everyday activities. It develops students' problem-solving skills, and allows them to make sense of numbers, time, patterns and shapes for everyday activities like cooking, gardening, sport and travel. Through the applied learning principles Numeracy students will understand the mathematical requirements for personal organisation matters involving money, time and travel. They can then apply these skills to their everyday lives to recognise monetary value, understand scheduling and timetabling, direction, planning, monetary risk and reward.

Technology is an integral part of everyday and working life in Australia. Handheld devices like tablets are used for common daily uses: connectivity, communication, sourcing information, and as a tool for carrying out a myriad of functions. Software applications are available on a range of devices. There is an expectation that our students are ready with these skills when they transition to independent living, further study or to work. The integration of digital technologies in the learning of mathematical processes is essential and is embedded throughout this study.

Applied learning

VM Numeracy is based on an applied learning approach to teaching, ensuring students feel empowered to make informed choices about the next stage of their lives through experiential learning and authentic learning experiences.

Applied learning incorporates the teaching of skills and knowledge in the context of 'real life' experiences. Students will apply what they have learnt by doing, experiencing and relating acquired skills to the real world. Applied learning teaching and practice ensures that what is learnt in the classroom is connected to scenarios and experiences outside the classroom and makes that connection as immediate and transparent as possible.

Applied learning is about nurturing and working with a student in a holistic manner, taking into account their personal strengths, interests, goals and previous experiences to ensure a flexible and independent approach to learning. Applied learning emphasises skills and knowledge that may not normally be the focus of more traditional school curriculums. It also recognises individual differences in ways of learning and post-educational experiences. Real-life application often requires a shift from a traditional focus on discrete curriculum to a more integrated and contextualised approach to learning, as students learn and apply the skills and knowledge required to solve problems, implement projects or participate in the workforce.

This study design acknowledges that part of the transition from school to further education, training and employment is the ability to participate and function in society as an adult. Moving students out of the classroom to learn allows them to make the shift to become more independent and responsible for their own learning and increase their intrinsic motivation. Best practice applied learning programs are flexible and student-centred, where learning goals and outcomes are individually designed and negotiated with students.

Applied learning may also involve students and their teachers working in partnership with external organisations and individuals to access VET and integrated work placements. These partnerships provide the necessary contexts for students to demonstrate the relevance of the skills and knowledge they have acquired in their study and training.

Approaches to applied learning

The VM Numeracy Study Design is based on an applied learning approach to teaching this study. Applied learning principles and practices are embodied in the following five categories.

Motivation to engage in learning	Applied learning practices	Student agency in learning	A student-centred and flexible approach	Assessment practices which promote success
• Ensure what is learnt in the classroom is connected to scenarios and experiences outside the classroom and makes that connection as immediate and transparent as possible • Engage students in demonstrations, activities, investigations and problem-solving in the classroom, community, workplace and other educational settings • Undertake activities that challenge the student's level of competence and support them to succeed and build self-efficacy.	• Ensure students apply what they have learnt by utilising the learning cycle of doing, experiencing, reflecting and relating new knowledge and skills to the real world • To cater for individual student needs, use authentic materials and resources drawn from everyday life rather than mass-produced textbooks or materials • Utilise the experience and knowledge of community members including employers, cultural and community leaders and former students • Ensure learning reflects the integration that occurs in real-life tasks, incorporating skills and knowledge relevant to the whole task and the whole person such as collaboration, communication, problem solving and interpersonal skills • Present learning activities in different modalities: visual, auditory and kinesthetic, to allow the greatest uptake of knowledge • Explicitly teach the technical language of the content that can be applied by students in talking, reading, writing and listening, using authentic examples.	• Engage in a dialogue with students about the curriculum and how they can make connections • Ensure students are moving to equal partners in determining the learning process as they develop greater independence and responsibility for their own learning • Encourage students to collaborate with peers and identify and utilise individual and group strengths, and reflect on each stage of their learning journey • Share knowledge and recognise the intellectual, cultural and practical knowledge students bring to the learning environment • Value students' own approaches to the study including effective use of supporting technologies • Support students to learn through interaction and cooperation via discussion, asking questions, giving explanations and presentations, and working cooperatively in pairs or small groups.	• Understand the students' knowledge and skills prior to commencing the study and use this as the starting point for their learning • Understand and encourage students' personal, education and pathway goals • Consider the whole person and celebrate successes and connections to build resilience, confidence and self-worth • Build on the positive strengths of each student, including learning strengths and character strengths • Teach concepts in contexts relevant to the students' backgrounds, interests and experiences • Facilitate mutually beneficial relationships with a range of local communities while raising awareness about social and community issues and practices that influence and impact on students' lives and futures.	• Use the assessment method that best fits the content and context and allows for incremental indications of success • Afford students multiple opportunities for success and assessment.

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Aims

This study enables students to:

- develop and enhance their numeracy practices to help them make sense of their personal, public and vocational lives
- develop mathematical skills with consideration of their local, national and global environments and contexts, and an awareness and use of appropriate technologies.

Structure

This study is made up of four units. Each unit deals with specific content contained in the areas of study and is designed to enable students to achieve a set of outcomes for that unit.

The Numeracy study design is structured around four complementary and essential components. See the 'Numeracy study components' section for details of these components, including: eight areas of study; Outcome 1 numeracy contexts; Outcome 2 problem-solving cycle; and Outcome 3 mathematical toolkit.

A glossary defining numerical and mathematical terms and notations used across Units 1 to 4 in the VCE Vocational Major Numeracy Study Design is included in the VCE VM Support materials.

The structure of this study is similar to other VCE Mathematics studies, ensuring a familiar format.

Flexible delivery

VM Numeracy has been designed so that Units 1 and 2 can be undertaken as standalone units or concurrently. Units 3 and 4 may be undertaken sequentially. See Entry below for further information.

Numeracy units have been designed to complement the full suite of VCE Vocational Major studies to ensure it is possible to deliver the units in an integrated approach. Flexible delivery of the Vocational Major units allows for integration of complementary outcomes across the studies.

Teaching programs can be flexibly structured so that students can undertake programs and projects that combine acquisition and application of knowledge and skills across several of the VCE Vocational Major units. Integration of teaching and learning materials and activities can increase understanding and application of general concepts, develop multiple perspectives and points of view, and increase the ability of the student to make decisions, think critically and creatively and build skills in problem solving. It may also enhance a learner's ability to transfer knowledge learnt in one study to other aspects of their life. Through integration of units and outcomes, it will be possible to create greater opportunity for collaboration and team projects.

In an integrated, flexible program students will still need to meet the individual outcomes, including key knowledge and key skills, for each of the units of study. Teachers should keep clear documentation of the student's achievement of the individual outcomes within any integrated teaching and learning program.

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An assessment task used to demonstrate achievement of one outcome in one VCE Vocational Major unit cannot be used to demonstrate achievement in any other VCE Vocational Major unit, Victorian Pathways Certificate unit, VET unit of competency or VCE study.

Entry

There are no prerequisites for entry into Units 1 and 2. Units 3 and 4 will be undertaken sequentially. Students will be introduced to the outcomes for both units at the beginning of the year so they can effectively plan for the latter part of the year and take appropriate actions to be ready for those outcomes.

Duration

Each unit involves at least 50 hours of scheduled classroom instruction over the duration of a semester.

Changes to the study design

During its period of accreditation minor changes to the study will be announced via the *VCAA Bulletin*. The *Bulletin* is the only source of changes to regulations and accredited studies. It is the responsibility of each teacher to monitor changes or advice about studies published in the *Bulletin*.

Monitoring for quality

As part of ongoing monitoring and quality assurance, the VCAA will periodically undertake an audit of VM Numeracy to ensure the study is being taught and assessed as accredited. The details of the audit procedures and requirements are published annually in the *VCE Administrative Handbook.* Schools will be notified when they are required to submit material to be audited.

Safety and wellbeing

It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students undertaking the study.

Employability skills

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This study offers a number of opportunities for students to develop employability skills. The VCE VM Numeracy Support materials provides specific examples of how students can develop employability skills during learning activities and assessment tasks.

Standards

The content of this study will support students to achieve core skills in literacy and numeracy across the curriculum.

Resources

There are no specialist resource requirements.

Legislative compliance

When collecting and using information, the provisions of privacy and copyright legislation, such as the Victorian *Privacy and Data Protection Act 2014* and *Health Records Act 2001*, and the federal *Privacy Act 1988* and *Copyright Act 1968*, must be met.

Child Safe Standards

Schools and education and training providers are required to comply with the Child Safe Standards made under the Victorian *Child Wellbeing and Safety Act 2005*. Registered schools are required to comply with *Ministerial Order No. 870 Child Safe Standards – Managing the Risk of Child Abuse in Schools*. For further information, consult the websites of the Victorian Registration and Qualifications Authority, the Commission for Children and Young People and the Department of Education and Training.

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Assessment and reporting

Assessment

Assessment is an integral part of teaching and learning that at the senior secondary level:

- identifies opportunities for further learning
- describes student achievement
- articulates and maintains standards
- provides the basis for the award of a certificate.

In the VCE Vocational Major it is expected that assessment tasks are in line with the key principles underpinning all VCE assessment practice. The system for assessing the learning outcomes for students must be valid, reasonable, equitable, balanced and efficient. To be valid and reasonable the assessment tools should only assess learning within the scope of the study design, students should be given clear instructions and tasks should be administered under conditions that are reasonably the same for all students. School moderation of tasks ensures fairness in assessment. To be equitable assessment tasks should neither privilege nor disadvantage certain groups of students based on gender, culture, physical disability, socioeconomic status or geographical location. In order to be balanced, assessment tasks should be designed to provide a range of opportunities for students to demonstrate their learning. In order to be efficient, each assessment task should balance the demands of precision with those of efficiency, ensuring they do not create workload or stress that diminishes the performance of students.

The standards of this course are described in the outcomes, which will guide teachers and students as to what students are expected to know, understand and do as a result of the learning. Development of the assessment tasks identified to gather evidence of the designated learning will be done within the specific context of the setting and will be related to applied learning principles by having authentic purposes and practical outcomes. Teachers will then design the learning experiences and instruction necessary for students to meet the goals, following the backward design model.[1]

The teacher will ascertain a student's achievement of the required standard when their assessment tools combine to provide evidence of achievement of the outcomes. A key indicator of the level of achievement of the standard are the active verbs at the start of each statement, based on the hierarchy of knowledge in Bloom's Taxonomy.[2] This decision will be supported by additional advice on rubric development and practical examples in the VCE VM Numeracy Support materials. The Curriculum and Assessment Audit will support the teacher's understanding and use of such resource materials.

Satisfactory completion

[1]McTighe J (n.d.) *Understanding by Design*. Three Stages of Backward Design: Frequently Asked Questions

[2] Bloom, B 1984 *Taxonomy of Educational Objectives,* Allyn and Bacon, Boston

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The award of satisfactory completion for a unit is based on the teacher's decision that the student has demonstrated achievement of the set of outcomes specified for the unit. Demonstration of achievement of outcomes and satisfactory completion of a unit are determined by evidence gained through the use of assessment tools. Teachers must develop courses that provide appropriate opportunities for students to demonstrate satisfactory achievement of outcomes.

The decision about satisfactory completion of a unit is distinct from the assessment of levels of achievement. Schools will report a student's result for each unit to the VCAA as S (Satisfactory) or N (Not Satisfactory).

An assessment task used to demonstrate achievement of one outcome in a VCE Vocational Major unit cannot be used to demonstrate achievement in any other VCE Vocational Major unit, VET unit of competency or VCE study.

Authentication

Work related to the outcomes of each unit will be accepted only if the teacher can attest that, to the best of their knowledge, all unacknowledged work is the student's own. Teachers need to refer to the *VCE Administrative Handbook* for authentication procedures.

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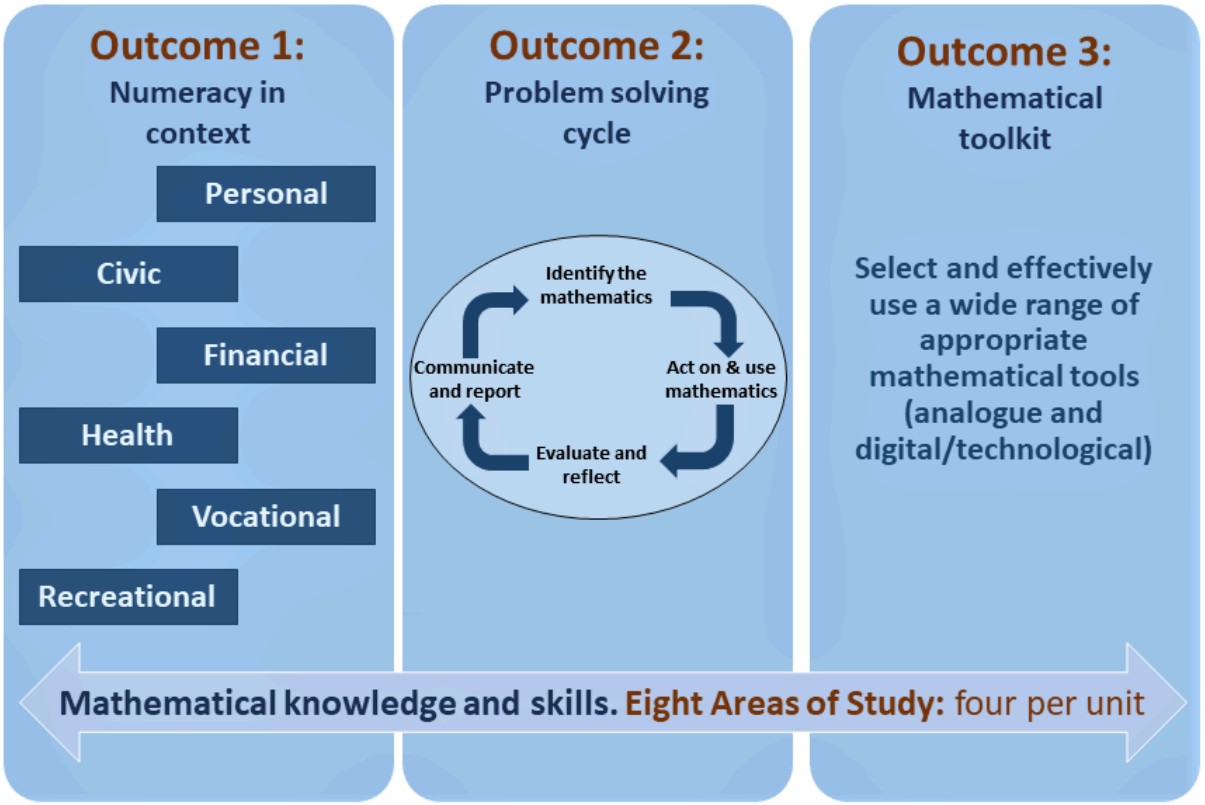
Numeracy study components

VCE Vocational Major Numeracy is designed around four complementary and essential components:

1. **Eight areas of study** (four in each unit) that name and describe a range of different mathematical knowledge and skills that are expected to be used and applied across the three outcomes.
2. **Outcome 1** is framed around working mathematically across six different **numeracy contexts**:
    a) Personal numeracy
    b) Civic numeracy
    c) Financial numeracy
    d) Health numeracy
    e) Vocational numeracy
    f) Recreational numeracy.
3. **Outcome 2** elaborates and describes a four-stage **problem-solving cycle** that underpins the capabilities required to solve a mathematical problem embedded in the real world.
4. **Outcome 3** requires students to develop and use a technical **mathematical toolkit** as they undertake their numeracy activities and tasks. Students should be able to confidently use multiple mathematical tools, both analogue and digital/technological.



The VM Numeracy structure

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Selecting the areas of study and the numeracies

Students will cover the eight areas of study at least once across Units 1 and 2, and across Units 3 and 4 (four areas of study in each unit).

Areas of study are to be selected to support the teaching and learning for each of the six numeracies, as appropriate to the situations and contextual problems being solved. The order in which the areas of study are taught, and how they are combined with other areas of study, is decided by the school and the teachers. This flexibility is an essential aspect of an applied learning approach.

Combinations can be based on the needs and interests of the student cohort and its community, and related vocational and work requirements.

Schools and teachers must make their selection of the areas of study based on the following guidelines:

- Each unit must include three numeracies.
- All six numeracies must be covered across Units 1 and 2 and across Units 3 and 4.
- Select either one or two areas of study to support each selected numeracy (four areas of study are covered in each unit).

Unpacking terminology in the outcome statements.

Familiar refers to situations that are either well-known by the student(s) or an area that students have had previous experience with, either in their lives within, or outside, school. Applying the key mathematical knowledge and skills in well-known situations allows for the student(s) to access and build strong meaningful connections between the mathematics and the real-life context.

Unfamiliar therefore refers to situations or contexts that are not previously encountered by the student(s) and are designed to extend their conceptual and contextual experience. Extending the conceptual application of mathematical key knowledge and skills to unknown situations should strengthen the skills of the student(s) to recognise and act on their mathematical knowledge and transfer their skills to other new contexts.

Routine contexts and tasks are those which people commonly encounter and undertake in their lives, often as part of work practices. These involve activities or procedures that are done regularly or at specified intervals involving frequent practice.

Specialised contexts are situations and tasks related to a specific purpose or area of knowledge, which may include higher order requirements, where the student needs to know about particular and distinct terminology and procedures in order to apply their mathematical knowledge and skills, and to carry out the mathematical actions.

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Unit 1

In Unit 1 students will develop their numeracy practices to make sense of their personal, public and vocational lives. They will develop mathematical skills with consideration of their local, community, national and global environments and contexts, and an awareness and use of appropriate technologies.

These units provide students with the fundamental mathematical knowledge, skills, understandings and dispositions to solve problems in real contexts for a range of workplace, personal, further learning and community settings relevant to contemporary society.

Areas of study

There are four areas of study for Unit 1:

- Area of Study 1: Number
- Area of Study 2: Shape
- Area of Study 3: Quantity and measures
- Area of Study 4: Relationships.

The areas of study cover a range of different mathematical knowledge and skills that are expected to be used and applied across the three outcomes.

Outcomes

For Units 1 and 2 the student is required to demonstrate achievement of three outcomes. As a set these outcomes are required to encompass all eight areas of study across the two units.

At the end of Units 1 and 2, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. Students should also be at ease with straightforward calculations manually and/or using technology.

Outcome 1

On completion of this unit, the student should be able to select, interpret and use the mathematical key knowledge and key skills from the four Areas of Study 1-4, embedded in familiar, routine and some less familiar contexts across the chosen range of numeracies.

Numeracy in context

The purpose of Outcome 1 is to support and enable students to develop a range of different numeracy skills and capabilities in order to make sense of their daily personal, public and vocational lives.

Outcome 1 describes the range of contexts that are the starting points and the focus for developing the student's numeracy and mathematical skills. These six numeracies cover personal, financial, civic, health, recreational and vocational contexts where a range of mathematical skills are situated and embedded.

The six numeracies are intended to be selected to best meet the needs and interests of the students and the school community, and should be mapped to the relevant and appropriate areas of study depending on the underpinning mathematical knowledge and skills required. The different numeracies can take on a more vocational focus if appropriate. For example, financial numeracy could take as its focus vocations such the financial or business sectors, or health numeracy could focus on working in the health, community or medical sectors.

Structure of Outcome 1

Outcome 1 is framed by six different numeracies over two units. **Each unit should cover three of the numeracies.**

- Choose three of the six numeracies.
- All six numeracies must be covered across Units 1 and 2.
- Select either one or two areas of study to support each selected numeracy.

a) **Personal numeracy** relates to the mathematical requirements for personal organisational matters involving numbers, data, money, time and travel.

Personal numeracy relates to understanding, using and interpreting numerical and mathematical information presented and embedded in different formats and media, to undertake personally relevant activities in familiar, routine and some less familiar situations.

The understanding, use and interpretation of personal numeracy can be drawn from, but is not limited to, the following examples:

- numerical information embedded in print and digital media, including monetary values
- planning a family or cultural event, such as trips to sites of cultural significance, or a BBQ
- personal and home/family day-to-day tasks such as cooking, gardening, sport, travel
- planning a class excursion or event including costs and logistics
- shopping and savings related activities such as comparing prices with different percentage discounts, or using and calculating unit prices.

b) **Civic numeracy** relates to participating in civic life through knowing how to stay informed, and understanding government, political and social data, information and processes.

Civic numeracy includes understanding, interpreting and reviewing statistical and quantitative information presented by governments and in news and media reports, and other data-related sources to meet the demands and challenges of life at local, state, national and global levels. It can incorporate the understanding, use and interpretation of quantitative and statistical information.

The understanding, use and interpretation of civic numeracy can be drawn from, but is not limited to, the following examples:

- political or government-related information, including advertising, elections and voting
- local environmental issues from multiple perspectives including First Nations peoples' perspectives, such as land management, fire management, waterways, wildlife
- local community social and environmental issues such as climate change, human rights, animal rights, cultural sites
- managing personal and social responsibilities and obligations

- basic economic data including unemployment rates, underemployment, participation rates, inflation and official interest rates.

c) **Financial numeracy** relates to understanding and undertaking financial transactions and making informed judgments and decisions regarding the use and management of money.

Financial numeracy involves managing relevant personal, social or work-related financial costs, charges, income and expenditure.

The understanding, use and interpretation of financial numeracy can be drawn from, but is not limited to, the following examples:

- personal money management such as banking, monitoring debit and credit transactions, and keeping track of money
- online financial services such as mobile banking, Medicare and MyGov services
- occupational income and expenses, penalty rates, sales-based commissions
- government financial systems such as taxation, GST, student loans, superannuation and Medicare
- calculations for allowances, such as travel, uniform and vehicle use
- utility and other relevant personal or family bills and charges, and comparing providers
- personal loans such as car loans, payday loans, buy now pay later services and store credit, use of online interest calculators
- making informed decisions about credit, including interest, minimum repayments, frequency of repayments, transacting safely online and via apps, and avoiding scams
- short- and long-term costs of purchases on oneself, family or communities, and the planet, for example interpreting special deals, or buying new versus second-hand.

d) **Health numeracy** relates to accessing, understanding and using mathematical information to make decisions and act in the interests of personal and community health and well-being.

Health numeracy involves being able to use mathematics to manage one's own health, safety and well-being, alongside being aware of such issues from a community or work-related perspective.

The understanding, use and interpretation of health numeracy can be drawn from, but is not limited to, the following examples:

- nutrition or fitness, including setting goals and understanding issues such as the relationships between lifestyle and disease
- social health issues such as drinking, safe driving, obesity, drugs
- health and safety at work such as accident types, rates and causes, audits of workplace chemicals and comparison with home-based chemicals
- medical information within a hospital/doctor setting such as typical blood pressure, heart rate, respiration rate, body temperature
- publicly available medical and health information and advice, for example in relation to maintaining a healthy and safe lifestyle including healthy eating/diet, exercise or diseases and pandemics
- personal medical care, such as the use and dosages of medications, including scheduling
- health and safety matters related to potential accidents and use of chemicals
- health care costs, including Medicare rebates and surcharge, comparing and using private health insurance.

e) **Vocational numeracy** relates to effectively participating in the workplace and managing the demands of work and/or vocational training.

Vocational or work-related numeracy includes the undertaking the required tasks and activities in a work-related context, such as using different workplace measurements, tools, applications and

processes/systems, following and giving directions, participating in quality assurance processes and data collection, and reading workplace documents and information.

The understanding, use and interpretation of vocational numeracy can be drawn from, but is not limited to, the following examples:

- workforce comparisons from past practice (pre-digital) to current (digital), including time to complete tasks and effort involved
- reading, following or creating instructions and documents related to workplace tasks such as phone numbers, proportions and rates to mix chemicals or for handling hazardous chemicals or substances, including interpreting Materials Safety Data Sheets (MSDS)
- occupational health and safety or quality assurance requirements
- workplace specific plans, diagrams, formulas, proportions and rates
- different technological, digital or analogue measuring and processing devices, tools and applications
- tolerances and levels of accuracy and the implications of incorrect applications or mixing of chemicals.

f) **Recreational numeracy** relates to the mathematical aspects of recreational activities including but not limited to arts, sport and social media.

Recreational numeracy encompasses not only physical exercise and sport, but also aspects of personal time spent on non-work activities such as indoor and outdoor pursuits, arts, social media, and interests such as gaming. It also covers community, cultural or religious activities.

The understanding, use and interpretation of recreational numeracy can be drawn from, but is not limited to, the following examples:

- the planning of an activity or event including costings, steps and processes
- comparison of planning and costs of different party venues and events, such as for a birthday party or cultural celebration
- traditional and modern games including games played by First Nations peoples and other cultural groups across different regions of Australia
- dimensions and specifications of playing or community recreation areas, such as the size of a netball court, chessboard, or multipurpose court
- dimensions and specifications of art and craft products being planned or created, such as photo sizes, dresses/costumes, furniture
- rules and game scoring systems and formulas, penalties, fines, timing
- use and overuse of recreational activities and associated dangers.

Areas of study

Area of Study 1: Number

In this area of study students will develop number sense through meaningful application of numeracy practices to a range of contexts where whole numbers, fractions, decimals and percentages are used. Students will select the appropriate method or approach required and communicate their ideas. They should be at ease with performing straightforward calculations both mentally, manually and using software tools and devices.

Key knowledge

- whole numbers and decimals up to two places

- place value and reading numbers expressed in digits or words
- multiplication facts and knowledge of factors and multiples
- rounding whole numbers and decimals up to two places
- order of operations
- common fractions and percentages, and their equivalence such as ¼ = 0.25 = 25%
- simple proportions.

Key skills

- demonstrate an understanding of reading numbers, place value and decimal place value, including rounding to two decimal places
- use the order of operations to solve a range of practical calculations with whole numbers and common decimals and fractions
- solve problems involving common fractions and decimals, for example half, quarter, third, fifth and equivalent decimals
- calculate common percentages of numbers, and increase and decrease numbers by common percentages
- use simple proportions and divide quantities by a simple ratio such as 1 to 2.

Area of Study 2: Shape

In this area of study students will learn to recognise, describe and name common two- and three-dimensional shapes. They will classify, manipulate, represent and construct common and familiar shapes in diagrammatical and concrete forms. They will also become familiar with common characteristics and properties used in classifying shapes.

Key knowledge

- properties and names of two-dimensional shapes and everyday familiar three-dimensional objects such as regular prisms, for example boxes and cylinders
- simple reflection, rotation and symmetry in relation to everyday familiar shapes
- patterns in, and between, everyday and familiar shapes
- appropriate technologies that create and manipulate simple two-dimensional shapes
- simple scaling in relation to enlargement and reduction such as in plans, diagrams and photographs.

Key skills

- describe and classify common and familiar two- and three-dimensional shapes, including the use of appropriate technology
- demonstrate an understanding of reflection, rotation and symmetry of simple familiar shapes
- create common and familiar two- and three-dimensional shapes and describe the relationship between these, including through the use of technology
- determine and name patterns of common and familiar shapes such as those found in engineering, architecture and design, for example bridges, buildings, sculptures.

Area of Study 3: Quantity and measures

In this area of study students will develop an understanding of routine and familiar metric quantities and their units of measurement applied to single- and multi-step measurement tasks. They will conduct estimations of measurements, undertake routine measurements, perform measurement

calculations, and convert units within the metric system with the embedded use of different technologies.

Key knowledge

- common and familiar measures of distance, perimeter, area, volume and capacity (for simple rectangular based shapes only)
- common and familiar metric units of measurement and conversion between metric units
- common units of time and temperature
- common measurement estimation strategies
- common measurement tools
- appropriate accuracy in measurements.

Key skills

- estimate and measure familiar objects and distances by using measurement tools
- undertake common calculations to determine measurements of distance, perimeter, area, volume and capacity, related to common two-dimensional shapes and three-dimensional objects, using common units of measurement
- convert with one-step calculations between common units of metric measurement such as millimetres, centimetres, metres, kilometres, grams, kilograms, millilitres, litres, and degrees Celsius
- read and interpret units of analogue and digital time and temperature
- perform simple calculations using units of time, including calendar months, weeks, days, hours, minutes, and seconds.

Area of Study 4: Relationships

In this area of study students will recognise, understand and represent simple patterns of relationship and change in mathematical terms where it exists in common and familiar contexts and applications. They should be able to recognise when change is occurring, be able to identify common and simple mathematical relationships and variables, and apply the most appropriate process or processes to determine the results of change.

Key knowledge

- common and familiar relationships such as rates of change, $/m, km/hr
- simple, common and familiar algebraic formulae, relationships and algebraic expressions such as for the area and perimeter of a rectangle, and cost per hour
- standard conventions used in the development, use and writing of simple, everyday algebraic relationships
- representation and visualisation of change such as tables, simple charts or graphs.

Key skills

- recognise and represent relationships with simple mathematical expressions, or simple pictorial or graphical representations
- demonstrate simple algebraic substitution with simple formulae to find solutions to everyday problems
- use and apply rates in familiar situations such as $/m, km/hr
- apply simple formulae to find solutions to everyday problems such as area, amounts or costings.

Selecting numeracies for Unit 1

All six numeracies must be covered across Units 1 and 2. The order in which this is done and how this is combined with the underpinning mathematical knowledge and skills, as described in the areas of study, is decided by the school or teacher. This flexibility is an essential part of an applied learning approach.

These combinations can therefore be selected based on the needs and interests of the student cohort, school community, or related vocational and work environment.

In summary, schools and teachers must make their selection of numeracies based on the following guidelines:

- Each unit must include three of the six numeracies.
- All six numeracies must be covered across Units 1 and 2.
- All four areas of study must be covered across each unit (i.e. eight areas of study in total over two units).

This table provides an overview for selecting numeracies in Units 1 and 2:

Numeracies	Areas of study
Unit 1, Outcome 1	
Select **three of the following six numeracies** for Unit 1: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy ensuring all four areas of study are covered in the unit – Area of Study 1: Number – Area of Study 2: Shape – Area of Study 3: Quantity and measures – Area of Study 4: Relationships
Unit 2, Outcome 1	
Select the **three remaining numeracies** for Unit 2: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy ensuring all four areas of study are covered in the unit – Area of Study 5: Dimension and direction – Area of Study 6: Data – Area of Study 7: Uncertainty – Area of Study 8: Systematics

Ensure all numeracies have been covered across the two units.

Connecting the numeracies with the mathematical content in the areas of study

The following table provides an example of a learning program that covers the four areas of study for Unit 1.

		Unit 1		
		Numeracy 1. E.g. Health	Numeracy 2. E.g. Vocational	Numeracy 3. E.g. Recreational
Areas of study	1. Number			✔
	2. Shape		✔	
	3. Quantity and measures	✔	✔	
	4. Relationships	✔		

Outcome 2

On completion of this unit, the student should be able to select, interpret and use the four stages of the mathematical problem-solving cycle, using a range of both informal and formal mathematical processes, representations, and conventions relevant to the mathematical key knowledge and key skills specified in the Areas of Study 1-4, and across the chosen range of numeracies.

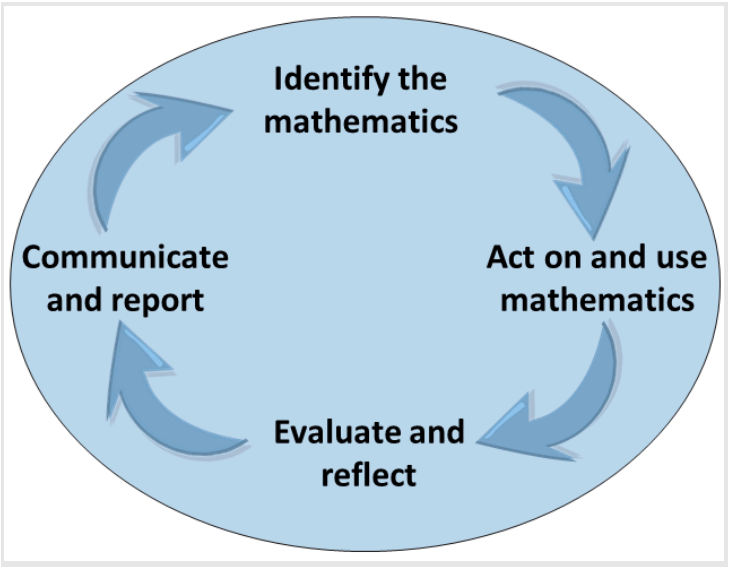
Problem-solving cycle

The purpose of Outcome 2 is to enable students to develop their everyday numeracy skills and practices in order to make sense of their daily personal, civic and vocational lives. Students need to develop the skills and capabilities to be able to problem-solve, and to use their skills to investigate and solve a problem where the mathematics is embedded within a real-world context. Outcome 2 describes and outlines a problem-solving cycle that supports students to become more capable problem solvers, and to use their mathematical skills successfully to become numerate individuals within the community and in their selected vocations.

Given that the contexts described in Outcome 1 will be the starting point, students need to be guided through a structured problem-solving cycle to know how to move from the real-world context to the mathematical world, and to apply their mathematical knowledge to solve the mathematical problem at hand. Part of solving any such embedded problem is to be able to reflect on, and evaluate the outcomes, and to then communicate and report on what was done and provide the results.

The problem-solving cycle underpinning the curriculum has four distinct components that include, in order: identifying the mathematics; acting on and using the mathematics; evaluating and reflecting; and communicating and reporting on the results.

These four components are represented in the figure below.



Structure of Outcome 2

The skills and knowledge required to achieve Outcome 2 are organised under four distinct components to match the problem-solving cycle:

a) **Identify the mathematics**: recognise, select and interpret the mathematical information embedded in a real-world context and decide what mathematics to use.

When mathematical problems are embedded within real-world contexts, students need to identify the essential features to be accommodated when transforming the real-world situation into a mathematical problem. This requires students to identify and name the mathematics embedded in the context or scenario and to make decisions about how the task can be best represented and solved mathematically. Students need to develop a plan of the actions they intend to undertake, including providing an overview of the scenario and any related background information, and specify the related mathematical questions of interest, conjectures or hypotheses.

Key knowledge

- the purpose of the task and the question(s) to be posed and answered
- the relevant mathematical information embedded in the selected numeracy context and materials
- the mathematical operation(s), processes and tools needed to solve the problem.

Key skills

- identify, interpret and comprehend a range of everyday mathematical information that is embedded in familiar and routine materials, texts and tasks where the mathematics content is fairly explicit or visual with relatively few distractors
- draw on a combination of hands on, contextually appropriate materials, personal experience, mathematical and prior knowledge to select appropriate solution strategies from the range of mathematical processes described in the areas of study
- develop a clear mathematical plan, using a combination of formal and informal written mathematical language and symbols.

b) **Act on and use mathematics:** perform mathematical actions and processes in order to complete a task – this includes the use and application of a range of technologies.

This stage of the problem-solving cycle involves undertaking the mathematical aspects of the task identified in the first stage. It requires the use of mathematical processes and problem-solving techniques, facts and procedures to solve the problem, and the selection and use of appropriate tools, representations and technologies. For example, students may need to undertake measurements; perform calculations; select and solve equations; make logical deductions from mathematical assumptions; perform symbolic manipulations; create and extract information from mathematical tables and graphs; represent and manipulate geometrical objects in 2D and 3D; or analyse data.

Key knowledge

- the appropriate mathematical processes required for completing the numeracy task.
- estimations required prior to completing the numeracy task
- appropriate technology, tools and applications required to complete the numeracy task
- the relevant mathematical actions, processes and calculations required to complete the numeracy task.

Key skills

- select and use appropriate tools, hand-held devices, computers and technological processes such as to measure, for example, the dimensions of a window in millimetres (mm) with a tape measure, or to create a personal weekly budget in a spreadsheet
- Use a blend of personal 'in-the-head' methods, formal pen and paper methods and digital/technological calculators, software, apps and tools to undertake the required mathematical actions, processes, calculations and problem-solving process.

Note: This requires the use and application of only one or two steps or processes, or more if they are related or similar processes.

c) **Evaluate and reflect:** check and reflect on the mathematical problem-solving processes and outcomes in relation to the real-world context.

Responses to real-world numeracy tasks, including any mathematical solutions and results, judgments, decisions or conclusions, require review and critical reflection and evaluation. Any results should be checked and evaluated against the original situation in terms of its reasonableness and its relevance to the final solution; with comparisons made against the initial estimates before deciding to accept the solution and/or make revisions and adjustments before presenting the final solutions. In cases where decisions or judgments are being made about the solution, other factors might also be considered, such as social or economic consequences. These processes are often referred to as contextual judgements.

Key knowledge

- estimations, actions and any calculations required to check if results are as expected
- appropriateness and reasonableness of results from the numeracy task.

Key skills

- use estimation and personal experience, mathematical and other prior knowledge, to check and reflect on the results and their reasonableness and appropriateness to the context and task, adjust results if necessary, and explain why a problem could not be solved if this is the outcome.

Note: Some level of teacher prompting, and support can be provided in relation to reflections on the outcome and results.

d) **Communicate and report:** use a combination of informal and formal mathematical representations to document and report outcomes and results

The results of any numeracy task require a summary of the work to be compiled and developed, including the presentation and interpretation of the findings from the mathematical activities and related applications. This stage requires students to prepare a range of representations to communicate the mathematical results. This will involve both oral and written language, and the use of formal and informal mathematical visualisations and representations, including the use of a range of different formats, media or technologies.

Key knowledge

- written mathematical representations used to document and report on the mathematical processes and the results of the numeracy task
- oral mathematical language used to present and discuss the mathematical processes and the results of the numeracy task
- a range of different formats, devices or technologies used to represent and document the numeracy task.

Key skills

- use a combination of both informal and formal written mathematical language and symbols and general language to document and report on the mathematical and problem-solving process and results
- use a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem-solving process and results
- use a combination of both formal and informal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level. For example:
  - 1/100, 12.5%
  - km/hr, $/kg
  - 1.25 m = 1250 mm.

Note: Not **all** of the key knowledge and skills above are expected to be covered in each numeracy investigation or task; however, they should be covered **at least once** across the different numeracy tasks for each unit.

Outcome 3

On completion of this unit, the student should be able to select and effectively and accurately use the appropriate mathematical tools and applications chosen from a developing mathematical toolkit relevant to the key knowledge and key skills specified in the Areas of Study 1-4, and across the chosen range of numeracies.

Mathematical toolkit

The purpose of Outcome 3 is for students to develop a mathematical toolkit to use where necessary as they undertake their numeracy practices, activities and tasks. At the end of Units 1 and 2, students should be developing their skills of both analogue and digital technologies with the ability to identify and use a range of appropriate mathematical tools (analogue and digital/technological) to solve and communicate mathematical problems embedded in practical contexts.

A student's toolkit should include: existing, traditional tools such as measuring equipment (e.g. tape measures, rulers, kitchen scales); software applications such as spreadsheets; and a range of new and emerging devices and applications from across different technologies (e.g. measurement, angle and level apps available on mobile phones or portable handheld devices). Students should be developing their skills to transfer their knowledge from one device or application to an unknown one, with the aim of adapting to emerging technologies into the future. For example, the use of internet applications (such as measuring and calculation apps) for costing and ordering of materials for an onsite job.

Key knowledge

In undertaking their numeracy tasks and activities as part of Outcomes 1 and 2, students should demonstrate understanding and knowledge of the following:

- contemporary technological and online and digital media, including software and applications based on computers, tablets, calculators and hand-held devices and the relevance, appropriateness of their use and application
- a range of familiar analogue and digital tools that may include tools such as manipulatives, clocks, tape measures, tools of trade and industry
- a range of digital tools that may include mobile technology, software (including spreadsheets) and applications
- the conventions and use of such analogue and digital tools appropriate to the individual, community and workplace, and comparisons between technologies
- the conventions and language for the representation of mathematical and statistical information, objects and processes, using different technologies and digital media
- the numerical, graphical, symbolic, geometric and statistical functionalities of this range of technologies
- the conditions and settings for a given purpose, and for appropriate application of a given technology and its functionality
- online safety when using technologies.

Key skills

- use a range of analogue and digital/technological tools and devices to carry out tasks and derive results
- use technology to carry out computations and analysis
- use technology to visualise and represent information, such as to produce diagrams, tables, charts, infographics and graphs which model situations and solve practical problems
- use technology to help interpret and communicate the results of a numeracy task
- identify accuracy and error with different technologies
- make decisions regarding inputs into technology and discuss the outputs of technology
- reflect on the use of tools and technology in relation to comparing estimates to results
- reflect on any tools and technologies used and the outcomes obtained relative to personal, contextual and real-world implications, appropriateness and reasonableness.

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of assessment tasks and tools that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes for satisfactory completion.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tools. Assessment must be part of the regular teaching and learning program and should be completed mainly under teacher supervision and within a limited timeframe.

All assessment tools for Units 1 and 2 are school-based. Procedures for assessment of levels of achievement in Units 1 and 2 are a matter for school decision.

The VCAA publishes VCE VM Support materials, which includes advice on the design of assessment tools including assessment rubrics.

Assessment Tools

Assessment tools are used to collect evidence to make a judgement as to whether the outcomes have been met. An assessment tool is a method to collect evidence on the standard reached by students and can be a task or a teacher observation using a checklist.

The following table provides the assessment requirements for the outcomes in Unit 1 and will assist teachers in determining the student attainment of the standard.

Outcome	Assessment tasks
Outcome 1 On completion of this unit, the student should be able to identify, use and apply the mathematical key knowledge and skills from the four areas of study, across the specific Numeracies.	Assessment tasks should provide opportunities for practical application of the outcome. The structure of the Numeracy study is such that the demonstration of achievement of Outcomes 1, 2 and 3 should be based on the student's performance on a selection of the following assessment tasks: ● Investigations and projects. For example, a diary ('week in the life of me'), outlining budgets (pay rates and tax), travel (how do I get places), shopping (best deals). ● Multimedia presentation, poster or report. For example, an outline of food requirements for an athlete preparing for their sport that includes nutrition, recipes, calories required and exerted, energy requirements, and measurements including distances. ● Portfolio. For example, students may prepare job interview questions and responses to include details on scheduling an appointment, planning what resources are needed for transforming a house to renewables using data and tables, and understanding cost
Outcome 2 On completion of this unit, the student should be able to identify and use the mathematical problem-solving cycle in an applied learning context, relevant to the mathematical key skills and knowledge reflected in the areas of study and across the Numeracies.	
Outcome 3 On completion of this unit, the student should be able to identify and use the appropriate mathematical tools.	

Outcome	Assessment tasks
	calculations, or unpacking statistics related to climate change.

Unit 2

In Unit 2 students will develop and extend their numeracy practices to make sense of their personal, public and vocational lives. They will develop mathematical skills with consideration of their local, community, national and global environments and contexts, and identification and appropriate selection and use of relevant technologies.

These units provide students with the fundamental mathematical knowledge, skills, understandings and dispositions to solve problems in real contexts for a range of workplace, personal, further learning and community settings relevant to contemporary society.

Areas of study

There are four areas of study for Unit 2:

- Area of Study 5: Dimension and direction
- Area of Study 6: Data
- Area of Study 7: Uncertainty
- Area of Study 8: Systematics

The areas of study cover a range of different mathematical knowledge and skills that are expected to be used and applied across the three outcomes.

Selecting the areas of study

Students will cover the eight areas of study at least once across Units 1 and 2.

Areas of study are to be selected to support the teaching and learning for each of the six numeracies, as appropriate to the situations and contextual problems being solved. The order in which the areas of study are taught, and how they are combined with other areas of study, is decided by the school and the teachers. This flexibility is an essential aspect of an applied learning approach.

Combinations can be based on the needs and interests of the student cohort and its community, and related vocational and work requirements.

Schools and teachers must make their selection of the areas of study based on the following guidelines:

- Each unit must include three numeracies.
- All six numeracies must be covered across Units 1 and 2.
- Select either one or two areas of study to support each selected numeracy.
- Select three numeracies for each unit.

Outcomes

For Units 1 and 2 the student is required to demonstrate achievement of three outcomes. As a set these outcomes are required to encompass all eight areas of study across the two units.

At the end of Units 1 and 2, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. Students should also be at ease with straightforward calculations manually and/or using technology.

Outcome 1

On completion of this unit, the student should be able to select, interpret and use the mathematical key knowledge and key skills from the four Areas of Study 5-8, embedded in familiar, routine and some less familiar contexts across the chosen range of numeracies.

Numeracy in context

The purpose of Outcome 1 is to support and enable students to develop a range of different numeracy skills and capabilities in order to make sense of their daily personal, public and vocational lives.

Outcome 1 describes the range of contexts that are the starting points and the focus for developing the student's numeracy and mathematical skills. These six numeracies cover personal, financial, civic, health, recreational and vocational contexts where a range of mathematical skills are situated and embedded.

The six numeracies are intended to be selected to best meet the needs and interests of the students and the school community, and should be mapped to the relevant and appropriate areas of study depending on the underpinning mathematical knowledge and skills required. The different numeracies can take on a more vocational focus if appropriate. For example, financial numeracy could take as its focus vocations such the financial or business sectors, or health numeracy could focus on working in the health, community or medical sectors.

Structure of Outcome 1

Outcome 1 is framed by six different numeracies. Each unit should cover three of the numeracies.

- Choose the remaining three of the six numeracies.
- All six numeracies must be covered across Units 1 and 2.
- Select either one or two areas of study to support each selected numeracy.

a) **Personal numeracy** relates to the mathematical requirements for personal organisational matters involving numbers, data, money, time and travel.

Personal numeracy relates to understanding, using and interpreting numerical and mathematical information presented and embedded in different formats and media, to undertake personally relevant activities in familiar, routine and some less familiar situations.

The understanding, use and interpretation of personal numeracy can be drawn from, but is not limited to, the following examples:

- personal relevant statistical data and information embedded in print and digital media
- personal and home/family travel tasks such as driving, road safety, holidays, getting to school or work, or family visits
- scheduling, timetabling and reorganising personal work and travel arrangements

- direction and locational materials (such as printed and online maps, location diagrams for buildings and GPS displays) and planning, describing and following oral and written directions such as tours, visits, holidays and excursions
- planning a family or cultural event, such as trips to sites of cultural significance, or a BBQ.

b) **Civic numeracy** relates to participating in civic life through knowing how to stay informed, and understanding government, political and social data, information and processes.

Civic numeracy includes understanding, interpreting and reviewing statistical and quantitative information presented by governments and in news and media reports, and other data-related sources to meet the demands and challenges of life at local, state, national and global levels. It can incorporate the understanding, use and interpretation of quantitative and statistical information.

The understanding, use and interpretation of civic numeracy can be drawn from, but is not limited to, the following examples:

- political or government-related information and data, including advertising, community information, elections and voting
- information and data on social issues such as human rights, animal rights, cultural and gender issues
- environmental issues from multiple perspectives including First Nations peoples' perspectives, such as land management, fire management, waterways, wildlife
- local community environmental issues such as climate change, land degradation, pollution
- statistical monitoring of people's lives, their use of devices and any actions made based on such data
- commonly reported economic state and national data and trends including unemployment rates, underemployment, participation rates, gender pay gaps, inflation and official interest rates.

c) **Financial numeracy** relates to understanding and undertaking financial transactions and making informed judgments and decisions regarding the use and management of money.

Financial numeracy involves managing relevant personal, social or work-related financial costs, charges, income and expenditure.

The understanding, use and interpretation of financial numeracy can be drawn from, but is not limited to, the following examples:

- comparing and analysing performance or costs and charges over time between different bills and charges, utilities, or providers such as petrol prices, household item prices
- managing and adjusting personal and family budgets using technology or software applications
- chance and likelihood as they relate to gambling, such as sporting odds
- data, trends, predictions, and risks related to financial issues and factors, such as housing prices, costs of living, CPI, wages and salaries
- planning and costing a holiday including locations and holiday planning apps such as airlines
- data and trends related to government financial systems such as taxation, GST, superannuation.

d) **Health numeracy** relates to accessing, understanding and using mathematical information to make decisions and act in the interests of personal and community health and well-being.

Health numeracy involves being able to use mathematics to manage one's own health, safety and well-being, alongside being aware of such issues from a community or work-related perspective.

The understanding, use and interpretation of health numeracy can be drawn from, but is not limited to, the following examples:

- nutrition or fitness, including setting goals, tracking data and understanding the issues
- data and trends about social health issues such as drinking, safe driving, obesity, drugs
- health and safety data at work such as accident types, rates and causes, audits of workplace chemicals
- publicly available medical and health information, data and advice, for example in relation to maintaining a healthy lifestyle including healthy eating/diet, exercise or diseases and pandemics, including long term chance and likelihood
- examining differing access to health services in rural and remote areas, and considering the impact on First Nations communities
- publicly available medical and health information, data and advice, for example in relation to maintaining a healthy lifestyle including healthy eating/diet, exercise or diseases and pandemics
- health and safety related data, statistics and trends related to potential accidents and use of chemicals.

e) **Vocational numeracy** relates to effectively participating in the workplace and managing the demands of work and/or vocational training.

Vocational or work-related numeracy relates to undertaking the required tasks and activities in a work-related context, such as using different workplace tools, applications and processes/systems, following and giving directions, participating in quality assurance processes and data collection, and reading workplace documents and information.

The understanding, use and interpretation of vocational numeracy can be drawn from, but is not limited to, the following examples:

- workforce comparisons from past practice (pre-digital) to current (digital), including time to complete tasks and effort involved
- workplace occupational health and safety related data, statistics and trends related to workplace accidents and trends
- reading or creating instructions, documents or reports related to workplace tasks and data such as giving or following workplace directions, collecting, collating and analysing workplace data
- occupational health and safety or quality assurance data requirements
- workplace specific plans and diagrams such as the location of buildings and equipment, hazards, safety and escape plans
- recording information and data or following and giving directions.

f) **Recreational numeracy** relates to the mathematical aspects of recreational activities including but not limited to arts, sport and social media.

Recreational numeracy encompasses not only physical exercise and sport, but also aspects of personal time spent on non-work activities such as indoor and outdoor pursuits, arts, social media, and interests such as gaming. It also covers community, cultural or religious activities.

The understanding, use and interpretation of recreational numeracy can be drawn from, but is not limited to, the following examples:

- statistical and data collection measures around personal or community recreational activities and events
- statistical information and data on the use, and overuse of recreational activities, social media and associated dangers
- statistical information, data and trends about sports and sportspeople and their performances
- chance and likelihood as they relate to gambling, such as sporting odds and chances of teams winning or losing
- activities that require skills in navigation such as orienteering, sailing, bushwalking, bike riding

- planning a trip or holiday using directional and locational materials, such as printed and online maps, GPS displays.

Areas of study

Area of Study 5: Dimension and direction

In this area of study students will develop an understanding of space, direction and location in relation to common landmarks and key compass directions. They will give and follow directions to locations based on digital and printed maps and diagrams. The study of dimension also includes common and routine angles with degrees and an awareness of the one-, two- and three-dimensions of space.

Key knowledge

- location and direction in relation to everyday, familiar objects and landmarks
- location and direction in relation to everyday, familiar maps and technologies
- everyday, familiar oral and written instructions for moving to specified locations
- everyday angles such as 45, 90, 180 and 360 degrees.

Key skills

- find and locate places of interest on maps and describe location in relation to other objects and landmarks using appropriate maps or technology
- determine and give or follow everyday straightforward instructions to move between familiar locations
- identify everyday compass directions such as N, S, W, E, NE, SE
- identify and demonstrate an understanding of everyday angles such as 45, 90, 180 and 360 degrees
- understand where an object is in space using one-, two- and three-dimensions and everyday familiar language such as up, down, left, right, in front, behind to describe position and location in space.

Area of Study 6: Data

Data can be found in everyday life, workplaces and society. In this area of study, students will collect, represent and undertake common analyses of data to look for patterns in data and derive meaning from data sets located within familiar and routine contexts. Data should be examined for comparison and analysis. Students should draw conclusions from the data and be confident in describing general patterns and trends.

Key knowledge

- simple data collection tools and processes
- display of data with commonly used tables and graphs, including use of axes and simple scales
- simple measures of spread, such as range and mean
- interpretation and description of familiar and simple data sets and their displays.

Key skills

- collect, collate and organise familiar and simple data sets, and display these choosing and using the most appropriate format, including axes and simple scales
- choose and find simple common measures of spread for contextual data sets, for example mean, and range of data

- identify key facts from tables and graphs
- read and interpret results from familiar and simple data presented in both graph and table form, including describing general patterns and trends.

Area of Study 7: Uncertainty

In this area of study students will explore the basic concepts and everyday language of chance. They will make mathematical predictions about the likelihood of common and familiar events occurring or not occurring. They will also consider conclusions from familiar known events or data and make very simple inferences.

Key knowledge

- likelihood of common and familiar events or occurrences happening
- common and familiar language of chance and its relationship to common numerical values associated with chance, such as 'even chance' = 0.5 or 50%
- simple and familiar unconditional probability events with randomness and chance
- simple inferencing from likelihood estimates to inform decision making in relation to common and familiar events such as rolling dice, or spinners.

Key skills

- estimate and identify likelihood of common and familiar events occurring using simple fractions, decimals or percentages such as $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$, 0.5, 50%
- identify sample spaces or options for common and familiar events or occurrences
- recognise that the likelihood of events occurring can differ, and develop an understanding of how to reduce or increase the likelihood of an event occurring.

Area of Study 8: Systematics

In this area of study students will understand the inputs and outputs of technology that can be used in everyday lives for the purposes of planning, collecting, sorting or categorising common and familiar quantitative or mathematical data and information. Students will choose a number of inputs of familiar data, compare the outputs and results, and understand the representations and any summary information derived from the technology.

Key knowledge

- common and familiar information and data inputs and outputs
- common and familiar computational data collection tools and applications
- collating, organising, categorising, planning, scheduling and table creation of common and familiar information and data using technology.

Key skills

This area of study includes the use of technology (such as spreadsheets, software, mobile technologies, and apps) to:

- create tables to collate, organise and input or record common and familiar data and information
- arrange and sort simple and familiar data and information
- use systems to plan and schedule common and familiar actions

- read inputs and interpret outputs such as from interactive maps, public transport timetables, online calculators/applications/planners
- adjust variables of inputs to optimise outputs and solutions for common and familiar situations and contexts.

Selecting numeracies for Units 1 and 2

All six numeracies must be covered across Units 1 and 2. The order in which this is done and how this is combined with the underpinning mathematical knowledge and skills, as described in the areas of study, is decided by the school or teacher. This flexibility is an essential part of an applied learning approach.

These combinations can therefore be selected based on the needs and interests of the student cohort, school community, or related vocational and work environment.

In summary, schools and teachers must make their selection of numeracies based on the following guidelines:

- Each unit must include three of the six numeracies.
- All six numeracies must be covered across Units 1 and 2.
- All eight areas of study must be covered across Units 1 and 2.

This table provides an overview for selecting numeracies in Units 1 and 2:

Numeracies	Areas of study
Unit 1, Outcome 1	
Select **three of the following six numeracies** for Unit 1: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy ensuring all four areas of study are covered in the unit. – Area of Study 1: Number – Area of Study 2: Shape – Area of Study 3: Quantity and measures – Area of Study 4: Relationships
Unit 2, Outcome 1	
Select the **three remaining numeracies** for Unit 2: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy ensuring all four areas of study are covered in the unit – Area of Study 5: Dimension and direction – Area of Study 6: Data – Area of Study 7: Uncertainty – Area of Study 8: Systematics

Ensure all numeracies have been covered across the two units.

Connecting the numeracies with the mathematical content in the areas of study

The following table provides an example of a learning program that covers the eight areas of study across Units 1 and 2.

		Unit 1		
		Numeracy 1 E.g. Health	Numeracy 2 E.g. Vocational	Numeracy 3 E.g. Recreational
Areas of study	1. Number			✔
	2. Shape		✔	
	3. Quantity and measures	✔	✔	
	4. Systematics	✔		
		Unit 2		
		Numeracy 4 E.g. Financial	Numeracy 5 E.g. Civic	Numeracy 6 E.g. Personal
Areas of study	5. Dimension and direction			✔
	6. Data	✔	✔	
	7. Uncertainty		✔	
	8. Systematics	✔		

Outcome 2

On completion of this unit, the student should be able to select, interpret and use the four stages of the mathematical problem-solving cycle, using a range of both informal and formal mathematical processes, representations, and conventions relevant to the mathematical key knowledge and key skills specified in Areas of Study 5-8, and across the chosen range of numeracies.

Problem-solving cycle

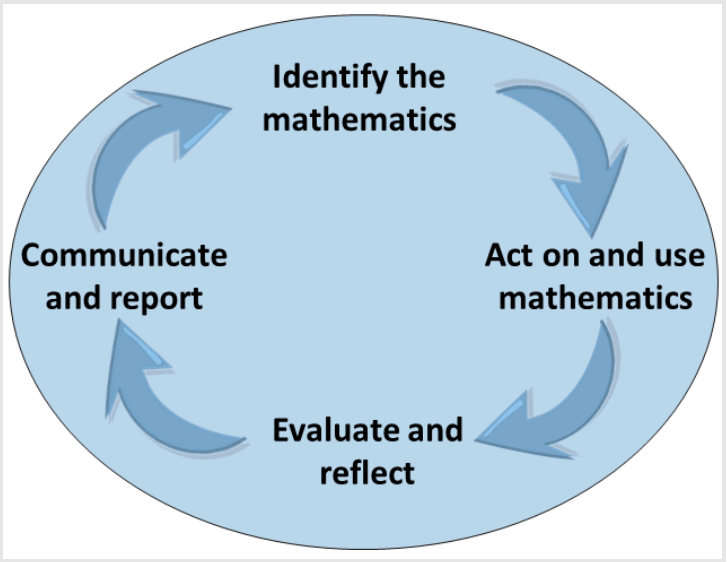
The purpose of Outcome 2 is to enable students to develop their everyday numeracy skills and practices to make sense of their daily personal, civic and vocational lives. Students need to develop the skills and capabilities to be able to problem-solve, and to use their skills to investigate and solve a problem where the mathematics is embedded within a real-world context. Outcome 2 describes and outlines a problem-solving

cycle that supports students to become more capable problem solvers, and to use their mathematical skills successfully to become numerate individuals within the community and in their selected vocations.

Given that the contexts described in Outcome 1 will be the starting point, students need to be taken through a structured problem-solving cycle to know how to move from the real-world context to the mathematical world, and to apply their mathematical knowledge to solve the mathematical problem at hand. Part of solving any such embedded problem is to be able to reflect upon and evaluate the outcomes, and to then communicate and report on what was done and the results.

The problem-solving cycle underpinning the curriculum has four distinct components which include, in order: identifying the mathematics; acting on and using the mathematics; evaluating and reflecting; and communicating and reporting on the results.

These four components are represented in the figure below.



Structure of Outcome 2

The skills and knowledge required to achieve Outcome 2 are organised under four distinct components to match the problem-solving cycle:

a) **Identify the mathematics**: recognise, select and interpret the mathematical information embedded in a real-world context and decide what mathematics to use.

When mathematical problems are embedded within real-world contexts, students need to identify the essential features to be accommodated when transforming the real-world situation into a mathematical problem. This requires students to identify and name the mathematics embedded in the context or scenario and to make decisions about how the task can be best represented and solved mathematically. Students need to develop a plan of the actions they intend to undertake, including providing an overview of the scenario and any related background information, and specify the related mathematical questions of interest, conjectures or hypotheses.

Key knowledge

- the purpose of the task and the question(s) to be posed and answered
- the relevant mathematical information embedded in the selected numeracy context and materials.
- the mathematical operation(s), processes and tools needed to solve the problem.

Key skills

- identify, interpret and comprehend a range of everyday mathematical information that is embedded in familiar and routine materials, texts and tasks where the mathematics content is fairly explicit or visual with relatively few distractors
- draw on a combination of hands-on, contextually appropriate materials, personal experience, mathematical and prior knowledge to select appropriate solution strategies from the range of mathematical processes described in the areas of study
- develop a clear mathematical plan, using a combination of formal and informal written mathematical language and symbols.

b) **Act on and use mathematics:** perform mathematical actions and processes in order to complete a task – this includes the use and application of a range of technologies

This stage of the problem-solving cycle involves undertaking the mathematical aspects of the task identified in the first stage. It requires the use of mathematical processes and problem-solving techniques, facts and procedures to solve the problem, and the selection and use of appropriate tools, representations and technologies. For example, students may need to undertake measurements; perform calculations; select and solve equations; make logical deductions from mathematical assumptions; perform symbolic manipulations; create and extract information from mathematical tables and graphs; represent and manipulate geometrical objects in 2D and 3D; or analyse data.

Key knowledge

- the appropriate mathematical processes required for completing the numeracy task
- estimations required prior to completing the numeracy task
- appropriate technology, tools and applications required to complete the numeracy task
- the relevant mathematical actions, processes and calculations required to complete the numeracy task.

Key skills

- select and use appropriate tools, hand-held devices, computers and technological processes such as to measure, for example, the dimensions of a window in *mm* with a tape measure, or to create a personal weekly budget in a spreadsheet
- use a blend of personal 'in-the-head' methods, formal pen and paper methods and digital/technological calculators, software, apps and tools to undertake the required mathematical actions, processes, calculations and problem-solving process.

Note: This requires the use and application of only one or two steps or processes, or more if they are related or similar processes.

c) **Evaluate and reflect:** check and reflect on the mathematical problem-solving processes and outcomes in relation to the real-world context

Responses to real-world numeracy tasks, including any mathematical solutions and results, judgements, decisions or conclusions, require review and critical reflection and evaluation. Any results should be checked and evaluated against the original situation in terms of its reasonableness and its relevance to the final solution; with comparisons made against the initial estimates before deciding to accept the solution and/or make revisions and adjustments before presenting the final solutions. In cases where decisions or judgements are being made about the solution, other factors might also be considered, such as social or economic consequences. These processes are often referred to as contextual judgements.

Key knowledge

- estimations, actions and any calculations required to check if results are as expected
- appropriateness and reasonableness of results from the numeracy task.

Key skills

- use estimation and personal experience, mathematical and other prior knowledge, to check and reflect on the results and their reasonableness and appropriateness to the context and task, adjust results if necessary, and explain why a problem could not be solved if this is the outcome.

Note: Some level of teacher prompting, and support can be provided in relation to reflections on the outcome and results.

d) **Communicate and report:** use a combination of informal and formal mathematical representations to document and report outcomes and results

The results of any numeracy task require a summary of the work to be compiled and developed, including the presentation and interpretation of the findings from the mathematical activities and related applications. This stage requires students to prepare a range of representations to communicate the mathematical results. This will involve both oral and written language, and the use of formal and informal mathematical visualisations and representations, including the use of a range of different formats, media or technologies.

Key knowledge

- written mathematical representations used to document and report on the mathematical processes and the results of the numeracy task
- oral mathematical language used to present and discuss the mathematical processes and the results of the numeracy task
- a range of different formats, devices or technologies used to represent and document the numeracy task.

Key skills

- use a combination of both informal and formal written mathematical language and symbols and general language to document and report on the mathematical and problem-solving process and results
- use a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem-solving process and results
- use a combination of both formal and informal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level. For example:
  - 1/100, 12.5%
  - km/hr, $/kg
  - 1.25 m = 1250 mm.

Note: Not **all** of the key knowledge and skills above are expected to be covered in each numeracy investigation or task; however, they should be covered **at least once** across the different numeracy tasks for each unit.

Outcome 3

On completion of this unit, the student should be able to select and effectively and accurately use the appropriate mathematical tools and applications chosen from a developing mathematical toolkit relevant to

the key knowledge and key skills specified in the Areas of Study 5-8, and across the chosen range of numeracies.

Mathematical toolkit

The purpose of Outcome 3 is for students to develop a mathematical toolkit to use where necessary as they undertake their numeracy practices, activities and tasks. At the end of Units 1 and 2, students should be developing their skills of both analogue and digital technologies with the ability to identify and use a range of appropriate mathematical tools (analogue and digital/technological) to solve and communicate mathematical problems embedded in practical contexts.

A student's toolkit should include: existing, traditional tools such as measuring equipment (e.g. tape measures, rulers, kitchen scales); software applications such as spreadsheets; and a range of new and emerging devices and applications from across different technologies (e.g. measurement, angle and level apps available on mobile phones or portable handheld devices). Students should be developing their skills to transfer their knowledge from one device or application to an unknown one with the aim of adapting to emerging technologies into the future. For example, the use of internet applications (such as measuring and calculation apps) for costing and ordering of materials for an onsite job.

Key knowledge

- contemporary technological and online and digital media, including software and applications based on computers, tablets, calculators and hand-held devices and the relevance, appropriateness of their use and application
- a range of familiar analogue and digital tools that may include tools such as manipulatives, clocks, tape measures, tools of trade and industry
- a range of digital tools that may include mobile technology, software (including spreadsheets) and applications
- the conventions and use of such analogue and digital tools appropriate to the individual, community and workplace, and comparisons between technologies
- the conventions and language for the representation of mathematical and statistical information, objects and processes, using different technologies and digital media
- the numerical, graphical, symbolic, geometric and statistical functionalities of this range of technologies
- the conditions and settings for a given purpose, and for appropriate application of a given technology and its functionality
- online safety when using technologies.

Key skills

- use a range of analogue and digital/technological tools and devices to carry out tasks and derive results
- use technology to carry out computations and analysis
- use technology to visualise and represent information, such as to produce diagrams, tables, charts, infographics, and graphs that model situations and solve practical problems
- use technology to help interpret and communicate the results of a numeracy task
- identify accuracy and error with different technologies
- make decisions regarding inputs into technology and discuss the outputs of technology
- reflect on the use of tools and technology in relation to comparing estimates to results
- reflect on any tools and technologies used and the outcomes obtained relative to personal, contextual and real-world implications, appropriateness and reasonableness.

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of assessment tasks and tools that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes for satisfactory completion.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tools. Assessment must be part of the regular teaching and learning program and should be completed mainly under teacher supervision and within a limited timeframe.

All assessment tools for Units 1 and 2 are school-based. Procedures for assessment of levels of achievement in Units 1 and 2 are a matter for school decision.

The VCAA publishes VCE VM Numeracy Support materials, which includes advice on the design of assessment tools including assessment rubrics.

Assessment tools

Assessment tools are used to collect evidence to make a judgement as to whether the outcomes have been met. An Assessment tool is a method to collect evidence on the standard reached by students and can be a task or a teacher observation using a checklist.

The following table provides the assessment requirements for the outcomes in Unit 2 and will assist teachers in determining the student attainment of the standard.

Outcome	Assessment tasks
Outcome 1 On completion of this unit, the student should be able to use and apply the mathematical key knowledge and skills from the four areas of study, across the specified Numeracies.	Assessment tasks should provide opportunities for practical application of the outcome. The structure of the Numeracy study sees that the demonstration of achievement of Outcomes 1, 2 and 3 should be based on the student's performance on a selection of the following assessment tasks: ● Investigations and projects. For example, a diary ('week in the life of me'), outlining budgets (pay rates and tax), travel (how do I get places), shopping (best deals). ● Multimedia presentation, poster or report. For example, an outline of food requirements for an athlete preparing for their sport including nutrition, recipes, calories required and exerted, energy requirements, and measurements including distances. ● Portfolio. For example, students may prepare job interview questions and responses to include details on scheduling an appointment, planning what resources are needed for transforming a house to renewables using data and tables, and understanding cost calculations, or unpacking statistics related to climate change.
Outcome 2 On completion of this unit, the student should be able to use and apply the mathematical problem-solving cycle in an applied learning context, relevant to the mathematical key skills and knowledge reflected in the areas of study and across the Numeracies.	
Outcome 3 On completion of this unit, the student should be able to identify, select and apply a wider range of appropriate mathematical tools.	

Unit 3

In Unit 3 students further develop and enhance their numeracy practices to make sense of their personal, public and vocational lives. Students extend their mathematical skills with consideration of their local, community, national and global environments and contexts, and the use and evaluation of appropriate technologies.

These units provide students with a broad range of mathematical knowledge, skills and understanding to solve problems in real contexts for a range of workplace, personal, further learning and community settings relevant to contemporary society.

The progression of learning is evident in Units 3 and 4 with the development of more complex numeracy and mathematical skills and knowledge, drawing on the knowledge gained from Units 1 and 2.

Areas of study

There are four areas of study in Unit 3:

- Area of Study 1: Number
- Area of Study 2: Shape
- Area of Study 3: Quantity and measures
- Area of Study 4: Relationships.

The areas of study cover a range of different mathematical knowledge and skills that are expected to be used and applied across the three outcomes.

Outcomes

For Units 3 and 4 the student is required to demonstrate achievement of three outcomes. As a set these outcomes are required to encompass all eight areas of study across the two units.

At the end of Units 3 and 4, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. At the end of Units 3 and 4, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. Students should be at ease with a range of calculations and mathematical processes both manually and/or using technology. They should be able to evaluate and critically reflect on the outcomes and results of their numeracy tasks and investigations and be aware of any real-world implications and consequences. They should be able to evaluate and critically reflect on the outcomes and results of their numeracy tasks and investigations and be aware of any real-world implications and consequences.

Outcome 1

On completion of this unit, the student should be able to extract, evaluate and apply the mathematical key knowledge and key skills from the four Areas of Study 1-4, embedded in a range of routine, non-routine, unfamiliar and some specialised contexts across the chosen range of numeracies.

Numeracy in context

The purpose of Outcome 1 is to support and enable students to use, justify, and formulate a range of different numeracy skills and capabilities in order to make sense of their daily personal, public and vocational lives.

Outcome 1 describes the range of contexts that are the focus for undertaking the numeracy and mathematical skills. These six numeracies cover personal, financial, civic, health, recreational and vocational contexts where a range of mathematical skills are situated and embedded.

The six numeracies described are intended to be selected to best meet the needs and interests of the students and the school community, and should be mapped to the relevant and appropriate areas of study depending on the underpinning mathematical knowledge and skills required. The different numeracies can take on a more vocational focus if appropriate. For example, financial numeracy could take as its focus vocations such as the financial or business sectors, or health numeracy could focus on working in the health, community or medical sectors.

Structure of Outcome 1

Outcome 1 is framed by six different numeracies:

- Choose three of the six numeracies.
- All six numeracies must be covered across Units 3 and 4.
- Select either one or two areas of study to support each selected numeracy.

a) **Personal numeracy** relates to the mathematical requirements for personal organisational matters involving numbers, data, money, time and travel.

   Personal numeracy relates to understanding, using and interpreting numerical and mathematical information presented and embedded in different formats and media, to undertake personally relevant activities in a range of routine, non-routine, unfamiliar and some specialised situations.

   The understanding, use and interpretation of personal numeracy can be drawn from, but is not limited to, the following examples:

   - numerical information embedded in printed and digital media, including monetary values
   - planning and undertaking a BBQ, family event, trips to sites of cultural significance
   - personal and home/family day-to-day tasks such as cooking, gardening, sport, travel
   - planning a class excursion or event including costs and logistics and complexities
   - savings related activities such as comparing prices with different discounts and payment deals, calculating and reviewing unit prices, or calculating and comparing fuel economy rates and costs for cars.

b) **Civic numeracy** relates to participating in civic life through knowing how to stay informed, and understanding government, political and social data, information and processes.

   Civic numeracy includes understanding, interpreting and evaluating statistical and quantitative information presented by governments and in news and media reports, and other data-related sources to meet the demands and challenges of life at local, state, national and global levels. It can incorporate the understanding, use and interpretation of quantitative and statistical information.

The understanding, use and interpretation of civic numeracy can be drawn from, but is not limited to, the following examples:

- political or government-related information, including advertising, elections and voting
- managing personal social responsibilities and obligations
- environmental issues from multiple perspectives including First Nations peoples' perspectives, such as land management, fire management, waterways, wildlife
- state, national and global social and environmental issues such as climate change, human rights, animal rights, cultural sites
- economic data including unemployment rates, underemployment, participation rates, inflation and official interest rates.

c) **Financial numeracy** relates to understanding and undertaking financial transactions and making informed judgments and decisions regarding the use and management of money.

Financial numeracy involves managing relevant personal, social or work-related financial costs, charges, income and expenditure.

The understanding, use and interpretation of financial numeracy can be drawn from, but is not limited to, the following examples:

- personal money management such as banking, monitoring debit and credit transactions, and keeping track of money
- online financial services such as mobile banking, Medicare and MyGov services
- occupational income and expenses, including work-related budgets, overtime and penalty rates
- sales based commissions, including fixed component and percentage commission, and comparisons
- government financial systems such as taxation, GST, student loans, superannuation and Medicare
- calculations for allowances, such as travel, uniform and vehicle use
- utility and other relevant personal or family bills and charges, and comparing providers
- personal loans such as car loans, payday loans, buy now pay later services and store credit, use of online interest calculators
- making informed decisions about credit, including interest, minimum repayments, frequency of repayments, transacting safely online and via apps, and avoiding scams
- short- and long-term costs of purchases on oneself, family or communities, and the planet, for example evaluating special deals, buying new versus second-hand, buying ethically versus sweat-shopped.

d) **Health numeracy** relates to accessing, understanding and using mathematical information to make decisions and act in the interests of health, healthcare and well-being.

Health numeracy involves being able to use mathematics to manage one's personal health, safety and well-being, alongside being aware of such issues from a community or work-related perspective.

The understanding, use and interpretation of health numeracy can be drawn from, but is not limited to, the following examples:

- nutrition or fitness, including setting goals and understanding issues such as the relationships between lifestyle and disease
- social health issues such as drinking, safe driving, obesity, drugs
- health and safety at work such as accident types, rates and causes, audits of workplace chemicals and comparison with home-based chemicals
- medical information within a hospital/doctor setting such as typical blood pressure, heart rate, respiration rate, body temperature
- publicly available medical and health information and advice, for example in relation to maintaining a healthy and safe lifestyle including healthy eating/diet, exercise or diseases and pandemics

- personal medical care, such as the use and dosages of medications, including scheduling
- health and safety matters related to potential accidents and use of chemicals
- health care costs, including Medicare rebates and surcharge, comparing and using private health insurance at different ages and stages of life such as single, coupled, family, uncoupled, elderly.

e) **Vocational numeracy** relates to effectively participating in the workplace and managing the demands of work and/or vocational training.

Vocational or work-related numeracy relates to undertaking the required tasks and activities in a work-related context, such as using different workplace measurements, tools, applications and processes/systems, following and giving directions, participating in quality assurance processes and data collection, and reading workplace documents and information.

The understanding, use and interpretation of vocational numeracy can be drawn from, but is not limited to, the following examples:

- workforce comparisons from past practice (pre-digital) to current (digital), including time to complete tasks and effort involved
- reading, following or creating instructions and documents related to workplace tasks such as phone numbers, ratios to mix chemicals or for handling hazardous chemicals or substances, including interpreting Materials Safety Data Sheets (MSDS)
- occupational health and safety or quality assurance requirements
- workplace specific plans, diagrams, formulas, proportions, rates and ratios
- different technological (digital or analogue) measuring and processing devices, tools and applications
- tolerances and levels of accuracy and the implications of incorrect applications or mixing of chemicals.

f) **Recreational numeracy** relates to the mathematical aspects of recreational activities including, but not limited to arts, sport and social media.

Recreational numeracy encompasses not only physical exercise and sport, but also aspects of personal time spent on non-work activities such as indoor and outdoor pursuits, arts, social media, and interests such as gaming. It also covers community, cultural or religious activities.

The understanding, use and interpretation of recreational numeracy can be drawn from, but is not limited to, the following examples:

- the planning of an activity or event including costings, steps and processes
- comparison of planning and costs of different party venues and events, such as for a birthday party or cultural celebration
- traditional and modern games including games played by First Nations peoples and other cultural groups across different regions within Australia
- dimensions and specifications of community recreation areas, such as the size of a netball court, playground, chessboard, or multipurpose court
- dimensions and specifications of art and craft products being planned or created, such as photo sizes, dresses/costumes, furniture
- rules and game scoring systems and formulas, penalties, fines, timing
- use and overuse of recreational activities and associated dangers.

Areas of study

Area of Study 1: Number

In this area of study students undertake single- and multi-step operations and tasks applied to a range of numbers, including positive and negative numbers, fractions, decimals and percentages and numbers expressed using familiar power notations. Students should be confident in selecting the appropriate method or approach required and communicating their ideas. They should be at ease with performing calculations both manually and using software tools and devices.

Key knowledge

- whole numbers, fractions, decimals up to three places, and reading numbers expressed in digits or words
- multiplication facts and knowledge of factors and multiples
- rounding whole numbers and decimals up to three decimal places
- positive and negative numbers
- powers up to an index of three and square roots
- equivalence of decimals, fractions and percentages
- simple proportions and ratios.

Key skills

- fluently read very large and very small numbers
- solve a range of practical calculations including positive and negative numbers, including rounding whole numbers and decimals up to three places
- solve problems involving fractions, decimals and percentages, including calculating percentage increase and decrease
- solve problems involving powers and square roots
- solve simple problems with ratio and proportions.

Area of Study 2: Shape

In this area of study students learn to recognise and name a range of two-dimensional shapes and three-dimensional objects. They classify, manipulate, represent and construct a range of simple and compound shapes in diagrammatical and concrete forms. Students also become familiar with the different characteristics and properties used in classifying shapes.

Key knowledge

- properties and names of a range of two-dimensional shapes and three-dimensional objects such as cones and pyramids
- reflectional and rotational symmetry and similarity of a range of shapes and objects
- key angle properties of shapes including degrees in triangles/quadrilaterals
- patterns in, and between, a range of different shapes
- appropriate technologies that create and manipulate a range of two-dimensional shapes and three-dimensional objects
- scaling in relation to enlargement and reduction in size.

Key skills

- describe and classify a range of different two-dimensional shapes and three-dimensional objects
- determine reflectional and rotational symmetry, and use these to manipulate shapes
- understand common angle properties in relation to two-dimensional shapes
- use ideas of congruence and self-similarity
- create compound two-dimensional shapes and three-dimensional objects and describe the relationship between these, including through the use of technology
- determine, name and describe patterns according to different properties of shapes such as those found in engineering, architecture and design, for example bridges, buildings, sculptures.

Area of Study 3: Quantity and measures

In this area of study students develop an understanding of metric measurements and their units of measurement applied to multi-step measurement tasks including working with commonly used non-metric measurements and their units of measure. Students will conduct estimations of measurements, perform a range of measurement calculations, and undertake conversions with the embedded use of different technologies.

Key knowledge

- a range of measures of distance, perimeter, area, volume and capacity including the use and application of common and routine measurement formulas
- a range of metric and relevant non-metric units of measurement and conversion between units
- a range of units of time and temperature
- a range of measurement estimation strategies
- a range of measurement tools
- understanding of accuracy and tolerances in measurements.

Key skills

- estimate and measure objects and distances by using measurement tools with appropriate accuracy and tolerance
- undertake calculations and determine measurements of distance, perimeter, area, volume and capacity for routine, more complex two-dimensional shapes and three-dimensional objects including compound shapes, for example the use of pi in circular measurements
- convert between both metric and non-metric units where relevant such as cm/inch, Celsius/Fahrenheit, and grams/pounds
- read and interpret units of analogue and digital time including 24-hour time and time zones
- read, interpret and calculate temperature measurements
- perform calculations using multiple units of time, including time zones, and calculate time durations, including the use of calendar months, weeks, days, as well as hours, minutes, and seconds.

Area of Study 4: Relationships

In this area of study students recognise, understand and represent relationship and change in more formal mathematical terms, where it exists in relevant real-life contexts and applications. Students should understand when change is occurring and be able to identify and use formal mathematical relationships, variables, and mathematical processes to determine the results of change.

Key knowledge

- a range of rates of change such as RPM, m/s
- relevant and straightforward ratios and proportions
- common, relevant and real-life algebraic formulas, relationships and algebraic expressions and thinking
- representation and visualisation of change such as algebraic expressions and formulas, conversion charts or graphs
- standard conventions used in the development, use and writing of a range of algebraic expressions.

Key skills

- describe relationships between variables and explain their significance in relationship to the applied context
- develop and represent relationships with mathematical expressions, or graphical or tabular representations
- use and apply formulas to solve real-life problems
- use and apply rates to solve problems such as $\$/m^3$, L/hr, wages/hr
- use and apply relevant ratios and proportions to solve problems such as scales on maps and plans, in the mixing of chemicals or ingredients, or calculating magnification factors.

Selecting numeracies for Units 3 and 4

All six numeracies must be covered across Units 3 and 4. The order in which this is done and how this is combined with the underpinning mathematical knowledge and skills, as described in the areas of study, is decided by the school and the teachers. This flexibility is an essential part of an applied learning approach.

These combinations can therefore be selected based on the needs and interests of the student cohort, school community, or related vocational and work environment.

Schools and teachers must make their selection of numeracies based on the following guidelines:

- Each unit must include three of the six numeracies
- All six numeracies must be covered across Units 3 and 4
- All eight areas of study must be covered across Units 3 and 4.

The following table provides an overview for selecting numeracies in Units 3 and 4:

Numeracies	Areas of study
Unit 3, Outcome 1	
Select **three of the following six numeracies** for Unit 3: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy. – Area of Study 1: Number – Area of Study 2: Shape – Area of Study 3: Quantity and measures – Area of Study 4: Relationships
Unit 4, Outcome 1	

Numeracies	Areas of study
Select the **three remaining numeracies** for Unit 4: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy. – Area of Study 5: Dimension and direction – Area of Study 6: Data – Area of Study 7: Uncertainty – Area of Study 8: Systematics

Ensure all areas of study have been covered over the two units.

Connecting the numeracies with the mathematical content in the areas of study

The following table provides an example of a learning program that covers the four areas of study across Unit 3.

		Unit 3		
		Numeracy 1 E.g. Personal	Numeracy 2 E.g. Financial	Numeracy 3. E.g. Civic
Areas of study	1. Number		✔	✔
	2. Shape			
	3. Quantity and measures	✔		✔
	4. Relationships	✔		

Outcome 2

On completion of this unit, the student should be able to select, evaluate and apply the four stages of the mathematical problem-solving cycle, using an expanding range of both informal and formal mathematical processes, representations, and conventions relevant to the mathematical key knowledge and key skills specified in the Areas of Study 1-4, and across the chosen range of numeracies.

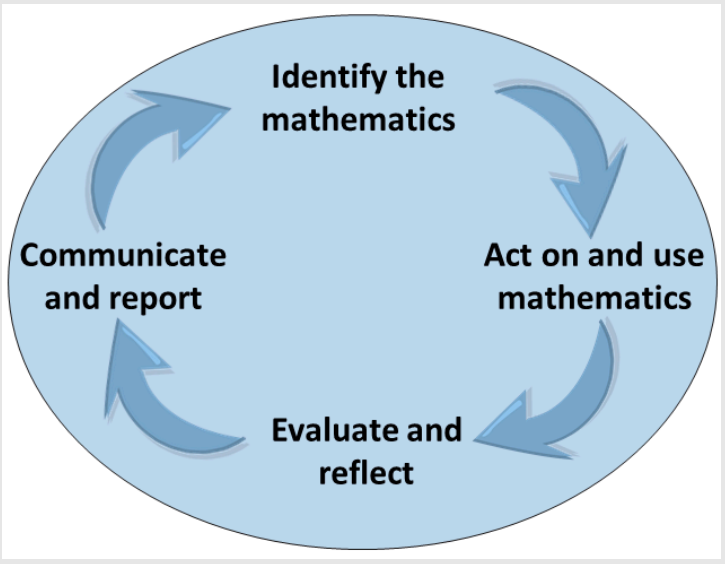
Problem-solving cycle

The purpose of Outcome 2 is to enable students to develop their everyday numeracy skills and practices in order to make sense of their daily personal, civic and vocational lives. Students need to develop the skills and capabilities to be able to problem-solve, and to use their skills to investigate and solve a problem where the mathematics is embedded within a real-world context. Outcome 2 describes and outlines a problem-solving cycle that supports students to become more capable, critical and reflective problem solvers, and to use their mathematical skills successfully and confidently to become numerate individuals within the community and in their selected vocations.

Given that the contexts described in Outcome 1 will be the starting point, students need to be taken through a structured problem-solving cycle to know how to move from the real-world context to the mathematical world, and to apply their mathematical knowledge to solve the mathematical problem at hand. Part of solving any such embedded problem is to be able to reflect upon and evaluate the outcomes, and to then communicate and report on what was done and the results.

The problem-solving cycle underpinning the curriculum has four distinct components which include, in order: identifying the mathematics; acting on and using the mathematics; evaluating and reflecting; and communicating and reporting on the results.

These four components are represented in the figure below.



Structure of Outcome 2

The skills and knowledge required to achieve Outcome 2 are organised under four distinct components to match the problem-solving cycle:

a) **Identify the mathematics:** recognise, select and interpret the mathematical information embedded in a real-world context and decide what mathematics to use

When mathematical problems are embedded within real-world contexts, students need to identify the essential features to be accommodated when transforming the real-world situation into a mathematical problem. This requires students to identify and name the mathematics embedded in the context or scenario and to make decisions about how the task can be best approached and solved mathematically. Students need to develop a plan of the actions they intend to undertake, including providing an overview of the scenario and any related background information, and specify the related mathematical questions of interest, conjectures or hypotheses.

Key knowledge

- the purpose of the task and the question(s) to be posed and answered
- the relevant mathematical information embedded in the selected numeracy context and materials
- the mathematical operation(s), processes and tools needed to solve the problem.

Key skills

- identify, interpret and comprehend a range of mathematical information that is embedded in a range of relevant but possibly unfamiliar or non-routine text, materials and tasks where the mathematics content needs to be identified and extracted from its contextual situation
- draw on a combination of hands-on, contextually appropriate materials, personal experience, mathematical and prior knowledge to select appropriate solutions or strategies selected from the range of mathematical processes described in the areas of study
- Develop a detailed and explicit mathematical plan, using a combination of formal and informal written mathematical language and symbols.

b) **Act on and use mathematics:** perform mathematical actions and processes in order to complete a task – this includes the use and application of a range of technologies

This stage of the problem-solving cycle involves undertaking the mathematical aspects of the task identified in the first stage. It requires the use of mathematical processes and problem-solving techniques, facts and procedures to solve the problem, and the selection and use of appropriate tools, representations and technologies. For example, students may need to undertake measurements; perform calculations; select and solve equations; make logical deductions from mathematical assumptions; perform symbolic manipulations; create and extract information from mathematical tables and graphs; represent and manipulate geometrical objects in 2D and 3D; or analyse data.

Key knowledge

- the appropriate mathematical processes required for completing the numeracy task
- estimations required prior to completing the numeracy task
- appropriate technology, tools and applications required to complete the numeracy task
- the relevant mathematical actions, processes and calculations required to complete the numeracy task.

Key skills

- flexibly use a blend of personal 'in-the-head' methods, formal pen and paper methods and digital/technological calculators, software, apps and tools to undertake the required mathematical actions, processes, calculations and problem-solving processes
- select and flexibly use the appropriate tools, hand-held devices, computers, and technological processes to perform the mathematical tasks required.

Note: This requires the use and application of a range of multiple and different mathematical steps or processes.

c) **Evaluate and reflect:** check and reflect on the mathematical problem-solving processes and outcomes in relation to the real-world context

Responses to real-world numeracy tasks, including any mathematical solutions and results, judgements, decisions or conclusions, require review and critical reflection and evaluation. Any results should be critically evaluated against the original situation in terms of their reasonableness and relevance to the final solution; with comparisons made to the initial estimates before decisions are made to accept the solution and/or make revisions and adjustments before presenting the final solutions. In cases where decisions or judgements are being made about the solution, other factors might also be considered, such as social or economic consequences. These processes are often referred to as contextual judgements.

Key knowledge

- the estimations, actions and any calculations required to check if results are as expected
- appropriateness, reasonableness and consequences of results of the numeracy task.

Key skills

- apply estimation and personal experience, mathematical and other prior knowledge, to check and critically reflect on the results and their reasonableness and appropriateness to the context and task, adjust results if necessary, and explain why a problem could not be solved if this is the outcome
- independently initiate and uses support from a range of established resources to evaluate the mathematics used and to critically reflect on the results obtained relative to personal, contextual and real-world implications and consequences.

d) **Communicate and report:** use a combination of informal and formal mathematical representations to document and report outcomes and results

The results of any numeracy task require a summary of the work to be compiled and developed, including the presentation and interpretation of the findings from the mathematical activities and related applications. This stage requires students to prepare a range of representations to communicate the mathematical results. This will involve both oral and written language, and the use of formal and informal mathematical visualisations and representations, including the use of a range of different formats, media or technologies.

Key knowledge

- written mathematical representations that document and report on the mathematical processes and the results and the evaluation of the numeracy task
- oral mathematical language to present and discuss the mathematical processes used and the results of the numeracy task
- the different formats, devices or technologies used to represent and document the numeracy task.

Key skills

- use a combination of informal but mostly formal written mathematical and general language including some specialised mathematical symbolism, abbreviations and terminology and representation to document, interpret and communicate the mathematical and problem-solving process, results and evaluation
- use a combination of formal and informal oral mathematical and general language including some specialised mathematical language and terminology to present and discuss the mathematical and problem-solving process, results and evaluation
- use a range of formal mathematical representations, symbolism, diagrams, graphs, algebraic representation and conventions relevant to the mathematical knowledge as specified in the areas of study.

Note: Not **all** of the key knowledge and skills above are expected to be covered in each numeracy investigation or task; however, they should be covered **at least once** across the different numeracy tasks for each unit.

Outcome 3

On completion of this unit, the student should be able to flexibly, effectively and accurately use a range of appropriate tools and applications chosen from an extensive mathematical toolkit relevant to the key knowledge and key skills specified in the Areas of Study 1-4, and across the chosen range of numeracies.

Mathematical toolkit

The purpose of Outcome 3 is for students to apply and use an extensive mathematical toolkit to use where required as they undertake their numeracy practices, activities and tasks. At the end of Units 3 and 4, students should be productive, informed and efficient users of both analogue and digital technologies with the ability to select and effectively use a wide range of appropriate mathematical tools (analogue and digital/technological) to solve and communicate mathematical problems embedded in practical contexts.

A student's toolkit should include: existing, traditional tools such as measuring equipment (e.g. tape measures, rulers, kitchen scales); software applications such as spreadsheets; and a range of new and emerging devices and applications from across different technologies (e.g. measurement, angle and level apps available on mobile phones or portable handheld devices). Students should be ready to adapt to emerging technologies into the future, for example, the use of drones and mobile technologies to measure and quote for jobs; or the use of internet applications (such as measuring and calculation apps) for costing and ordering of materials for an onsite job.

Key knowledge

- contemporary technological and online and digital media, including software and applications based on computers, tablets, calculators and hand-held devices, and the accuracy, relevance, appropriateness and validity of their use and application
- emerging technologies and their use and representations
- a range of familiar and unfamiliar analogue tools that may include concrete objects and manipulatives such as clocks, tape measures, tools of trade and industry
- a wide range of digital tools that may include mobile technology, software (including spreadsheets) and applications
- the conventions and use of such analogue and digital tools appropriate to the individual, community and workplace, and critical comparisons between technologies regarding validity and accuracy
- the conventions and language for the representations of mathematical and statistical information, objects and processes, using different technologies and digital media
- the numerical, graphical, symbolic, geometric and statistical functionalities of this range of technologies for working mathematically
- the conditions and settings including accuracy for a given purpose, and for effective and appropriate application of a given technology and its functionality
- online safety when using technologies.

Key skills

- use a wide range of both analogue and digital/technological tools and devices to carry out tasks and derive results
- use and apply technology to carry out computations and analysis
- use technology to effectively and validly visualise and represent information, such as to produce diagrams, tables, charts, infographics and graphs which model situations and solve practical problems
- use technology to help interpret, evaluate, discuss and communicate the results of a numeracy task
- identify, calculate and evaluate accuracy and error with different technologies and the implications for results
- make decisions regarding inputs into technology and then reflect on and evaluate and discuss the outputs of technology
- reflect on and evaluate the use of tools and technology in relation to comparing estimates to results

- critically reflect on and evaluate any tools and technologies used and the outcomes obtained relative to personal, contextual and real-world implications, appropriateness and reasonableness.

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of assessment tasks and tools that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes for satisfactory completion.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tools. Assessment must be part of the regular teaching and learning program and should be completed mainly under teacher supervision and within a limited timeframe.

All assessment tools for Units 3 and 4 are school-based. Procedures for assessment of levels of achievement in Units 3 and 4 are a matter for school decision.

The VCAA publishes VCE VM Numeracy Support materials, which includes advice on the design of assessment tools including assessment rubrics.

Assessment tools

Assessment tools are used to collect evidence to make a judgement as to whether the outcomes have been met. An assessment tool is a method to collect evidence on the standard reached by students and can be a task or a teacher observation using a checklist.

The following table provides the assessment requirements for the outcomes in Unit 3 and will assist teachers in determining the student attainment of the standard.

Outcome	Assessment tasks
Outcome 1 On completion of this unit, the student should be able to apply, analyse and evaluate the key mathematical knowledge and skills from the four areas of study, across the specified Numeracies.	Assessment tasks should provide opportunities for practical application of the outcome. The structure of the Numeracy study is such that the demonstration of achievement of Outcomes 1, 2 and 3 should be based on the student's performance on a selection of the following assessment tasks: ● Investigations and projects. For example, students may undertake the costings of a project, including budgeting, invoices, receipts and money handling, or consider loans or mortgages including interest and repayments for buying a car or a house. ● Multimedia presentation, poster or report. For example, students may consider the materials needed for painting a house, including measurement, cost and labour.
Outcome 2 On completion of this unit, the student should be able to apply, analyse and evaluate the mathematical problem-solving cycle in an applied learning context, relevant to the mathematical key skills and knowledge reflected in the areas of study and across the Numeracies.	
Outcome 3 On completion of this unit, the student should be able to select, use and apply tools from an extensive mathematical toolkit to a wide range of contexts effectively and accurately.	

Outcome	Assessment tasks
	● Portfolio. For example, students may plan design and run an event for the community, taking into consideration factors such as budgeting, measuring, time and travel.

Unit 4

In Unit 4 students further develop, enhance and extend their numeracy practices to make sense of their personal, public and vocational lives. Students extend their mathematical skills with consideration of their local, community, national and global environments and contexts, and use of, evaluation and justification of appropriate technologies.

These units provide students with a broad range of mathematical knowledge, skills and understanding to solve problems in real contexts for a range of workplace, personal, further learning and community settings relevant to contemporary society.

The progression of learning is evident in Units 3 and 4 with the development of more complex numeracy and mathematical skills and knowledge, drawing on the knowledge gained from Units 1 and 2.

Areas of study

There are four areas of study for Unit 4:

- Area of Study 5: Dimension and direction
- Area of Study 6: Data
- Area of Study 7: Uncertainty
- Area of Study 8: Systematics

The areas of study cover a range of different mathematical knowledge and skills that are expected to be used and applied across the three outcomes.

Selecting the areas of study

Students will cover eight areas of study at least once across Units 3 and 4.

Areas of study are to be selected to support the teaching and learning for each of the six numeracies, as appropriate to the situations and contextual problems being solved. The order in which the areas of study are taught, and how they are combined with other areas of study, is decided by the school and teachers. This flexibility is an essential aspect of an applied learning approach.

Combinations can be based on the needs and interests of the student cohort and its community, and related vocational and work requirements.

Schools and teachers must make their selection of the areas of study based on the following guidelines:

- Each unit must include three numeracies.
- All six numeracies must be covered across Units 3 and 4.
- Select either one or two areas of study to support each selected numeracy.

Outcomes

For Units 3 and 4 the student is required to demonstrate achievement of three outcomes. As a set these outcomes are required to encompass all eight areas of study across the two units.

At the end of Units 3 and 4, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. At the end of Units 3 and 4, students should be able to select the appropriate method or approach required, attempt a series of operations or tasks, and communicate their ideas in multiple formats, including verbal and written form. Students should be at ease with a range of calculations and mathematical processes both manually and/or using technology. They should be able to evaluate and critically reflect on the outcomes and results of their numeracy tasks and investigations and be aware of any real-world implications and consequences. They should be able to evaluate and critically reflect on the outcomes and results of their numeracy tasks and investigations and be aware of any real-world implications and consequences.

Outcome 1

On completion of this unit, the student should be able to extract, evaluate and apply the mathematical key knowledge and key skills from the four Areas of Study 5-8, embedded in a range of routine, non-routine, unfamiliar and some specialised contexts across the chosen range of numeracies.

Numeracy in Context

The purpose of Outcome 1 is to support and enable students to use, justify, and formulate a range of different numeracy skills and capabilities in order to make sense of their daily personal, public and vocational lives.

Outcome 1 describes the range of contexts that are the focus for undertaking the numeracy and mathematical skills. These six numeracies cover personal, financial, civic, health, recreational and vocational contexts where a range of mathematical skills are situated and embedded.

The six numeracies described are intended to be selected to best meet the needs and interests of the students and the school community, and should be mapped to the relevant and appropriate areas of study depending on the underpinning mathematical knowledge and skills required. The different numeracies can take on a more vocational focus if appropriate. For example, financial numeracy could take as its focus vocations such as the financial or business sectors, or health numeracy could focus on working in the health, community or medical sectors.

Structure of Outcome 1

Outcome 1 is framed by six different numeracies. Each unit should cover three of the numeracies.

- Choose the remaining three of the six numeracies.
- All six numeracies must be covered across Units 1 and 2.
- Select either one or two areas of study to support each selected numeracy.

a) **Personal numeracy** relates to the mathematical requirements for personal organisational matters involving numbers, data, money, time and travel.

   Personal numeracy relates to understanding, using and interpreting numerical and mathematical information presented and embedded in different formats and media, to undertake personally relevant activities in a range of routine, non-routine, unfamiliar and some specialised situations.

The understanding, use and interpretation of personal numeracy can be drawn from, but is not limited to, the following examples:

- personal relevant statistical data and information embedded in print and digital media
- personal and home/family travel tasks such as driving, road safety, holidays, getting to school or work, or family visits
- scheduling, timetabling and reorganising personal work and travel arrangements
- directional and locational materials (such as printed and online maps, location diagrams for buildings and GPS displays) and planning, describing and following oral and written directions such as tours, visits, holidays and excursions
- planning a family or cultural event, such as trips to sites of cultural significance, or a BBQ.

b) **Civic numeracy** relates to participating in civic life through knowing how to stay informed, and understanding government, political and social data, information and processes.

Civic numeracy includes understanding, interpreting and evaluating statistical and quantitative information presented by governments and in news and media reports, and other data-related sources to meet the demands and challenges of life at local, state, national and global levels. It can incorporate the understanding, use and interpretation of quantitative and statistical information.

The understanding, use and interpretation of civic numeracy can be drawn from, but is not limited to, the following examples:

- political or government-related information and data, including advertising, community information, elections and voting
- information and data on social issues such as human rights, animal rights, cultural and gender issues
- environmental issues from multiple perspectives including First Nations peoples' perspectives, such as land management, fire management, waterways, wildlife
- local, community, state, national and global environmental issues such as climate change, land degradation, pollution
- statistical monitoring of people's lives and their use of devices, and actions made based on such data
- commonly reported state, national and global economic data, trends and predictions including unemployment rates, underemployment, participation rates, gender pay gaps, inflation, official interest rates, GDP data.

c) **Financial numeracy** relates to understanding and undertaking financial transactions and making informed judgements and decisions regarding the use and management of money.

Financial numeracy involves managing relevant personal, social or work-related financial costs, charges, income and expenditure.

The understanding, use and interpretation of financial numeracy can be drawn from, but is not limited to, the following examples:

- comparing and analysing performance or costs and charges over time between different charges, utilities or providers such as petrol prices, household item prices
- managing and adjusting personal, family and work budgets using technology or software applications
- chance and likelihood as it relates to gambling, such as sporting odds
- data, trends, predictions, and risks related to financial issues and factors, such as housing prices, costs of living, CPI, wages and salaries
- data and trends related to government financial systems such as taxation, GST, superannuation.

d) **Health numeracy** relates to accessing, understanding and using mathematical information to make decisions and act in the interests of personal and community health and well-being.

Health numeracy involves being able to use mathematics to manage one's personal health, safety and well-being, alongside being aware of such issues from a community or work-related perspective.

The understanding, use and interpretation of health numeracy can be drawn from, but is not limited to, the following examples:

- nutrition or fitness, including setting goals, tracking data and understanding the issues
- data and trends about social health issues such as drinking, safe driving, obesity, drugs
- health and safety data at work such as accident types, rates and causes, audits of workplace chemicals and comparison with home-based chemicals
- publicly available medical and health information, data and advice, for example in relation to maintaining a healthy lifestyle including healthy eating/diet, exercise or diseases and pandemics, including long term chance and likelihood
- examining differing access to health services in rural and remote areas, and considering the impact on First Nations communities
- publicly available medical and health information, data and advice, for example in relation to maintaining a healthy lifestyle including healthy eating/diet, exercise or diseases and pandemics
- health and safety related data, statistics and trends related to potential accidents and use of chemicals.

e) **Vocational numeracy** relates to effectively participating in the workplace and managing the demands of work and/or vocational training.

Vocational or work-related numeracy relates to undertaking the required tasks and activities in a work-related context, such as using different workplace tools, applications and processes/systems, following and giving directions, participating in quality assurance processes and data collection, and reading workplace documents and information.

The understanding, use and interpretation of vocational numeracy can be drawn from, but is not limited to, the following examples:

- workforce comparisons from past practice (pre-digital) to current (digital), including time to complete tasks and effort involved
- workplace occupational health and safety related data, statistics and trends related to workplace accidents and trends
- reading or creating instructions, documents or reports related to workplace tasks and data such as giving or following workplace directions, collecting, collating and analysing workplace data
- occupational health and safety or quality assurance data requirements
- workplace specific plans and diagrams such as the location of buildings and equipment, hazards, safety and escape plans
- recording information and data or following and giving directions.

f) **Recreational numeracy** relates to the mathematical aspects of recreational activities including but not limited to arts, sport and social media.

Recreational numeracy encompasses not only physical exercise and sport, but also aspects of personal time spent on non-work activities such as indoor and outdoor pursuits, arts, social media, and interests such as gaming. It also covers community, cultural or religious activities.

The understanding, use and interpretation of recreational numeracy can be drawn from, but is not limited to, the following examples:

- statistical and data collection measures around personal or community recreational activities and events

- statistical information and data on the use and overuse of recreational activities, social media and associated dangers
- statistical information and data about sports and sportspeople and their performances
- chance and likelihood as they relate to gambling, such as sporting odds and chances of teams winning or losing
- activities that require skills in navigation such as orienteering, sailing, bushwalking, bike riding
- planning a trip or holiday using direction and locational materials, such as printed and online maps, GPS displays.

Areas of study

Area of Study 5: Dimension and direction

In this area of study students develop an understanding of the use of space, direction and location in relation to landmarks and compass directions. Students should be able to accurately give and follow complex directions to multiple locations based on digital and printed maps and diagrams. The study of dimension also includes angles with degrees and spatial awareness.

Key knowledge

- location and direction in relation to objects and landmarks
- location and direction in relation to maps and technologies
- oral and written instructions for moving to specified locations
- a range of angle measures and representations.

Key skills

- give direction and location instructions between multiple destinations, including unfamiliar locations using appropriate maps or technology
- understand and use compass directions and use appropriate language such as NE, SSW, N15°W
- demonstrate an understanding of angles using degrees
- understand where an object is in space using one-, two- and three- dimensions and using the appropriate language to describe an object's position and movement in space.

Area of Study 6: Data

Data can be found in everyday life, workplaces and society. In this area of study, students collect, represent and undertake different analyses of data to discover patterns in data, undertake summary statistics, and derive meaning from data located within relevant but possibly unfamiliar or non-routine contexts. Data should be examined for comparison and analysis. Students should draw conclusions from the data and their analysis and be confident to represent, describe and reflect on any patterns, outcomes and trends.

Key knowledge

- data collection tools, categorisation, processes and production
- display of data with commonly used tables and graphs including axes and scales
- simple measures of central tendency and spread of data, including outliers
- straightforward analysis of data sets and their displays.

Key skills

- collect, collate and organise data sets and display these in the most appropriate format, including axes and scales
- choose and find the most appropriate common measures of centre and spread for data sets, such as mean, median and range of data
- discriminate between the different measures of centre and spread and understand how they can change conclusions from data, and identify outliers and their implications for the data
- read and interpret results from data presented in multiple forms of tables, graphs and summary statistics, including to describe patterns, variations and trends in the data
- draw conclusions from the data analysis.

Area of Study 7: Uncertainty

In this area of study students use concepts of randomness, chance and probability. Students should be able to make mathematical predictions about the likelihood of events occurring or not occurring. They should be able to consider and make conclusions about likelihood based on the data and make straightforward inferences. Students should be familiar with the concept of risk and apply the idea of uncertainty to risk.

Key knowledge

- likelihood of events or occurrences happening and how to represent them
- simple unconditional probability events with randomness and chance
- relevant language of chance and their relationship to numerical values associated with chance and probability
- randomness and chance of unconditional probability events
- inferencing from likelihood estimates to inform decision making in relation to real-life events, including risk.

Key skills

- identify possible outcomes of an event and create visual representations of sample spaces or options
- estimate, predict and calculate the likelihood of events occurring using decimals, ratios and percentages
- compare different real-life events or probabilities
- make decisions based on inferences about sets of accessible, relevant and appropriate data and information
- evaluate risk in relation to relevant and appropriate problems with reference to likelihood of events occurring.

Area of Study 8: Systematics

In this area of study students develop an understanding of inputs and outputs of technology, including emerging technologies, that can be used for the purposes of planning, collecting, sorting or categorising a range of quantitative or mathematical data and information. Students should be confident in choosing multiple inputs of data, compare the outputs and results, and analyse, review and make decisions and conclusions based on the representations and any summary information derived from the technology.

Key knowledge

- relevant and appropriate information and data inputs and outputs
- relevant and appropriate computational data collection and interpretation tools and applications
- collating, organising, categorising, planning, scheduling and table creation of relevant information and data using different technologies.

Key skills

This area of study includes the use of technology (such as spreadsheets, software, mobile technologies and apps) to:

- choose appropriate technologies such as spreadsheets, software or applications to input or record real-life data and information
- use technology to collect, organise and sort relevant data and information
- use different technology systems to plan and schedule different actions
- make informed decisions on inputs and interpret outputs mathematically such as from interactive maps, PTV, online calculators/applications/planners
- decide, set and adjust parameters of inputs to optimise outputs and solutions for real-life situations and contexts.

Selecting numeracies for Unit 4

All six numeracies must be covered across Units 3 and 4. The order in which this is done and how this is combined with the underpinning mathematical knowledge and skills, as described in the areas of study, is decided by the school and the teachers. This flexibility is an essential part of an applied learning approach.

These combinations can therefore be selected based on the needs and interests of the student cohort, school community, or related vocational and work environment.

Schools and teachers must make their selection of numeracies based on the following guidelines:

- Each unit must include three of the six numeracies
- All six numeracies must be covered across Units 3 and 4
- All eight areas of study must be covered across Units 3 and 4.

The following table provides an overview for selecting numeracies in Units 3 and 4:

Numeracies	Areas of study
Unit 3, Outcome 1	
Select **three of the following six numeracies** for Unit 3: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy. – Area of Study 1: Number – Area of Study 2: Shape – Area of Study 3: Quantity and measures – Area of Study 4: Relationships
Unit 4, Outcome 1	

Numeracies	Areas of study
Select the **three remaining numeracies** for Unit 4: a) Personal numeracy b) Civic numeracy c) Financial numeracy d) Health numeracy e) Vocational numeracy f) Recreational numeracy	• Select **one or two areas of study** to support the chosen numeracy. – Area of Study 5: Dimension and direction – Area of Study 6: Data – Area of Study 7: Uncertainty – Area of Study 8: Systematics

Ensure all areas of study have been covered over the two units.

Connecting the numeracies with the mathematical content in the areas of study

The following table provides an example of a learning program that covers the eight areas of study across Units 3 and 4.

		Unit 3		
		Numeracy 1 E.g. Personal	Numeracy 2 E.g. Financial	Numeracy 3 E.g. Civic
Areas of study	1. Number		✔	✔
	2. Shape		✔	
	3. Quantity and measures	✔		✔
	4. Relationships	✔		
		Unit 4		
		Numeracy 4 E.g. Health	Numeracy 5 E.g. Vocational	Numeracy 6 E.g. Recreational
Areas of study	5. Dimension and direction		✔	✔
	6. Data	✔		
	7. Uncertainty	✔		
	8. Systematics		✔	

Outcome 2

On completion of this unit, the student should be able to select, evaluate and apply the four stages of the mathematical problem-solving cycle, using an expanding range of both informal and formal mathematical processes, representations, and conventions relevant to the mathematical key knowledge and key skills specified in the Areas of Study 1-4, and across the chosen range of numeracies.

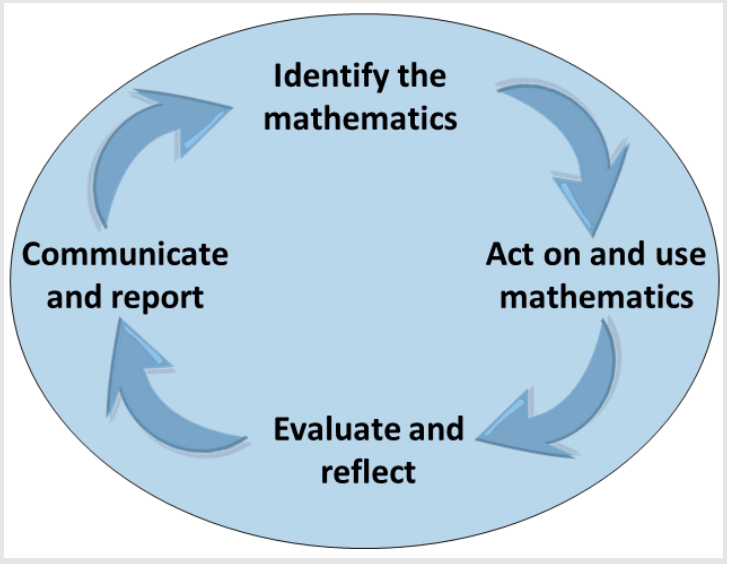
Problem-solving cycle

The purpose of Outcome 2 is to enable students to develop their everyday numeracy skills and practices to make sense of their daily personal, civic and vocational lives. Students need to develop the skills and capabilities to be able to problem-solve, and to use their skills to investigate and solve a problem where the mathematics is embedded within a real-world context. Outcome 2 describes and outlines a problem-solving cycle that supports students to become more capable, critical and reflective problem solvers, and to use their mathematical skills successfully and confidently to become numerate individuals within the community and in their selected vocations.

Given that the contexts described in Outcome 1 will be the starting point, students need to be taken through a structured problem-solving cycle to know how to move from the real-world context to the mathematical world, and to apply their mathematical knowledge to solve the mathematical problem at hand. Part of solving any such embedded problem is to be able to reflect upon and evaluate the outcomes, and to then communicate and report on what was done and the results.

The problem-solving cycle underpinning the curriculum has four distinct components which include, in order: identifying the mathematics; acting on and using the mathematics; evaluating and reflecting; and communicating and reporting on the results.

These four components are represented in the figure below.



Structure of Outcome 2

The skills and knowledge required to achieve Outcome 2 are organised under four distinct components to match the problem-solving cycle:

a) **Identify the mathematics:** recognise, select and interpret the mathematical information embedded in a real-world context and decide what mathematics to use

When mathematical problems are embedded within real-world contexts, students need to identify the essential features to be accommodated when transforming the real-world situation into a mathematical

problem. This requires students to identify and name the mathematics embedded in the context or scenario and to make decisions about how the task can be best approached and solved mathematically. Students need to develop a plan of the actions they intend to undertake, including providing an overview of the scenario and any related background information, and specify the related mathematical questions of interest, conjectures or hypotheses.

Key knowledge

- the purpose of the task and the question(s) to be posed and answered
- the relevant mathematical information embedded in the selected numeracy context and materials
- the mathematical operation(s), processes and tools needed to solve the problem.

Key skills

- identify, interpret and comprehend a range of mathematical information that is embedded in a range of relevant but possibly unfamiliar or non-routine text, materials and tasks where the mathematics content needs to be identified and extracted from its contextual situation
- draw on a combination of hands-on, contextually appropriate materials, personal experience, mathematical and prior knowledge to select appropriate solutions or strategies selected from the range of mathematical processes described in the areas of study
- develop a detailed and explicit mathematical plan, using a combination of formal and informal written mathematical language and symbols.

b) **Act on and use mathematics:** perform mathematical actions and processes in order to complete a task – this includes the use and application of a range of technologies

This stage of the problem-solving cycle involves undertaking the mathematical aspects of the task identified in the first stage. It requires the use of mathematical processes and problem-solving techniques, facts and procedures to solve the problem, and the selection and use of appropriate tools, representations and technologies. For example, students may need to undertake measurements; perform calculations; select and solve equations; make logical deductions from mathematical assumptions; perform symbolic manipulations; create and extract information from mathematical tables and graphs; represent and manipulate geometrical objects in 2D and 3D; or analyse data.

Key knowledge

- the appropriate mathematical processes required for completing the numeracy task
- estimations required prior to completing the numeracy task
- appropriate technology, tools and applications required to complete the numeracy task
- the relevant mathematical actions, processes and calculations required to complete the numeracy task.

Key skills

- flexibly uses a blend of personal 'in-the-head' methods, formal pen and paper methods and digital/technological calculators, software, apps and tools to undertake the required mathematical actions, processes, calculations and problem-solving processes
- select and flexibly use the appropriate tools, hand-held devices, computers, and technological processes to perform the mathematical tasks required.

Note: This requires the use and application of a range of multiple and different mathematical steps or processes.

c) **Evaluate and reflect:** check and reflect on the mathematical problem-solving processes and outcomes in relation to the real-world context

Responses to real-world numeracy tasks, including any mathematical solutions and results, judgements, decisions or conclusions, require review and critical reflection and evaluation. Any results should be critically evaluated against the original situation in terms of its reasonableness and relevance to the final solution; with comparisons made to the initial estimates before decisions are made to accept the solution and/or make revisions and adjustments before presenting the final solutions. In cases where decisions or judgements are being made about the solution, other factors might also be considered, such as social or economic consequences. These processes are often referred to as contextual judgements.

Key knowledge

- the estimations, actions and any calculations required to check if results are as expected
- appropriateness, reasonableness and consequences of results of the numeracy task.

Key skills

- apply estimation and personal experience, mathematical and other prior knowledge, to check and critically reflect on the results and their reasonableness and appropriateness to the context and task, adjust results if necessary, and explain why a problem could not be solved if this is the outcome
- independently initiate and use support from a range of established resources to evaluate the mathematics used and to critically reflect on the results obtained relative to personal, contextual and real-world implications and consequences.

d) **Communicate and report:** use a combination of informal and formal mathematical representations to document and report outcomes and results

The results of any numeracy task require a summary of the work to be compiled and developed, including the presentation and interpretation of the findings from the mathematical activities and related applications. This stage requires students to prepare a range of representations to communicate the mathematical results. This will involve both oral and written language, and the use of formal and informal mathematical visualisations and representations, including the use of a range of different formats, media or technologies.

Key knowledge

- written mathematical representations to document and report on the mathematical processes and the results and the evaluation of the numeracy task
- oral mathematical language to present and discuss the mathematical processes used and the results of the numeracy task
- the different formats, devices or technologies used to represent and document the numeracy task

Key skills

- use a combination of informal but mostly formal written mathematical and general language, including some specialised mathematical symbolism, abbreviations and terminology and representation, to document, interpret and communicate the mathematical and problem-solving process, results and evaluation
- use a combination of formal and informal oral mathematical and general language, including some specialised mathematical language and terminology, to present and discuss the mathematical and problem-solving process, results and evaluation
- use a range of formal mathematical representations, symbolism, diagrams, graphs, algebraic representation and conventions relevant to the mathematical knowledge as specified in the areas of study.

Note: Not **all** of the key knowledge and skills above are expected to be covered in each numeracy investigation or task; however, they should be covered **at least once** across the different numeracy tasks for each unit.

Outcome 3

On completion of this unit, the student should be able to flexibly, effectively and accurately use a range of appropriate tools and applications chosen from an extensive mathematical toolkit relevant to the key knowledge and key skills specified in the Areas of Study 5-8, and across the chosen range of numeracies.

Mathematical toolkit

The purpose of Outcome 3 is for students to apply and use an extensive mathematical toolkit to use where required as they undertake their numeracy practices, activities and tasks. At the end of Units 3 and 4, students should be productive, informed and efficient users of both analogue and digital technologies with the ability to select and effectively use a wide range of appropriate mathematical tools (analogue and digital/technological) to solve and communicate mathematical problems embedded in practical contexts.

A student's toolkit should include: existing, traditional tools such as measuring equipment (e.g. tape measures, rulers, kitchen scales); software applications such as spreadsheets; and a range of new and emerging devices and applications from across different technologies (e.g. measurement, angle and level apps available on mobile phones or portable handheld devices). Students should be ready to adapt to emerging technologies into the future, for example, the use of drones and mobile technologies to measure and quote for jobs; or the use of internet applications (such as measuring and calculation apps) for costing and ordering of materials for an onsite job.

Key knowledge

- contemporary technological and online and digital media, including software and applications based on computers, tablets, calculators and hand-held devices, and the accuracy, relevance, appropriateness and validity of their use and application
- emerging technologies and their use and representations
- a range of familiar and unfamiliar analogue tools that may include concrete objects and manipulatives such as clocks, tape measures, tools of trade and industry
- a wide range of digital tools that may include mobile technology, software (including spreadsheets) and applications
- the conventions and use of such analogue and digital tools appropriate to the individual, community and workplace, and critical comparisons between technologies regarding validity and accuracy
- the conventions and language for the representations of mathematical and statistical information, objects and processes, using different technologies and digital media
- the numerical, graphical, symbolic, geometric and statistical functionalities of this range of technologies for working mathematically

- the conditions and settings including accuracy for a given purpose, and for effective and appropriate application of a given technology and its functionality
- online safety when using technologies.

Key skills

- use a wide range of both analogue and digital/technological tools and devices to carry out tasks and derive results
- use and apply technology to carry out computations and analysis
- use technology to effectively and validly visualise and represent information, such as to produce diagrams, tables, charts, infographics and graphs which model situations and solve practical problems
- use technology to help interpret, evaluate, discuss and communicate the results of a numeracy task
- identify, calculate and evaluate accuracy and error with different technologies and the implications for results
- make decisions regarding inputs into technology and then reflect on and evaluate and discuss the outputs of technology
- reflect on and evaluate the use of tools and technology in relation to comparing estimates to results
- critically reflect on, evaluate, and justify any tools and technologies used and the outcomes obtained relative to personal, contextual and real-world implications, appropriateness and reasonableness.

Satisfactory completion

The award of satisfactory completion for a unit is based on whether the student has demonstrated the set of outcomes specified for the unit. Teachers should use a variety of assessment tasks and tools that provide a range of opportunities for students to demonstrate the key knowledge and key skills in the outcomes for satisfactory completion.

The areas of study, including the key knowledge and key skills listed for the outcomes, should be used for course design and the development of learning activities and assessment tools. Assessment must be part of the regular teaching and learning program and should be completed mainly under teacher supervision and within a limited timeframe.

All assessment tools for Units 3 and 4 are school-based. Procedures for assessment of levels of achievement in Units 3 and 4 are a matter for school decision.

The VCAA publishes VCE VM Numeracy Support materials, which includes advice on the design of assessment tools including assessment rubrics.

Assessment tools

Assessment tools are used to collect evidence to make a judgement as to whether the outcomes have been met. An assessment tool is a method to collect evidence on the standard reached by students and can be a task or a teacher observation using a checklist.

The following table provides the assessment requirements for the outcomes in Unit 4 and will assist teachers in determining the student attainment of the standard.

Outcome	Assessment tasks
Outcome 1 On completion of this unit, the student should be able to apply, critically analyse, evaluate and justify the key mathematical knowledge and skills from the four areas of study, across the specified Numeracies.	Assessment tasks should provide opportunities for practical application of the outcome. The structure of the Numeracy study is such that the demonstration of achievement of Outcomes 1, 2 and 3 should be based on the student's performance on a selection of the following assessment tasks: ● Investigations and projects. For example, students may undertake the costings of a project, including budgeting, invoices, receipts and money handling, or consider loans or mortgages including interest and repayments for buying a car or a house. ● Multimedia presentation, poster or report. For example, students may consider the materials needed for painting a house, including measurement, cost and labour. ● Portfolio. For example, students may plan design and run an event for the community, taking into consideration factors such as budgeting, measuring, time and travel.
Outcome 2 On completion of this unit, the student should be able to apply, critically analyse, evaluate and justify the mathematical problem-solving cycle in an applied learning context, relevant to the mathematical key skills and knowledge reflected in the areas of study and across the Numeracies.	
Outcome 3 On completion of this unit, the student should be able to select, apply, evaluate and justify the use of tools from an extensive mathematical toolkit to a wide range of contexts effectively and accurately.	