



# Curriculum Planning Guide: Literacy and Numeracy Skills Strand

## Numeracy Skills Units

VCAL  The hands-on option for Years 11 & 12 students

# **Curriculum Planning Guide: Literacy and Numeracy Skills Strand Numeracy Skills Units**

**ISBN 978-1-921264-66-5**

© Victorian Curriculum and Assessment Authority 2008

Published by the Victorian Curriculum and Assessment Authority  
41 St Andrews Place, East Melbourne, Victoria 3002

This publication is copyright. Apart from any use permitted under the *Copyright Act 1968*, no part may be reproduced by any process without the written permission of the Victorian Curriculum and Assessment Authority.

Photocopying: VCAL providers may photocopy this publication for use in teaching VCAL.

# Contents

<b>Section 1: Introduction .....</b>	<b>1</b>
<b>VCAL QUALIFICATION INFORMATION .....</b>	<b>1</b>
Qualification Title .....	1
Qualification Design .....	2
Assessment and Reporting .....	5
Recognition of Prior Learning (RPL) .....	7
Safety and Risk Management .....	7
<b>Section 2: VCAL Literacy and Numeracy Skills strand .....</b>	<b>9</b>
<b>INTRODUCTION.....</b>	<b>9</b>
Pathways .....	10
<b>NUMERACY SKILLS UNITS .....</b>	<b>11</b>
Rationale .....	11
Structure .....	11
Delivery .....	14
Assessment and Reporting .....	14
<b>Section 3: VCAL unit information.....</b>	<b>15</b>
<b>NUMERACY SKILLS FOUNDATION .....</b>	<b>15</b>
<b>LEARNING OUTCOME DETAILS.....</b>	<b>19</b>
Learning Outcome 1 .....	19
Learning Outcome 2 .....	20
Learning Outcome 3 .....	21
Learning Outcome 4 .....	22
Learning Outcome 5 .....	23
Learning Outcome 6 .....	24
Integrated Assessment Tasks/Activities for Foundation Level.....	25
Integrated Assessment Tasks/Activities Across VCAL Strands .....	26
<b>NUMERACY SKILLS INTERMEDIATE .....</b>	<b>28</b>
<b>LEARNING OUTCOME DETAILS.....</b>	<b>31</b>
Learning Outcome 1 .....	31
Learning Outcome 2 .....	32
Learning Outcome 3 .....	33
Learning Outcome 4 .....	34
Learning Outcome 5 .....	35
Learning Outcome 6 .....	36
Integrated Assessment Tasks/Activities for Intermediate Level .....	37
Integrated Assessment Tasks/Activities Across VCAL Strands .....	38

<b>NUMERACY SKILLS SENIOR .....</b>	<b>39</b>
<b>LEARNING OUTCOME DETAILS.....</b>	<b>42</b>
Learning Outcome 1 .....	42
Learning Outcome 2 .....	43
Learning Outcome 3 .....	44
Learning Outcome 4 .....	45
Learning Outcome 5 .....	46
Learning Outcome 6 .....	47
Learning Outcome 7 .....	48
Integrated Assessment Tasks/Activities for Senior Level .....	49
Integrated Assessment Tasks/Activities Across VCAL Strands .....	49
<b>ADVANCED NUMERACY SKILLS SENIOR.....</b>	<b>50</b>
<b>LEARNING OUTCOME DETAILS.....</b>	<b>53</b>
Learning Outcome 1 .....	53
Learning Outcome 2 .....	54
Learning Outcome 3 .....	55
Learning Outcome 4 .....	56
Learning Outcome 5 .....	57
Learning Outcome 6 .....	58
Learning Outcome 7 .....	59
Integrated Assessment Tasks/Activities for Advanced Senior Level .....	60
<b>Section 4 – Resources .....</b>	<b>61</b>
<b>FOUNDATION.....</b>	<b>61</b>
<b>INTERMEDIATE .....</b>	<b>64</b>
<b>SENIOR .....</b>	<b>68</b>
<b>ADVANCED SENIOR.....</b>	<b>72</b>
<b>GLOSSARY.....</b>	<b>75</b>



# Section 1: Introduction

## VCAL QUALIFICATION INFORMATION

### QUALIFICATION TITLE

The Victorian Certificate of Applied Learning (VCAL) is accredited at three award levels:

- Victorian Certificate of Applied Learning (Foundation)
- Victorian Certificate of Applied Learning (Intermediate)
- Victorian Certificate of Applied Learning (Senior).

The three award levels provide flexible entry and exit points for a range of student abilities and interests and offer a clear progression for skills, knowledge and attitudinal development.

### Structure of the VCAL

VCAL units at each level reflect the progression in skills, knowledge and attitude development. For example:

- At Foundation level, students learn under close supervision with high levels of direction. Knowledge and employability skills development is supported by a strong emphasis on literacy and numeracy skills and preparatory learning.
- At Intermediate level, learning is reasonably autonomous in regard to planning and work activities but conducted under supervision. Knowledge and employability skills development leads to independent learning, confidence and a high level of transferable skills.
- At Senior level, learning is autonomous in regard to planning and work activities but conducted under supervision. Knowledge and employability skills development leads to a high level of interpersonal skills, independent action and achievement of tasks that require decision making and leadership.

It is important that a clear distinction is able to be made between learning and delivery of the VCAL program at these three levels.

### Entry

There are no prerequisites for entry to VCAL units.

### Nominal duration

Each of the three award levels has a nominal duration of 1000 hours.

Attendance and hours are not requirements to receive a VCAL qualification. However, within a school setting, a typical VCAL learning program would be based on a full-time load of independent learning and timetabled class time of 1000 hours. In other educational settings the nominal hours (including both scheduled and unscheduled contact hours) may vary, taking into consideration the specific needs of the student.

## **Aims of the qualification**

The VCAL aims to provide skills, knowledge and attitudes to enable students to make informed choices regarding pathways to work and further education. Personal development, the utilisation of a student's particular interests, and new pathways for senior secondary students, in the context of applied learning, are underpinning principles of the VCAL.

The VCAL acknowledges this within the development of knowledge and:

- employability skills that help prepare the individual for employment and for the participation in the broader context of family, community and lifelong learning
- skills that assist the individual to make informed vocational choices within specific industry sectors and/or to facilitate pathways to further learning.

## **QUALIFICATION DESIGN**

### **Course requirements**

To be awarded the VCAL, students must successfully complete a learning program which contains a minimum of ten credits.

The VCAL program must include:

- curriculum components to the value of at least one credit, each of which can be justified against the purpose statement for each of the four VCAL curriculum strands
- a minimum of two VCAL units
- one credit for numeracy
- curriculum components to the value of six credits at the level of the VCAL award (or above), of which one must be for literacy and one credit must be for a VCAL Personal Development Skills unit.

At the VCAL Intermediate and Senior levels, the learning program must also include accredited Vocational Education and Training (VET) curriculum components to the value of a minimum of one credit in the Industry Specific Skills Strand.

The VCAL program may also contain curriculum components drawn from Victorian Certificate of Education (VCE) units and Further Education (FE) accredited curriculum. One credit is awarded on successful completion of 100 nominal hours of accredited FE curriculum.

### **VCAL curriculum strands**

Each VCAL award level contains four curriculum strands:

- Literacy and Numeracy Skills
- Industry Specific Skills
- Work Related Skills
- Personal Development Skills.

To ensure coherence in designing a VCAL learning program, selected curriculum components must closely align to the purpose statements of the appropriate curriculum strand. Information about VCAL curriculum strands is available in the VCAL section of the current VCE and VCAL Administrative Handbook and additional VCAL publications available at the VCAA website: [www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

### **VCAL delivery principles**

The delivery of the VCAL is based on adult learning and youth development principles. These principles have been found to be relevant in providing successful programs for students seeking a pathway to further VET and/or employment. Delivery and teaching strategies for VCAL learning programs should be based on adult learning and youth development principles including:

- curriculum content negotiated to build on the student's interests, abilities and strengths
- curriculum content that focuses on practical 'hands-on' opportunities for learning
- curriculum content and delivery strategies that encourage personal development and growth and include opportunities to integrate learning across the learning program
- recognition of student achievement and student contributions that is both formal and informal
- curriculum and delivery strategies that enable students to learn at their own pace

- curriculum and delivery strategies that enable students to learn in different ways according to different learning styles
- delivery and assessment that assists the individual to achieve positive educational outcomes
- curriculum that values and engages the contribution of young people
- curriculum that builds competence and resilience in individuals including minimising risk factors and enhancing the promotion of protective behaviours of young people
- curriculum and delivery strategies that encourage civil and civic participation and promote active citizenship
- development of partnership approaches to program planning and delivery that link young people with the broader community.

### **Delivery modes**

The VCAL allows for a range of delivery modes in a variety of settings. Delivery modes may include but are not limited to:

- applied learning linked to community, work or school activities
- classroom delivery based on whole class, small groups or individual activities
- flexible delivery such as distance learning and online learning.

Delivery settings may include schools, post-compulsory providers, community, family, workplace, sporting or simulated environments.

Delivery can be full-time or part-time. Some students may choose to complete units over longer periods of time than the nominal hours. Single VCAL or VCE units can be delivered over two semesters where appropriate. Students are also able to complete VCAL at an award level in a shorter timeframe, allowing them to continue working at another award level within a year's full-time commitment of hours.

Delivery and assessment must be in accordance with the requirements of the individual curriculum components selected for the study. For example, if selecting VCE units the delivery and assessment must be consistent with the requirements of the Victorian Curriculum and Assessment Authority (VCAA) as set out in the official VCE study designs.

### **Educational and delivery practices**

The VCAL program is underpinned by the following curriculum principles:

- student-centred approaches and decision making regarding program design, delivery and evaluation
- opportunities for experiential learning and skill development through activities that are structured and sequential in their learning outcomes
- program design that has high relevance to personal strengths and experiences and that is responsive to diverse needs
- program delivery that builds resilience, confidence and self-worth
- learning environments that strengthen connections with the community
- students can enter and exit VCAL at each level to pursue a range of pathway options.

**The following practices should be considered when planning VCAL learning programs for students:**

#### **Negotiating learning programs**

It is important that students are actively involved in negotiating and planning their individual learning program, in particular the VCAL units.

#### **Using flexible delivery modes**

When planning the VCAL learning program, teachers should determine the delivery modes most suited to students' needs and circumstances. Delivery of the VCAL can take place in classrooms, online, in community or workplace settings and may use workplace or community contexts. VCAL providers will need to ensure that delivery modes for units of competency or modules are consistent with any mandatory requirements specified in the relevant accredited curriculum document/Training Package.

#### **Adopting student-centred teaching practices**

Delivery should be based on student-centred experiential learning activities such as role plays, case studies, guest speakers and audio-visual presentations. Where possible, teachers should extend the learning experiences beyond the classroom through excursions and field trips and through other applied learning methods, for example integrating the classroom learning with another unit that has an applied or practical focus.

## Integrating curriculum

The teaching and learning program for the various units, units of competency and modules that make up the learning program can be integrated. Providers of VCAL are encouraged to integrate the learning outcomes from a number of VCAL units where possible and practicable. The knowledge and skills development that lead to the learning outcomes in one unit, such as a VCAL unit, can be extended by including content drawn from a VET module/unit of competency. Record keeping for each curriculum component should reflect assessment of each learning outcome and/or unit of competency.

Programs can be designed to include a thematic or project based approach. Planning for this includes learning experiences and assessment tasks that are based on integration of learning outcomes. This might include combining the learning outcomes from different curriculum components in the same or different curriculum strands to reflect the integration of skills and competencies in authentic contexts, such as social or work activities.

Development of numeracy skills should ideally occur in an integrated curriculum. Rather than be delivered as discrete units, Literacy and Numeracy Skills units can be integrated into learning experiences across the four curriculum strands of VCAL. Tasks and activities for learning outcomes in one strand can be linked with tasks and activities for learning outcomes in other strands.

Integrating learning outcomes across strands reflects the integration of skills and competencies in social and work activities. Both the Literacy and Numeracy Skills units recognise the connections between the curriculum areas and provide a structure for an integrated approach. Learning activities may integrate two or more strands across a number of learning outcomes.

## VCAL and structured workplace learning

There is no formal on-the-job training or structured workplace learning requirement within the accredited units of the VCAL. However, if a VET module/unit of competency is used to meet one of the requirements of the VCAL, this VET module/unit of competency may require a structured workplace learning placement.

Structured workplace learning can be used to meet some or all of the learning outcomes of the Work Related Skills units. Schools will need to refer to information on structured workplace learning requirements on the following website:

[www.education.vic.gov.au/sensecyouth/careertrans/worklearn/default.htm](http://www.education.vic.gov.au/sensecyouth/careertrans/worklearn/default.htm)

If a student undertakes structured workplace learning as part of their VCAL learning program, they must complete relevant accredited Occupational Health and Safety (OH&S) training prior to commencement of the structured workplace learning placement.

For example, if a VCAL student is enrolled in Certificate II in Automotive Technology Studies and has completed a relevant Occupational Health and Safety unit within this certificate, then this student is able to undertake a structured work placement in an automotive environment. If, however, this student wishes to undertake a structured work placement in a retail environment, then this student has to complete Work Related Skills Unit 1, including the safe@work program before commencing this placement.

Providers using the safe@work OH&S program to fulfill part of the requirements of Work Related Skills Unit 1 will need to refer to guidelines/advice issued by the Department of Education & Early Childhood Development (DEECD). For further information please refer to the website above. Additional information on VCAL and structured workplace learning is provided in Appendix 1 of the *Curriculum Planning Guide: Industry Specific Skills Strand and Work Related Skills Strand*.

Where learning and assessment occur through structured workplace learning, the VCAL provider will need to ensure that the student will have opportunities to demonstrate successful completion of the learning outcomes for the VCAL unit that the student is enrolled in. This will require appropriate supervision and monitoring of student progress, and a cooperative arrangement with the employer.

Schools must comply with the relevant Ministerial Order. These orders are made by the Minister and relate to workplace learning arrangements entered into by a principal of a school with an employer. The arrangement must be in accordance with the *Education (Workplace Learning) Act 2003* and the relevant Ministerial Order.

VCAL providers from the Technical and Further Education (TAFE) and Adult Community Education (ACE) sectors must comply with the provisions of the *Education and Training Reform Act 2006* Part 5.4.14 Division 2 – Practical Placement.

## ASSESSMENT AND REPORTING

The award of satisfactory achievement for a unit is based on a decision that the student has demonstrated achievement of the learning outcomes specified for the unit. The curriculum components in a VCAL learning program must be assessed in accordance with the requirements and guidelines outlined in the curriculum documents for the units and/or units of competency/modules delivered in the learning program:

- All assessment of VCE units must be in accordance with VCAA guidelines.
- All VCAL units must be assessed in accordance with the assessment and quality requirements of the VCAA.
- All assessment of VET and FE units of competency/modules must be in accordance with the VET accredited curriculum or Training Package qualification or accredited FE curriculum document and according to the standards of the Australian Quality Training Framework (AQTF).

**Students should be observed to demonstrate competence on more than one occasion and wherever possible in different contexts to make sure that the assessment is as consistent, fair and equitable as possible.**

A range of assessment methods and task types may be used. These include:

- teacher observation and/or checklists
- self-assessment inventories
- physical demonstration of understanding of written or oral text
- a portfolio of accumulated evidence
- evidence accumulated through project or program participation
- awards from recognised programs
- oral or written reports and presentations
- oral explanation of text
- written text
- discussion
- debates
- role-plays
- folios of tasks or investigations
- performing practical tasks
- evidence of information and communications technology, including Internet usage
- reflective work journals
- student logbooks.

Teachers must develop learning programs that provide opportunities for students to demonstrate achievement of learning outcomes. A holistic approach to the development of skills through project-based activities that integrate the learning outcomes will ensure that students are able to identify and apply these skills within authentic social and working environments.

The VCAL provider coordinates the assessment and collection of results for all curriculum components within the VCAL learning program. The satisfactory completion of curriculum components must be in accordance with the assessment guidelines for the accredited curriculum.

For VCAL units, students will receive an S (Satisfactory) or N (Not yet complete) result for each unit. For VCE reporting, refer to the current VCE and VCAL Administrative Handbook.

Information about assessment processes and procedures for VCAL units can be found in the *VCAL Unit Assessment Planning Guide* which is available from the VCAA website at: [www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

### Assessment principles for VCAL learning programs

Assessment within the VCAL should be based on the following principles:

- Assessment tasks/activities should be grounded in a relevant context and not be culturally biased.
- Students should have the opportunity to demonstrate achievement at their own pace.
- Students should be assessed across as wide a range of tasks/activities as possible, in order to increase reliability and validity of assessment. One-off assessment tasks/activities do not provide a reliable and valid measure of competence.
- Instructions for assessment tasks/activities should be clear and explicit. Students must know what is expected and the criteria by which satisfactory completion will be established.

- Time allowed to complete a task should be reasonable and specified and should allow for preparation and reflection as appropriate to the activity. Where the assessment task is linked to a project or activity the assessment tasks/activities may take place over a number of weeks.
- Assessment tasks/activities should be open-ended and flexible to meet the specific needs of students.
- Assessment should include access to ICT where appropriate to the context of the activity or task.
- Assessment must be valid in terms of context and methods. Assessment must be reliable in showing consistent results over a number of occasions. Assessment must not unduly disadvantage any student and must provide flexibility in the range of methodologies that cater to the needs of individual students.

When assessing students with particular needs the validity of assessment must be maintained. Flexibility in assessment methods should be used to ensure alternative methods are utilised to allow the demonstration of completion of learning outcomes without disadvantaging the student.

### **Integrated assessment**

Where possible, assessment in the VCAL should focus on integrated curriculum projects/activities. In developing an integrated or holistic approach to assessment, a number of outcomes (VCAL learning outcomes and/or VET or FE learning outcomes) from curriculum components in one or more strands can be grouped into logical, assessable activities that take into account project-based or thematic activities. However, assessment of VCE units must be in accordance with VCE study designs and cannot be integrated with other assessment.

It is preferable for assessment tasks/activities to integrate more than one learning outcome. This enables assessment to be more easily integrated into learning activities and reflects the integrated nature of literacy and numeracy. Where delivery and assessment of the Numeracy Skills units is integrated with units from other strands and/or from courses and qualifications other than VCAL, the assessment tasks must meet the requirements of those units/courses/qualifications.

Examples of assessment tasks which relate to a specific learning outcome can be found in the learning outcome details. Examples of integrated assessment tasks/activities can be found at the end of the Numeracy Skills units. These examples are of tasks/activities that integrate and assess more than one learning outcome: sometimes within the Numeracy Skills units, sometimes across the VCAL strands.

### **Assessing students with disabilities**

While flexibility in relation to assessment methods, assessment tools and context is encouraged to meet the specific needs of students, the validity and reliability of the assessment must not be compromised in any way.

Flexibility in assessment methods is important, particularly for students with disabilities. For example, if a person is unable to communicate by speaking, then an alternative means of communicating may be used to demonstrate unit outcomes normally demonstrated through the spoken word. Similarly, students who are hearing impaired may sign their response, those with a physical disability may use a voice synthesiser or communication board. In some instances the time taken to respond in alternative modes may be considerably longer than through speech and it may be unrealistic to expect such students to achieve the outcomes in the stated nominal hours. Students may therefore need an extended time to complete the learning outcomes in these cases.

### **Quality assurance of assessment**

The quality assurance (QA) of all curriculum components delivered in VCAL learning programs is ensured through existing assessment requirements.

The QA of VCAL units will ensure consistency in interpretation of learning outcomes and the relevant levels. A shared understanding of learning outcomes, elements and assessment processes and practices will be fostered through the QA process. Information about this process will be circulated to VCAL providers by the VCAA in Term 1 of the school year.

Satisfactory completion of the VCAL units must be based on evidence that demonstrates that the student has successfully completed the learning outcomes. The curriculum for the VCAL unit will include learning activities that develop the student's knowledge and skills, as well as instance/s of assessment. The assessment instance/s for the unit are separate from the learning activities. When developing an assessment task it must enable students to complete the learning outcomes. The elements further describe the learning outcome/s and are a guide to the requirements for the appropriate VCAL level.

‘S’ or ‘N’ results for VCE units must be consistent with the requirements of the study designs.

Validation of assessments for VET and FE modules/units of competency will be the responsibility of the relevant Registered Training Organisation (RTO) and will be in accordance with the requirements of the Australian Quality Training Framework. These requirements will be set out in the accredited course document.

## **RECOGNITION OF PRIOR LEARNING (RPL)**

RPL is the acknowledgment of skills and knowledge obtained through any combination of formal or informal training, work experience or general life experience. RPL is a process to assess successful completion of learning outcomes through skills, knowledge and experience gained in other settings besides traditional school programs, for example, through part-time work or voluntary involvement in a community organisation. RPL can only be applied to the VCAL Work Related Skills and VCAL Personal Development Skills units. Decisions regarding RPL for VCAL Personal Development Skills and Work Related Skills units are the responsibility of the enrolling VCAL provider. Where students have been granted RPL, evidence that demonstrates successful completion of the entire unit learning outcomes must be completed and kept by the VCAL provider.

Information about RPL procedures and processes for VCAL Personal Development Skills and Work Related Skills units can be found in the *VCAL Unit Assessment Planning Guide* that is on the VCAA website: [www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

## **SAFETY AND RISK MANAGEMENT**

It is the responsibility of the VCAL provider to ensure that duty of care is exercised in relation to the health and safety of all students undertaking the VCAL program. Guidelines for government schools are provided in Section 4 of the Victorian Government Schools Reference Guide.

Because students will be undertaking project work in workplaces where there may be a range of OH&S risks, the VCAL provider will have a shared responsibility with the workplace owner/occupier to ensure OH&S legislation is complied with. This responsibility applies both to any risks generated by the VCAL project/activity and OH&S risk exposure generated by the workplace.

Safe operating procedures shall be documented in a manner ensuring that those involved or exposed to a process are equipped to conduct work activities in accordance with OH&S requirements. Safe operating procedures shall include (but are not limited to):

- a description of the activity or process with appropriate training undertaken
- the person or position that has supervisory responsibility for the activity or process
- a clear explanation in sequential order of the steps or stages
- details of potential hazards
- safety controls to minimise potential risk from any identified hazards
- health and safety precautions to be exercised in the course of carrying out work activities.

Other VCAL providers must ensure duty of care is exercised in relation to the regulations covering their particular sector.

Consistent with the VCAL principle to ensure curriculum that builds competence and resilience in individuals including minimising risk factors and enhancing the promotion of protective behaviour of young people, it is incumbent on VCAL providers to ensure that risks are identified, assessed and controlled effectively and to develop appropriate risk control strategies as part of project planning and implementation. VCAL providers should actively encourage student participation in the risk-management process.

Risks may include health and safety risks but can also cover:

- reputation risks (for example, actions by the student that impact negatively on the reputation of the student, the workplace or VCAL provider)
- relationship risks (for example, actions that impact on client or staff relationships)
- property damage and financial risks
- legal risks.

## **Duty of care**

The delivery of accredited curriculum within a school setting is governed by legislative and regulatory responsibilities.

Government schools that are VCAL providers must comply with all the rules and regulations of the DEECD for schools. These include circulars sent to principals and school council presidents as well as the guidelines for delivery and implementation of curriculum as outlined in:

- the relevant Ministerial Order
- structured workplace learning manuals produced by the DEECD
- Education (Workplace Learning) Act
- the Victorian Government Schools Reference Guide.

Guidelines for schools for delivery and implementation of structured workplace learning are outlined in Ministerial Order 55. Further information on workplace learning arrangements is available at: [www.education.vic.gov.au/sensecyouth/careertrans/worklearn/default.htm](http://www.education.vic.gov.au/sensecyouth/careertrans/worklearn/default.htm)

Other VCAL providers (for example, TAFE institutes or ACE organisations) must comply with the provisions of the Education and Training Reform Act Part 5.4 .14 Division 2 – Practical Placement.

## **OH&S and environmental requirements**

Participants in VCAL programs must demonstrate safe working practices by complying with all relevant OH&S requirements applicable to their learning environment.

VCAL providers and assessors must also ensure all learning and assessment environments and activities conform to current OH&S and environmental legislation, regulatory requirements and structured workplace learning guidelines produced by the DEECD.

## **Risk assessment**

OH&S risk should be assessed wherever there is a project activity or work environment associated with a risk of injury or ill-health.

If the project is to be conducted within a workplace, then the employer should have in place a number of OH&S risk controls to minimise OH&S risk. The student should consult the supervisor regarding risk controls, workplace induction and protective apparel which apply to the student's work activity and work environment.



## Section 2: VCAL Literacy and Numeracy Skills strand

### INTRODUCTION

Curriculum selected for inclusion in the Literacy and Numeracy Skills strand must be consistent with the purpose statements of this strand. Through aligning curriculum with the purpose statements of the curriculum strand, the learning program will provide literacy and numeracy skills development and experiences that are important for the vocational, employability and personal development outcomes of VCAL students.

#### Aims

Study in this strand is designed to:

- develop knowledge, skills and understanding relevant to reading, writing and oral communication in the social contexts of family, employment, further learning and community
- develop knowledge, skills and understanding relevant to the practical application of numeracy in the contexts of home, work and the community
- provide pathways to further study and work.

#### Gaining credit/s toward the award of VCAL

One credit will be awarded for the successful completion of one VCE or VCAL unit, or for a combination of accredited VET or FE units or modules that total approximately 100 nominal hours.

To satisfy the requirements of the VCAL, in the VCAL Literacy and Numeracy Skills strand, students must successfully attain one credit for Literacy and one credit for Numeracy. The Literacy unit must be at the award level or above. The Numeracy unit does not have to be selected at the award level.

**Note: If using VCAL units, to meet the eligibility requirements of the literacy component of the VCAL Literacy and Numeracy Skills strand, the Reading and Writing unit must be completed at the award level or above. The Oral Communication unit, taken at the appropriate level, can be included as one of the six credits (required at the award level) in a student's VCAL learning program. It is appropriate, but not mandatory, that an Oral Communication unit is integrated with a Reading and Writing unit.**

For further information refer to the current edition of the VCE and VCAL Administrative Handbook.

Providers can select VCAL Literacy and Numeracy Skills units to meet these requirements or alternatively, select other curriculum such as VCE units or units and modules from appropriate FE certificates such as the Certificate in General Education for Adults.

#### Literacy Skills purpose statement

The purpose of literacy curriculum selected for this strand is to enable the development of skills, knowledge and attitudes in literacy that allow progression in the main social contexts of family, employment, further learning and citizenship.

Literacy skills corresponding with these social contexts include literacy for self expression, practical purposes, knowledge and public debate.

Literacy includes reading, writing and oral communication skills.

Where literacy units are identified in VET certificates as suitable for literacy skills development, they will need to be consistent with the Literacy Skills purpose statement. Literacy units from one or more accredited certificates may be combined to provide the literacy component of the learning program.

### **Numeracy Skills purpose statement**

Numeracy is the ability to use mathematical skills in order to carry out purposes and functions within society related to designing, measuring, constructing, using graphical information, money, time and travel, and the underpinning skills and knowledge for further study in mathematics or related fields.

Curriculum selected for numeracy in this strand should develop skills to facilitate the practical application of mathematics at home, work and in the community.

### **Selecting literacy and numeracy curriculum**

Curriculum in the Literacy and Numeracy Skills strand can include VCAL Literacy and Numeracy Skills units or any VCE English units and any VCE Mathematics units and/or accredited modules or certificates with a literacy/numeracy focus such as Certificates I, II and III in General Education for Adults.

**Note:** Additional VCE units may be used to meet the eligibility requirements of this VCAL strand. Please refer to the current VCE and VCAL Administrative Handbook for more information.

### **VCAL Literacy and Numeracy Skills units**

The VCAL Literacy and Numeracy Skills units are:

- LIT011 Literacy Skills Foundation Reading and Writing
- LIT012 Literacy Skills Foundation Oral Communication
- LIT021 Literacy Skills Intermediate Reading and Writing
- LIT022 Literacy Skills Intermediate Oral Communication
- LIT031 Literacy Skills Senior Reading and Writing
- LIT032 Literacy Skills Senior Oral Communication
- NUM011 Numeracy Skills Foundation
- NUM021 Numeracy Skills Intermediate
- NUM031 Numeracy Skills Senior
- NUM032 Advanced Numeracy Skills Senior.

## **PATHWAYS**

VCAL is designed to develop and extend pathways for young people. On completion of the Literacy and Numeracy Skills units, pathways at each level may, depending on the required skills and prerequisites, include the following:

### **Literacy and Numeracy Skills Foundation units**

- Intermediate level VCAL
- Certificate II in General Education for Adults
- VCE studies
- Certificate II VET courses
- Certificate II FE courses
- School Based Apprenticeships
- Employment

### **Literacy and Numeracy Skills Intermediate units**

- Senior level VCAL
- Certificate III in General Education for Adults
- VCE studies
- Certificate III VET courses
- Certificate III FE courses
- School Based Apprenticeships
- Employment

## **Literacy and Numeracy Skills Senior units**

- VCE studies
- Certificate III and IV VET courses
- Certificate III and IV FE courses
- School Based Apprenticeships
- Employment.

# **NUMERACY SKILLS UNITS**

The Numeracy Skills units are designed for use within the Literacy and Numeracy Skills strand of VCAL.

Rather than the learning outcomes having as their focus the traditional mathematical areas (number, space and shape, data, measurement, and algebra) the purposes or functions to which the mathematics may be put, are given prominence. The learning outcomes still ensure that the skills and knowledge of the mathematics strands are included but they are arranged under a different organisational structure. The specific mathematical skills and knowledge required are embedded in the learning outcomes and specified within the elements.

Four domains of Numeracy have been identified as corresponding to the domains of self expression, practical purposes, public debate and knowledge identified in the Literacy Skills Reading and Writing units.

**Numeracy for Practical Purposes** addresses aspects of the physical world to do with designing, making and measuring.

**Numeracy for Interpreting Society** relates to interpreting and reflecting on numerical and graphical information of relevance to self, work or community.

**Numeracy for Personal Organisation** focuses on the numeracy requirements for personal organisational matters involving money, time and travel.

**Numeracy for Knowledge** deals with mathematical skills needed for further study in mathematics, or other subjects with mathematical underpinnings and/or assumptions.

## **RATIONALE**

Underpinning the Numeracy Skills units is the notion that curriculum should be developed to meet the needs of the students. The Numeracy Skills units are aligned with AQF levels I, II and III and provide a link to vocational pathways at those AQF levels.

A number of VCAL programs have opted for an integrated approach to numeracy skills delivery based on the need to make programs more engaging and relevant to students for whom a traditional approach is not suitable. The Numeracy Skills units are designed specifically to allow for such flexibility and courses can be less traditional in design and delivery.

## **STRUCTURE**

The Numeracy Skills units are designed at three levels – Foundation, Intermediate and Senior. The three levels reflect the progression in skills, knowledge and attitude development of numeracy skills.

The Numeracy Skills Foundation unit satisfies the award level requirements for Foundation and Intermediate. The Numeracy Skills Intermediate unit satisfies the award level requirements for Foundation, Intermediate and Senior. The Numeracy Skills Senior unit and the Advanced Numeracy Skills Senior unit satisfy the award requirements for all levels.

### **Foundation**

The Foundation unit enables students to develop the confidence to perform simple and familiar numeracy tasks and to develop the ability to make sense of mathematics in their daily personal lives. The mathematics involved includes measurement, shape, numbers, graphs, and use of calculators, which are part of the students' normal routines to do with shopping, travelling, cooking, interpreting public information and telling the time etc.

On completion of the award level students will be able to perform everyday mathematical tasks which involve a single mathematical step or process. Their communication about mathematical ideas will mainly be spoken rather than written responses.

At this level there are six learning outcomes. However, it is only necessary to demonstrate competence in five of the six learning outcomes. Although it is expected that in most teaching contexts all the six learning outcomes would be taught, the aim of achieving only five of the six has been included in order to offer both students and teachers more flexibility in assessment and, in some specific contexts such as workplaces, one of the learning outcomes could be left out if it was not seen to be relevant.

### **Intermediate**

The Intermediate unit looks at mathematics applied to tasks which are part of the students' normal routine and also outside their immediate personal environment such as tasks (first-hand or simulated) in the workplace and the community. The purpose is to enable students to develop everyday numeracy skills to make sense of their daily personal and public lives.

At exit Intermediate level, students will be able to attempt a series of operations or tasks with some confidence, select the appropriate method or approach required and communicate their ideas both verbally and in written form. They would be at ease with straightforward calculations either manually and/or using a calculator.

At this level there are six learning outcomes. However, it is only necessary to demonstrate competence in five of the six learning outcomes. Although it is expected that in most teaching contexts all the six learning outcomes would be taught, the aim of achieving only five of the six has been included in order to offer both students and teachers more flexibility in assessment and, in some specific contexts such as workplaces, one of the learning outcomes could be left out if it was not seen to be relevant.

### **Senior**

There are two Numeracy Skills units at Senior Level – Numeracy Skills Senior and Advanced Numeracy Skills Senior. Students may undertake one or both units in their VCAL learning program.

Numeracy Skills Senior enables students to explore mathematics beyond its familiar and everyday use to its application in wider, less personal contexts such as newspapers and other media reports, workplace documents and procedures, and specific projects at home or in the community. It also introduces students to formal areas of mathematical study. The mathematics covered is extended beyond that of the Intermediate level and would include measurement, graphs and simple statistics, use of maps and directions and an introductory understanding of the use of formulae and problem-solving strategies.

The Advanced Numeracy Skills Senior unit provides students with a solid introduction to the knowledge and skills belonging to several formal areas of mathematics. The mathematics involved will include numerical calculations and analysis of graphical data required for interpreting information about society; the use of formulae, algebraic techniques and problem-solving strategies; and familiarity with fundamental processes of at least two other selected specialist mathematical areas. The mathematics covered allows students to interpret and use the formal symbols, conventions and basic processes of the chosen fields of mathematics in order to solve problems, and to communicate their problem-solving processes in writing using a variety of informal and formal language.

Two numeracy for knowledge learning outcomes are introduced in Numeracy Skills Senior. They are introduced in order to provide students with knowledge about the conventions and techniques of formal study in mathematics. Numeracy for Knowledge is extended in the Advanced Numeracy Skills Senior unit to provide a solid basis of knowledge and skills belonging to several formal areas of mathematics.

In both the Numeracy Skills Senior and Advanced Numeracy Skills Senior units there are seven learning outcomes; however, it is only necessary to demonstrate competence in six of the seven learning outcomes. The aim of achieving only six of the seven has been included in order to offer both students and teachers more flexibility in assessment and, in some specific contexts such as workplaces, one of the learning outcomes could be left out if it was not seen to be relevant.

### **Flexibility in the linking of learning outcomes across the levels**

Because there is continuity in the structure and flow of the learning outcomes in the Numeracy Skills units, this enables integration of students from different levels within a class. This is especially true of Foundation and Intermediate levels, where the learning outcomes match, the points of difference being the sophistication and complexity of the mathematics and communication required. There are similar relationships (although not quite as clear cut), in the progressions from

Intermediate to Senior and Advanced Senior levels. This continuity supports delivery in mixed ability classes with students working on the same themes and topics, for the same learning outcomes, but at different levels. The diagram linking the learning outcomes below shows the relationships between the learning outcomes across the different levels.

### ***Linking the learning outcomes***

Numeracy Skills Foundation	Numeracy Skills Intermediate	Numeracy Skills Senior	Advanced Numeracy Skills Senior
1. Numeracy for Practical Purposes – Design	1. Numeracy for Practical Purposes – Design	1. Numeracy for Practical Purposes – Design	
2. Numeracy for Practical Purposes – Measuring	2. Numeracy for Practical Purposes – Measuring	2. Numeracy for Practical Purposes – Measuring	
3. Numeracy for Personal Organisation – Money and Time	3. Numeracy for Personal Organisation – Money and Time		
4. Numeracy for Personal Organisation – Location	4. Numeracy for Personal Organisation – Location	3. Numeracy for Personal Organisation – Location	
5. Numeracy for Interpreting Society – Data	5. Numeracy for Interpreting Society – Data	4. Numeracy for Interpreting Society – Data	1. Numeracy for Interpreting Society – Data
6. Numeracy for Interpreting Society – Numerical Information	6. Numeracy for Interpreting Society – Numerical Information	5. Numeracy for Interpreting Society – Numerical Information	2. Numeracy for Interpreting Society – Numerical Information
		6. Numeracy for Knowledge – Further Study in Maths (formulae)	3. Numeracy for Knowledge – Further Study in Maths (formulae and graphs)
			4. Numeracy for Knowledge – Further Study in Maths (algebraic techniques)
			5. Numeracy for Knowledge – Further Study in Maths (Area A)
			6. Numeracy for Knowledge – Further Study in Maths (Area B)
		7. Numeracy for Knowledge – Further Study in Maths (problem solving)	7. Numeracy for Knowledge – Further Study in Maths (problem solving)

## DELIVERY

The Numeracy Skills units can be delivered in any way that allows students to develop competence in the learning outcomes. A variety of modes of delivery may be used including classroom based, online and other off-campus delivery. However, it is recommended that most of the delivery be face to face via a teacher, tutor or mentor.

Classroom based delivery should include a mixture of whole class, small group and individual activities.

It is essential that the curriculum be delivered in a way that meets the needs of the students and that the teaching/learning methods employed should allow for individual differences in learning styles.

Students must be actively involved in what is to be covered and how it is to be covered. This may take the form of negotiation of content and should allow students to develop a range of learning strategies.

Learning activities should encourage the integration of learning outcomes.

Learning activities should be flexible to allow students to work across levels. Further information about delivery and educational practices can be found in the current VCE and VCAL Administrative Handbook.

## ASSESSMENT AND REPORTING

Although students should cover all learning outcomes in the teaching/learning context, to be credited with the unit at Foundation and Intermediate levels, the student must demonstrate competence in five of the six learning outcomes.

At the Senior level, students must demonstrate competence in six of the seven learning outcomes. It is expected that they would cover all learning outcomes in the teaching/learning context.

VCAL providers will report results for each unit as S (Satisfactory) or N (Not yet completed).

### Assessment methods

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical applications over a period of time. It will require a combination of evidence collected mainly through teacher observations and some collection of written records of students' work.

It is not expected that all elements for an outcome can be assessed within a single task, that is, it would be unlikely that both the money and time aspects of the personal organisation learning outcome could be demonstrated within a task. Therefore it might require a number of observations or tasks to completely assess any given outcome.

It will often be possible to assess aspects of more than one learning outcome within one assessment task, for example a task which involves the practical application of measurement knowledge and skills (Numeracy for Practical Purposes – Measuring) may also allow demonstration of ability to calculate with money (Numeracy for Personal Organisation – Money and Time).

It would be ideal for students to be assessed actually undertaking a real task such as purchasing goods in a shop and checking change, measuring ingredients for cooking, following directions in outside locations. Such activities could be undertaken as part of an integrated activity involving Work Related Skills units or Personal Development Skills units as shown in the sample integrated unit included at the end of the Foundation Numeracy Skills unit.

Where the elements include listed items of mathematical knowledge, it is assumed that most of these will be included as part of the teaching/learning program. It is not envisaged that all the listed items would be assessed individually – competence in one or two may be sufficient evidence that the element can be met.

A range of assessment options should be used according to the needs of students and the teaching/learning situation, for example assessment could be observation of students performing in the workplace or simulating on the job tasks in a classroom environment.

A folio of evidence could be collected through a combination of the following:

- records of teacher observations of students' activities, oral presentations, practical tasks etc.
- samples of students' written work
- student self-assessment sheets, reflections or journal entries (where appropriate)
- pictures, diagrams, models created by students.



## Section 3: VCAL unit information

### NUMERACY SKILLS FOUNDATION

#### **Unit name**

Numeracy Skills Foundation

#### **Nominal duration**

100 hours – 1 credit

#### **Unit purpose**

The purpose of this unit is to enable students to develop the confidence and skills to perform simple and familiar numeracy tasks and to develop the ability to make sense of mathematics in their daily personal lives. The mathematics involved includes measurement, shape, numbers, and graphs that are part of the students' normal routines to do with shopping, travelling, cooking, interpreting public information, telling the time etc.

On successful completion of this unit students will be able to perform everyday mathematical tasks which involve a single mathematical step or process. Their communication about mathematical ideas would mainly be spoken rather than written responses.

#### **Content summary**

The content range relevant to each learning outcome can be found in the learning outcome details.

#### **Learning outcomes and elements**

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit, although they should cover all the learning outcomes in the teaching/learning context.

#### ***Summary of learning outcomes***

##### **1. Numeracy for Practical Purposes – Design**

Can use everyday informal language of shape, size, colour and other commonly used attributes to identify and recognise shapes in the context of their common usage and application.

##### **2. Numeracy for Practical Purposes – Measuring**

Can use familiar simple measurements of length, mass, capacity and temperature to compare or measure materials or objects in personal situations.

##### **3. Numeracy for Personal Organisation – Money and Time**

Can identify and use familiar everyday numbers, and units of money and time to make decisions about money and time in personal situations.

##### **4. Numeracy for Personal Organisation – Location**

Can use simple everyday language of location to give and follow informal oral directions.

## **5. Numeracy for Interpreting Society – Data**

Can use simple everyday tables and graphs to interpret public information which is of personal relevance or interest.

## **6. Numeracy for Interpreting Society – Numerical Information**

Can use simple everyday numbers and figures to interpret information which is in texts of personal relevance or interest.

### **Elements**

The elements detail the requirements for satisfying each learning outcome. The learning outcome is achieved when students can demonstrate competence in all the elements. However, it is not expected that one assessment task or activity can or should cover all the elements.

The elements are grouped according to three categories: Mathematical knowledge and techniques; Mathematical language; and Interpretation.

### **Mathematical knowledge and techniques**

The specific mathematical skills, knowledge and techniques required for each learning outcome are specified within this category of the elements.

Within this section specific techniques are not laid down as mandatory requirements in order to allow for the variety of idiosyncratic methods which students bring to the numeracy classroom. It is hoped that such personal techniques will be encouraged, discussed and valued alongside any new formal or informal techniques taught.

An exception, however, is calculator use which is regarded as a fundamental skill in our modern technological society. Students should be therefore exposed to a variety of ways to use calculators and other technology.

Pen and paper methods are not seen as superior to other methods such as calculators or 'in the head' methods.

### **Mathematical language**

There is limited value in only developing a range of mathematical skills, knowledge and techniques without being able to interpret mathematical information and be able to communicate this to others, either orally or in writing. So an important aspect of learning mathematics and being numerate is understanding and developing the associated mathematical language (both formal and informal), and because it is vital, relevant elements are named and described under this category for each learning outcome.

### **Interpretation**

There are two important aspects of numeracy and mathematics that are addressed under the Interpretation category of the elements. The first is checking results against initial estimates such as: decides on reasonableness of calculations through rough approximations and decides on reasonableness of measurement through visualisation and/or prior knowledge. The second aspect relates to the issue of using mathematics critically. Students are expected to relate the meaning of mathematical tasks or activities to their personal experiences, implications, beliefs and social consequences. This critical aspect needs to be supported and encouraged through teacher prompting in the initial stages at the Foundation level.

## **Educational practices**

### **Teaching/learning strategies**

Strategies adopted should be appropriate to the learning situation and should include some of the following:

- small group and whole group activities
- undertaking out-of-class activities or investigations such as trips to learn about reading and using maps and costing of such trips; planning meals, purchasing the ingredients and cooking them in a kitchen; planning, designing, costing and planting a garden
- classroom based activities, investigations, problem solving
- using the Internet to find out about mathematical topics or to find data to analyse
- oral presentations
- listening to guest speakers
- where appropriate writing essays, reports, timelines, posters, flowcharts
- producing multimedia and/or web based reports or documents
- valuing students' own approaches to solving problems including effective use of supporting technologies.

Other principles of good teaching practice should also be used which:

- ensure that all students experience success and hence develop their confidence
- use appropriate everyday and mathematical language as part of the teaching of numeracy and mathematics to explain ideas, concepts, and terminology that can be understood by students and applied by them in talking, reading, writing and listening
- encourage students to learn through interaction and cooperation – via discussion, asking questions, giving explanations and presentations, and working cooperatively in pairs or small groups
- use practical and ‘hands-on’ materials and resources – through out-of-class or classroom based demonstrations, activities, investigations, and puzzle or problem solving
- teach concepts in contexts relevant to the students, utilising their backgrounds, interests and experiences. This should include putting mathematics into its historical and cultural contexts
- ensure holistic teaching: integrating other skill areas such as oral communication, reading and writing into the numeracy and mathematics learning and teaching, and vice versa
- raise awareness about social and community issues and practices that influence and impact on students’ lives.

### ***Learning-to-learn***

Teaching, learning and assessment at this level should explicitly model and validate a wide range of learning-to-learn strategies which are integral to the development of effective numeracy skills. These learning-to-learn strategies may include:

- risk taking (having a go)
- asking for and accepting help/advice/feedback from a variety of sources
- reviewing and reflecting, for example ‘Is the answer reasonable?’ Checking the answer against estimate
- linking new information to existing knowledge
- learning from mistakes
- changing the approach/method
- voicing experiences and responding to the diverse experiences of others.

### **Assessment**

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit.

#### ***Conditions of assessment***

The conditions of assessment for the Numeracy Skills Foundation unit are that students use:

- concrete, relevant, familiar and personal contexts and materials where the mathematical content is explicit
- actual objects (where possible) for spatial and diagrammatic representations
- the context, their prior knowledge and personal experiences to derive meaning and check reasonableness
- support from mentors and/or teachers, advice/modelling and first/other language resources
- personal ‘in the head’ or pen and paper methods, calculators and/or computers to solve calculations and problems
- oral descriptions using common, everyday, informal language and gestures for explanations, answers and interpretations.

#### ***Assessment methods***

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical application over a period of time. It will require a combination of evidence collected mainly through teacher observations and some collection of written records of students’ attempts at tasks.

It is not expected that all elements for an outcome can be assessed within a single task. For example, it would be unlikely that both the money and time aspects of the personal organisation learning outcome 3 could be demonstrated within a task. Therefore, it might require a number of tasks collected or observed to completely assess any given outcome.

It would be ideal for students to be assessed actually undertaking a real task such as purchasing goods in a shop and checking change, measuring ingredients for cooking, following directions in outside locations. Some of these tasks such as shopping may be able to be simulated in a classroom but it is preferable that students gain the skills and confidence through undertaking the task in a real situation.

Where elements include a list of items of mathematical knowledge (for example, in Numeracy for Practical Purposes – Measuring, learning outcome 2, uses appropriately common units of measurement such as centimetre, metre, kilogram, litre, degree Celsius, and may include imperial measurements, it is assumed that most of these will be included as part of the teaching/learning program. It is not envisaged that all the listed items be assessed individually – competence in one or two being sufficient evidence that the elements can be met.

A range of assessment options should be used according to the needs of the student group and the learning situation. A folio of evidence could be collected through a combination of the following:

- records of teacher observations of students' activities, discussions and practical tasks
- occasional samples of students' written work
- pictures, diagrams, models, etc. created by students.

## LEARNING OUTCOME DETAILS

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit, although they should cover all learning outcomes in the teaching/learning context.

### LEARNING OUTCOME 1

#### **Numeracy for Practical Purposes – Design**

Can use everyday informal language of shape, size, colour and other commonly used attributes to identify and recognise shapes in the context of their common usage and application.

##### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Use concepts of shape and size to describe and compare shapes.
- b) Use touch and sight of objects to classify and compare objects.

##### ***Language***

- c) Use appropriately informal language of comparisons such as bigger, smaller, the same as, thicker, darker, hotter, longer, shorter.
- d) Use appropriately informal language of shape such as straight, curved, square, circle.

##### ***Interpretation***

- e) Decide, with teacher prompting, whether descriptions are correct using personal experience, context and prior knowledge.

##### **Content range**

- Actual objects should be used as often as possible for identification, comparison and description.
- Relevant shapes would include everyday signs such as road signs, tiles, patchwork, building shapes.
- Computer software may be appropriate for the teaching and illustration of different shapes.

#### **Examples of assessment tasks/activities for learning outcome 1**

Assessment tasks should be developed to reflect the learning style and context of students' experiences.

- Describe and compare different everyday shapes such as road signs, sports grounds/arenas, shapes in buildings or packaging.
- Games with attribute blocks, for example finding an attribute block with only one attribute different. Students could name the shape and give reasons why they selected a particular block.
- Draw particular shapes from an oral description, for example draw a shape which has four straight sides the same length.
- Give a description of a shape or symbol for someone else to draw.

## LEARNING OUTCOME 2

### **Numeracy for Practical Purposes – Measuring**

Can use familiar simple measurements of length, mass, capacity and temperature to compare or measure materials or objects in personal situations.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Choose appropriate measuring instruments from a given range of available instruments.
- b) Use measuring instrument correctly, for example begins from zero.
- c) Use whole numbers appropriately.
- d) Use the common units of measurement and their abbreviations such as centimetre, metre, kilogram, litre, and imperial measurements, for example inch, foot, pound, ounce, degree Celsius to compare and measure materials or objects.

##### ***Language***

- e) Use orally and in writing common units and their abbreviations.

##### ***Interpretation***

- f) Decide, with teacher prompting, whether measurements are within a reasonable range using personal experience, context and prior knowledge.

#### **Content range**

- Chosen measuring instruments and measuring units need to be familiar, relevant and applicable to the student.
- The types of measuring instruments may include tape measures (builders, dressmakers) domestic measuring jugs and cups, household scales, thermometers, or any others appropriate to student goals.
- Appropriate abbreviations may include units such as l, ml, m, cm, kg, g, °C or work/context specific ones such as mm, V.

### **Examples of assessment tasks/activities for learning outcome 2**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Cook or bake some food following a simple recipe and/or verbal instructions.
- Guess the weight or length of some common objects. Then weigh/measure the objects using the appropriate measuring instrument and work out how close the guess was. Objects could be arranged in order from lightest/shortest to heaviest/longest.
- Compare the size of animals, for example a lion and a cat.
- Organise a BBQ for a school occasion. Include surveying in class to develop a rule of thumb for quantities needed and possibly cost per person, including discussion on whether catering for a larger or smaller group would be easier to estimate. If a BBQ takes place students organise sketch maps to indicate where to buy food. Possible timelines for cooking and a sketch map of layout of cooking/serving area could be included.

## LEARNING OUTCOME 3

### Numeracy for Personal Organisation – Money and Time

Can identify and use familiar everyday numbers, and units of money and time to make decisions about money and time in personal situations.

#### Elements

Not all elements need to be met in the one assessment task or activity.

#### *Mathematical knowledge and techniques*

- a) Read, write, interpret and compare numbers related to money on relevant documents or in familiar situations.
- b) Read, write, interpret and compare numbers related to time on relevant documents or in familiar situations.
- c) Perform simple one-step calculations with money.
- d) Interpret the language of simple fractions such as  $\frac{1}{2}$ ,  $\frac{1}{4}$  as applied to time and money.
- e) Read and use time measuring devices such as clocks, watches, calendars.

#### *Language*

- f) Use orally the language of time such as hour, minute, day, week, month, before/after, longer/shorter.
- g) Use and interpret money notation and symbols, and associated language such as more/less, cheaper/more expensive/dearer, double/halve, total.

#### *Interpretation*

- h) Relate results to personal experience with teacher prompting.

#### Content range

Size of numbers would need to be relevant and familiar, for example:

- documents may include bills, leaflets, catalogues, simple pricelists, including such information that is available on the Internet
- situations could include use of simple transport timetables, TV or radio programs, film schedules, including such information that is available on the Internet
- decisions might relate to whether purchases can be made with available money, rough estimate of what change to expect in a transaction, simple budget strategies, leaving in time to get to appointments or catch a bus, checking use by dates
- calculations may be done in idiosyncratic manner, with or without the aid of concrete aids, real money, or a calculator.

#### Examples of assessment tasks/activities for learning outcome 3

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Based on a brochure from a pizza restaurant (or other restaurant), ask students what they would buy with a \$50 voucher to the restaurant to feed themselves and three friends.
- Based on the same restaurant brochure with opening days and times, ask students questions about the days and times they could go to the restaurant to buy the food.
- Interpret, by answering questions, the meaning of a sign advertising the opening times of a shop.
- Investigate and answer questions about working hours and times and pay rates for a casual job a student wants to apply for.
- Use an advertising catalogue to calculate the cost of buying more than one item, rounding amounts of money and working out change.
- Ask questions about the current month (for example, the date of second Monday in the month, and provide dates for each Tuesday in the month).

## LEARNING OUTCOME 4

### **Numeracy for Personal Organisation – Location**

Can use simple everyday language of location to give and follow informal oral directions.

#### ***Elements***

Not all elements need to be met in the one assessment task or activity.

#### ***Mathematical knowledge and techniques***

- a) Interpret and use simple concepts of relative position and location.
- b) Give and follow simple oral directions for moving between locations.
- c) Describe orally the relative location of two or more objects.

#### ***Language***

- d) Use orally the informal language of position such as over/under, in front/behind, left/right, up/down, through, opposite, on the corner, next to.

#### ***Interpretation***

- e) Check, with teacher prompting, to see if directions followed or given, match intentions.

#### **Content range**

- Oral directions to be followed should be short, clear, with only one or two given at a time.
- Locations might include moving from one position to another within a room; one room to another; or between buildings in a large institution, workplace or shopping centre.
- Directions given may be clarified with teacher prompting.
- Simple drawings, plans or maps may be used as an aid.

### **Examples of assessment tasks/activities for learning outcome 4**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Students give directions for someone to go from the classroom to another familiar place, for example toilets, canteen, office.
- Make and describe patterns formed with coloured cubes/counters, for example there are three blocks but they are not in a row; the blue one is in front of the red one and the yellow one is beside the blue one and to the left of it. Students, after hearing or reading this description arrange the blocks according to the description. The student can then form his/her own arrangement and give a description for other students to follow.
- Investigate simple maps provided for tourists on the web for areas such as theme parks, national parks and construct very simple maps of the school indicating important areas for a new Year 7 student, a parent volunteer at canteen or similar using ideas from web research.

## LEARNING OUTCOME 5

### Numeracy for Interpreting Society – Data

Can use simple everyday tables and graphs to interpret public information which is of personal relevance or interest.

#### Elements

Not all elements need to be met in the one assessment task or activity.

##### *Mathematical knowledge and techniques*

- a) Identify the key features, conventions and symbols of simple everyday graphs and tables.
- b) Read and interpret whole numbers used in relevant tables and graphs.
- c) Interpret text that incorporates tables and graphs by locating and reporting orally on specific information.

##### *Language*

- d) Use orally the language of tables and graphs such as table, graph, highest, lowest, most, least.

##### *Interpretation*

- e) Relate, with teacher prompting, the meaning/information of table or graph to personal beliefs, opinions and expectations.

#### Content range

The types of graphs or tables could include simple pie charts, bar graphs, line graphs, pictograms of the kind found in newspapers, magazines, on household bills, information leaflets etc.

#### Examples of assessment tasks/activities for learning outcome 5

Assessment tasks should be developed to reflect the learning style and context of students' experiences.

- Answer questions and discuss the meaning of simple graphs on bills such as phone bills.
- Answer questions and discuss the meaning of the information in a simple table, for example a table of car prices or running costs, print out of results from a sporting event (for example, football, go carting, ten-pin bowling), survey results printed in a newspaper or magazine.
- Use the graph on a bill and compare with the previous bill, or compare with last year's amount.

## LEARNING OUTCOME 6

### **Numeracy for Interpreting Society – Numerical Information**

Can use simple everyday numbers and figures to interpret information which is in texts of personal relevance or interest.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Recognise whole numbers and simple, familiar fractions in numeral and word form.
- b) Order, use and interpret whole numbers and familiar, simple fractions in everyday texts or simple tables.

##### ***Language***

- c) Say or write numbers and simple, familiar fractions in numeral and word form.
- d) Use common words for ordering and comparing numbers and simple, familiar fractions such as smaller, bigger, larger, first, second, between.

##### ***Interpretation***

- e) Relate meaning of the numbers in the text to personal experience, beliefs, opinions or expectations in response to specific questioning from the teacher.

#### **Content range**

Size of numbers would need to be relevant and familiar, for example:

- information should be personally relevant, real-life written texts or information given orally
- texts could include short newspaper articles, advertising materials, public information documents or leaflets from councils, utilities, services etc.
- relevant and simple texts and information off the Internet may be appropriate stimulus material.

#### **Examples of assessment tasks/activities for learning outcome 6**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Recognise, order and use the numerical information in sports articles from newspapers or audio/video excerpts from a sports show.
- Answer questions relating to weather from a newspaper or TV weather report.
- Answer questions relating to relevant information in brochures or simple articles incorporating numbers and figures in newspapers or magazines.
- Answer questions relating to relevant information or simple articles incorporating numbers and figures on Internet sites (for example, sports, TV program, music).
- Use the school canteen price list to create a different order for each day of the week, including cost and change received each day from a set amount.

## INTEGRATED ASSESSMENT TASKS/ACTIVITIES FOR FOUNDATION LEVEL

Assessment tasks similar in complexity to these examples are recommended.

### Sample task 1: Interpreting shop signs

**TRADING HOURS**

**MONDAY–FRIDAY**

**9.00 am – 5.00 pm**

**SATURDAY**

**9.00 am – 11.30 am**

Using the above sign (or something similar), the students could discuss questions such as:

- What do you think ‘Trading hours’ means?
- What does ‘am’ mean? What does ‘pm’ mean?
- How many days a week does the shop open?
- List the days the shop is open.
- What time does the shop open on Tuesday? Draw or demonstrate this on a clock.
- What time does the shop open on Thursday?
- What time does the shop close on Saturday? Draw or demonstrate this on a clock.
- Is the shop open on Sunday?
- How many hours is the shop open on Monday (Explain how you worked this out)?
- How many hours is the shop open on Saturday?
- How many hours is the shop open for the week?
- If you went to the shop at 12 o’clock on Saturday would the shop be open?
- If you went to the shop at 3.00 am on Wednesday, would the shop be open?
- Write these times another way (These could be demonstrated using a clock)

9.00	11.00	2.00
8.30	6.30	7.30
10.15	3.45	5.15
12.15	9.45	12.00

- How many hours would the shop be open on Monday if:
  - the shop was closed for  $\frac{1}{2}$  hour for lunch?
  - the shop closed at 4.30 pm?
  - the shop opened at 10.00 am?
  - the shop opened at 9.30 am and closed at 3.00 pm?

### ***Learning outcomes and elements covered***

This task has the potential to demonstrate competence in the elements for Numeracy for Personal Organisation – Money and Time, learning outcome 3.

### Sample task 2: The cook measures up

Observe students following instructions of a simple recipe which requires them to interpret measurements such as cup, tablespoon, some weights or measures using scales or measuring cups, and some interpretation of simple fractions such as  $\frac{1}{2}$  a cup. Instructions may need to be given verbally.

Ideal recipes are those which require little or no cooking such as slices, salads, fruit salads, drinks and punch mixtures, although recipes such as fried rice or stir fries are also suitable if power points are available for electric frying pans. If kitchens are available then more full scale cooking can be undertaken. Suitable examples of lists of ingredients from recipes might be:

Rum slice	Rice salad
250 g plain sweet biscuits	1 cup long grain rice
1 cup sultanas	1 teaspoon salt
$\frac{1}{4}$ cup finely chopped walnuts	310 g tin whole kernel corn
1 egg	2 spring onions
125 g butter	$\frac{1}{2}$ cup pineapple pieces
$\frac{1}{2}$ cup sweetened condensed milk	1 stalk celery
1 teaspoon cinnamon	1 green pepper
1 tablespoon rum	$\frac{1}{4}$ cup oil
	3 tablespoons white vinegar
	salt and pepper
	$\frac{3}{4}$ cup pineapple juice

If a collection of different recipes were used then pairs of students could make different items to share.

#### ***Learning outcomes and elements covered***

Such tasks have the potential to cover most of the elements for Numeracy for Practical Purposes – Measuring, learning outcome 2.

Although most elements of learning outcome 2 would be covered by this activity, other tasks may be required to complement this, such as in 2 a) where another task may be needed to cover a wider range of metric units if the recipe used had a restricted number of measurements and units used.

The task could easily be extended to address elements for Numeracy for Personal Organisation – Money and Time, learning outcome 3 if students were observed shopping and purchasing the required ingredients. It could also incorporate criteria related to time if cooking time questions were included and/or use by dates for left over ingredients were interpreted.

## **INTEGRATED ASSESSMENT TASKS/ACTIVITIES ACROSS VCAL STRANDS**

The following tasks/activities are examples of how more than one learning outcome can be integrated and assessed across the Literacy and Numeracy Skills, Personal Development Skills and Work Related Skills strands.

### **Sample task 1: Occupational Health and Safety investigation**

Students work in small groups to investigate Occupational Health and Safety (OH&S) requirements of a workplace of interest. This could include:

- a survey on work safe practices (Reading and Writing: Writing for Practical Purposes, learning outcome 2; Reading and Writing: Reading for Practical Purposes, learning outcome 6; Numeracy for Interpreting Society – Data, learning outcome 5; Work Related Skills Unit 1, learning outcome 2)
- identification of hazard concerns, at a workplace of your choice, and possible ways to address them (Reading and Writing: Writing for Knowledge, learning outcome 3; Reading and Writing: Writing for Public Debate, learning outcome 4; Reading and Writing: Reading for Knowledge, learning outcome 7; Reading and Writing: Reading for Public Debate, learning outcome 8; Work Related Skills Unit 1, learning outcomes 2 and 4)
- awareness of strategies and emergency procedures (Reading and Writing: Reading for Practical Purposes, learning outcome 6)
- identification of characteristics of Hazard and Safety signs (Numeracy for Practical Purposes – Design, learning outcome 1)
- evaluation of employer/employee rights and completion of an OH&S report (Reading and Writing: Writing for Knowledge, learning outcome 3; Work Related Skills Unit 1, learning outcomes 2 and 3)
- linking a task like the one above to the other VCAL units is also possible. For example, where a student has a part-time job in a retail business it may be possible to complete units of competency from an appropriate VET certificate.

**Sample task 2: Buying a car**

Students work in pairs to decide on a particular car they would like to buy second hand (choosing a fairly common brand of car). Search newspaper car advertisements or car sale sites on the Internet to find out what choices there are. Students analyse and prepare an oral report on what is available and which car they would buy and why.

This task has the potential to cover the following learning outcomes, or aspects of them:

- Numeracy for Personal Organisation – Money and Time, learning outcome 3
- Numeracy for Interpreting Society – Numerical Information, learning outcome 6
- Oral Communication: Oracy for Knowledge, learning outcome 2
- Oral Communication: Oracy for Exploring Issues and Problem Solving, learning outcome 4.

# NUMERACY SKILLS INTERMEDIATE

## Unit name

Numeracy Skills Intermediate

## Nominal duration

100 hours – 1 credit

## Unit purpose

The purpose of this unit is to enable students to develop everyday numeracy to make sense of their daily personal and public lives. The mathematics involved includes measurement, shape, numbers, and graphs applied to tasks which are part of the students' normal routine but also extending to applications outside their immediate personal environment such as the workplace and the community, whether first hand or portrayed by the media.

At the end of the unit students would be able to attempt a series of operations or tasks with some confidence, be able to select the appropriate method or approach required, and would be able to communicate their ideas both verbally and in written form. They would be at ease with straightforward calculations either manually and/or using a calculator.

## Content summary

The content range relevant to each learning outcome can be found in the learning outcome details.

## Learning outcomes and elements

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit.

### *Summary of learning outcomes*

#### **1. Numeracy for Practical Purposes – Design**

Can interpret and use the knowledge and conventions of common shapes and their representation for describing, designing or representing real life objects.

#### **2. Numeracy for Practical Purposes – Measuring**

Can use straight forward measurement and the metric system to estimate and measure for the purpose of interpreting, making or purchasing materials in familiar practical situations.

#### **3. Numeracy for Personal Organisation – Money and Time**

Can use and interpret whole numbers (including large numbers), simple fractions, decimals and percentages to make decisions about money and time in familiar situations.

#### **4. Numeracy for Personal Organisation – Location**

Can interpret and use everyday language and symbols of location and direction to give and follow oral and written directions.

#### **5. Numeracy for Interpreting Society – Data**

Can use and create everyday tables and graphs to represent and interpret public information which is of interest or relevance.

#### **6. Numeracy for Interpreting Society – Numerical Information**

Can identify and translate everyday numerical concepts to interpret public information which is in texts of interest or relevance.

## Elements

The elements give the detailed criteria for satisfying the learning outcome. The learning outcome is achieved when the student can demonstrate competence in all the elements. However, it is not expected that one assessment task or activity can or should cover all the elements.

The elements are grouped according to three categories: Mathematical knowledge and techniques; Mathematical language; and Interpretation.

## **Mathematical knowledge and techniques**

The specific mathematical skills, knowledge and techniques required for each learning outcome are specified within this category of the elements.

Within this section, specific techniques are not laid down as mandatory requirements in order to allow for the variety of idiosyncratic methods which students bring to the numeracy classroom. It is hoped that such personal techniques will be encouraged, discussed and valued alongside any new formal or informal techniques learned.

An exception, however, is calculator use which is regarded as a fundamental skill in our modern technological society. Students should therefore be exposed to a variety of ways to use calculators.

## **Mathematical language**

There is no point in just developing a range of mathematical skills, knowledge and techniques without being able to interpret mathematical information and be able to communicate this to others, either orally or in writing. So an important aspect of learning mathematics and being numerate is understanding and developing the associated mathematical language (both formal and informal), and because it is vital, relevant elements are named and described under this category for each learning outcome.

## **Interpretation**

There are two important aspects of numeracy and mathematics that are addressed under the Interpretation category of the elements. The first is checking results against initial estimates such as: decides on reasonableness of calculations through rough approximations and decides on reasonableness of measurement through visualisation and/or prior knowledge. The second aspect relates to the issue of using mathematics critically. Students are expected to relate the meaning of mathematical tasks or activities, personal experience, implications, beliefs, and social consequences. At the initial levels, often this critical aspect needs to be supported and encouraged through teacher prompting.

## **Educational practices**

### **Teaching/learning strategies**

Strategies adopted should be appropriate to the learning situation and should include some of the following:

- using small group and whole group activities
- undertaking out-of-class activities or investigations such as: trips to learn about reading and using maps and costing of such trips; planning meals, purchasing the ingredients and cooking them in a kitchen; planning, designing, costing and planting a garden
- using a variety of classroom based activities, investigations, problem solving
- using the Internet to find out about maths topics or to find data to analyse
- using oral presentations
- listening to guest speakers
- producing written essays, reports, timelines, posters and/or flowcharts
- producing multimedia and/or WWW reports or documents
- undertaking research projects.

Other principles of good teaching practice should also be used which:

- ensure that all students experience success and hence develop their confidence
- use appropriate everyday and mathematical language as part of the teaching of numeracy and mathematics to explain ideas, concepts, and terminology that can be understood by students and applied by them in talking, reading, writing and listening
- encourage students to learn through interaction and cooperation – via discussion, asking questions, giving explanations and presentations, and working cooperatively in pairs or small groups
- use practical and hands-on materials and resources – through out-of-class or classroom based demonstrations, activities, investigations, and puzzle or problem solving
- teach concepts in contexts relevant to the students, utilising their backgrounds, interests and experiences; this should include putting mathematics into its historical and cultural contexts
- teach in a holistic way, integrating other skills areas such as oral communication, and reading and writing into the numeracy and mathematics learning and teaching, and vice versa
- raise awareness about social and community issues and practices that influence and impact on students' lives.

### **Learning-to-learn**

Teaching, learning and assessment at this level should explicitly model and validate a wide range of learning-to-learn strategies which are integral to the development of effective numeracy skills.

These learning-to-learn strategies may include:

- risk taking (having a go)
- asking for and accepting help/advice/feedback from a variety of sources
- reviewing and reflecting, for example; ‘Is the answer reasonable?’ Check answer against estimate
- linking new information to existing knowledge
- learning from mistakes
- changing the approach/method
- voicing experiences and responding to the diverse experiences of others.

### **Assessment**

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit.

#### **Conditions of assessment**

The conditions of assessment for the Numeracy Skills Intermediate unit are that students:

- use concrete, relevant, familiar contexts and materials where the mathematical content is predictable and easily accessible
- rely on context, prior knowledge and personal experience to derive meaning and check reasonableness
- perform where access to mentor/teacher and advice/modelling is available and recourse to first/other language is acceptable
- use a blend of personal ‘in the head’ methods, pen and paper methods and calculator procedures
- use a combination of oral and written general, and some mathematical, language, symbols and abbreviations.

#### **Assessment methods**

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical application over a period of time. It will require a combination of evidence collected through teacher observations and collection of written records of students’ attempts at tasks and problem-solving activities.

It will often be possible to assess aspects of more than one learning outcome within one assessment task, for example a task which involves the practical application of measurement knowledge and skills (practical purposes – measurement) may also allow demonstration of ability to calculate with money (personal organisation).

It is not expected, however, that all elements for an outcome can be assessed within one single task. It might require a number of tasks collected or observed to completely assess any given outcome.

Where an element includes a list of items of mathematical knowledge, for example in learning outcome 2: Numeracy for Practical Purposes – Measuring element (a) Interpret, calculate and use the concept of length, mass, volume, area, capacity and temperature, it is assumed that suitable selection of these will be included as part of the teaching/learning program. It is not envisaged that all the listed items be assessed individually – competence in one or two being sufficient evidence that the element can be met.

A range of assessment options should be used according to the needs of the student group and the learning situation, for example in the workplace, assessment could be from observation of students performing on-the-job tasks, whereas these may have to be simulated in a classroom environment.

A folio of evidence could be collected through a combination of the following:

- records of teacher observations of students’ activities, oral presentations, practical tasks, etc.
- samples of students’ written work
- written reports of investigations or problem-solving activities
- student self assessment sheets, reflections, or journal entries
- pictures, diagrams, models created by students
- use of technology, for example Microsoft PowerPoint, digital cameras, web-based publishing, accounting software.

## LEARNING OUTCOME DETAILS

Students must demonstrate competence in five out of the six learning outcomes to be credited with this unit, although all learning outcomes should be covered in the teaching/learning context.

### LEARNING OUTCOME 1

#### **Numeracy for Practical Purposes – Design**

Can interpret and use the knowledge and conventions of common shapes and their representation for describing, designing or representing real life objects.

##### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Recognise and name common two- and three-dimensional shapes.
- b) Represent simple two- and three-dimensional shapes and objects in diagrammatic form.
- c) Interpret plans and diagrams, and their conventions, for representing familiar real life objects.
- d) Assemble or model three-dimensional objects by following construction instructions, plans or diagrams.

##### ***Language***

- e) Use the language of shape such as rectangle, triangle, sphere, cube, cylinder, pyramid and descriptions such as horizontal, diagonal, vertical, parallel, sides, edges, corners and faces, diameter, radius.

##### ***Interpretation***

- f) Compare and check whether finished product represents original object and vice versa.

##### **Content range**

- Diagrams would be in rough sketch form – rulers and scales not necessary.
- Appropriate plans and diagrams would include builders, architects or landscaping plans; assembly instructions; dressmaking, craft patterns; workplace floor plans, machine components, etc.
- Relevant two-dimensional shapes would include OH&S signs, road signs, tiles, patchwork, building shapes, etc.
- Relevant three-dimensional shapes would include packaging, buildings, machines/machine parts, etc.

#### **Examples of possible assessment tasks/activities for learning outcome 1**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Predict, construct and then name three-dimensional objects from their nets.
- Match house plans to house photos giving reasons for the match.
- Organise a Year 12 memento, such as can holder or t-shirt. Look at possible designs, costs, minimum size of order and timelines to complete. Many prison workshops can complete this type of work on smaller runs than commercial organisations.

## LEARNING OUTCOME 2

### **Numeracy for Practical Purposes – Measuring**

Can use straightforward measurement and the metric system to estimate and measure for the purpose of interpreting, making or purchasing materials in familiar practical situations.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Interpret, calculate and use the concept of length, mass, volume, area, capacity and temperature.
- b) Make an initial estimate of measurements.
- c) Choose appropriate measuring instruments and use them correctly to measure.
- d) Choose and perform arithmetic operations where appropriate.
- e) Read and interpret calibrations on a range of familiar measuring instruments.
- f) Use appropriately the names and symbols of the units of measurement, for example centimetre (cm), millimetre (mm), kilometre (km), kilogram (kg) tonne (t).
- g) Convert within the metric system for length, mass, and volume, for example 3500 m is  $3\frac{1}{2}$  km or 3.5 km.

##### ***Language***

- h) Use the words, symbols and conventions for measurement units and rates such as litre, (l), millilitre, ml, \$/m, \$/l, \$/kg,  $\text{cm}^2$ , square metre ( $\text{m}^2$ ), hectare, cubic metre,  $\text{cm}^3$ .

##### ***Interpretation***

- i) Decide on reasonableness of measurement using personal experience, context and prior knowledge and checks against initial estimate.
- j) Interpret the measurement in terms of the purpose of the practical situation.

#### **Content range**

- Measurement instruments may include tape measures, rulers, kitchen and bathroom scales, thermometers, measuring cups, medicine glasses.
- Fractions and decimals should include  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and multiples of 0.1, and 0.25 and other fractions and decimals appropriate to the student.
- Units of measurement such as metre, litre, gram or relevant familiar work/context specific units such as volt.

#### **Examples of possible assessment tasks/activities for learning outcome 2**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Cost the preparation and painting of a classroom.
- Investigate the best weight to carry in a shopping bag.
- Compare the cost of supplying drinks, for example orange juice, to a number of people at a party in different size containers, for example 200 ml, 1 litre, 2 litre.
- Calculate the surface area of a basic rectangular room.
- Calculate the capacity of simple packaging and materials used to make a cardboard box.
- Calculate the volume of petrol in a rectangular fuel tank.
- Compare prices of different sizes of bottles/packets.
- Find the Total Surface Area (TSA) of various containers and predict the area of wrapping to cover article. Include cubes, cuboids, triangular based prisms and cylinders.
- Use different objects to measure and predict the size (using appropriate units) given the magnification factor.

## LEARNING OUTCOME 3

### Numeracy for Personal Organisation – Money and Time

Can use and interpret whole numbers (including large numbers), simple fractions, decimals and percentages to make decisions about money and time in familiar situations.

#### Elements

Not all elements need to be met in the one assessment task or activity.

#### *Mathematical knowledge and techniques*

- Use number facts and rounding to give rough estimates of numerical calculations.
- Use place value concepts for whole numbers and decimals to interpret and compare written and spoken numbers involving money.
- Use and calculate with time, for example converting between digital and analogue time and calculating elapsed time.
- Interpret and compare commonly used fractions, decimals and percentages relating to money; convert between common fraction, decimal and percentage forms for simplification of calculations, such as .25 or 25% to  $\frac{1}{4}$ .
- Obtain accurate results for calculations involving money.

#### *Language*

- Read, write and use orally whole numbers, fractions, decimals and percentages in numerals, words and symbols.
- Use common words for ordering and comparing numbers such as smaller, bigger, larger, first, second, between, less than.
- Identify and use appropriately words, phrases and symbols for arithmetical operations such as add, and, total, subtract, minus, take away, from, times, multiply, share, divide, ten percent of, a quarter of, double.

#### *Interpretation*

- Explain the meaning of calculation results and check feasibility in terms of the original practical situation.

#### Content range

- Familiar situations using percentages may include discounts, straightforward interest estimates, deposits, GST, division by a single digit number only, long division using a calculator and estimation techniques.
- Fractions calculations only in practical realistic situations such as combining times, recipes — formal operations not required.
- Short cut, in the head, or back of envelope calculation techniques acceptable as valuable strategies.
- Only one or two operations per task and percentage calculations without a calculator should be for simple percentages such as 10%, 25% and multiples of these.
- Calculations with time could include times based on time sheets, television programs, timetables, etc.

#### Examples of possible assessment tasks/activities for learning outcome 3

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Cost for recipes with a number of components.
- Cost the catering for a barbecue and a time schedule for preparation and delivery.
- Calculate time for a 24 hour roster, for example what is 19 hours?
- Organise a class or year level sports tipping competition. The number of participants needs to be limited for ease of processing and should use ICT to minimise the workload.
- Assist in the canteen for a period of time, particularly in an area that requires mental arithmetic for change calculations.
- Shop on a limited income. Calculate cost of sale items purchased using simple percentages (for example, 20% off storewide).

## LEARNING OUTCOME 4

### **Numeracy for Personal Organisation – Location**

Can interpret and use everyday language and symbols of location and direction to give and follow oral and written directions.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Interpret key features of maps or directories.
- b) Use map indexes and keys to locate particular places of interest.
- c) Estimate distances using the scale indicator on maps or directories using numerically marked distances and/or visual distance indicator.
- d) Interpret distances in terms of approximate travelling time such as 15 minutes walk, or 2 hours drive.
- e) Use familiar maps or directories to describe or follow routes between locations.
- f) Draw rough sketch maps of familiar areas to describe route or location of building or feature of interest.

##### ***Language***

- g) Use and interpret, orally and in writing, a range of informal and some formal, language of direction such as North, East, clockwise/anticlockwise;  $\frac{1}{2}$  turn,  $\frac{1}{4}$  turn;  $180^\circ$  degree turn.
- h) Read and interpret major keys and symbols on maps and directories.

##### ***Interpretation***

- i) Decide on effectiveness of given directions by checking the results and interpretations.

#### **Content range**

- Routes could be between suburbs (using a street directory), or towns or special features on local maps, state maps, plans of large workplaces or institutions, or any other relevant maps.
- Route instructions need to be clear and may be either written or spoken or drawn in a sketch map.
- Appropriate keys and symbols would include railway lines, stations and other public transport features, major buildings or services such as hospitals, police stations; geographic features such as rivers, bridges, traffic lights.
- Familiarity with local area, state and national maps is to be encouraged.
- Estimates of travel time could be based on personal experience rather than formal rate calculations.

#### **Examples of possible assessment tasks/activities for learning outcome 4**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Use a map and supplied written instruction to navigate around an area (the teaching venue, suburb, city centre). Students mark their route and specified features on their map, for example location of toilets, shade in walk ways, mark in the seats in an area.
- Give instructions to a friend about how to get from one place to another, for example instructions on how to get from the teaching venue to a park where the group is having a barbecue. Estimations on the time to travel the route could be given with reasons.
- Find 'places of interest' in the street directory and give directions to get there, including traveling time.
- Organise to mark out sports areas for school and/or local sports practice or competition as per official plans. This would be better if it involved planning where to locate sports considering safety. Running tracks are particularly challenging and students may need to work in conjunction with the sports teacher.

## LEARNING OUTCOME 5

### Numeracy for Interpreting Society – Data

Can use and create everyday tables and graphs to represent and interpret public information which is of interest or relevance.

#### Elements

Not all elements need to be met in the one assessment task or activity.

#### *Mathematical knowledge and techniques*

- a) Identify the key features and conventions of everyday tables and graphs including the concept of scale.
- b) Use whole numbers, percentages, decimals and fractions found on tables and graphs.
- c) Collect, sort and record data in a table using simple techniques.
- d) Draw an appropriate graph for the data, labeling the graph and axes and marking in the scale.
- e) Interpret and discuss the meaning of tables, graphs and accompanying text.

#### *Language*

- f) Use the descriptive language of tables and graphs such as maximum, minimum, increasing, decreasing, going up, constant, changing, slope.

#### *Interpretation*

- g) Interpret the meaning of graphs or tables in response to teacher prompting in terms of personal implications and/or social consequences.
- h) Decide on the fairness or bias of the data in response to teacher prompting.

#### Content range

- The types of tables and graphs could include simple pie graphs, bar graphs, line graphs, pictograms, etc. of the kind found in newspapers, on household bills, information leaflets, etc.
- Scales created should count in ones, twos, fives, or tens.
- Scales interpreted from public information not limited to the above simple scales — can interpret from more complex scales available on public information.

### Examples of possible assessment tasks/activities for learning outcome 5

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Use a phone, water or power bill to demonstrate understanding of the key features and conventions of everyday tables and graphs and to interpret their meaning, and changes over time, with the accompanying information from the account.
- Choose a question or issues of interest to investigate. After clearly stating what this is, gather and record data in appropriate tables and graphs and discuss the meaning of their findings.

Any topic could be used. Some suggestions are:

- calculate quantity of water/gas/electricity the household uses each day. Recordings are made from the relevant meter. A household conservation campaign could then take place and a second set of recordings taken and the effect of the campaign assessed
- study TV watching habits of friends
- calculate amount of petrol and cost of fuel for a car for a period of time
- design, carry out and interpret a survey
- design a simple survey of the class and present the data in different ways.

## LEARNING OUTCOME 6

### **Numeracy for Interpreting Society – Numerical Information**

Can identify and translate everyday numerical concepts to interpret public information which is in texts of interest or relevance.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Use place value concepts for whole numbers and decimals to interpret and compare written and spoken numbers.
- b) Interpret and compare commonly used fractions, decimals and percentages.
- c) Use number facts and rounding to give rough estimate to numerical calculations.
- d) Obtain accurate results for calculations with whole numbers and simple fractions, decimals and percentages.
- e) Convert between common fraction, decimal and percentage forms for simplification of calculations, such as 0.25 or 25% to  $\frac{1}{4}$ .
- f) Calculate fractions of whole number quantities only.

##### ***Language***

- g) Read, write and use orally whole numbers, fractions, decimals and percentages in numerals, words and symbols.
- h) Use common words for ordering and comparing numbers such as smaller, bigger, larger, first, second, between, less than.
- i) Identify and use appropriately words, phrases and symbols for arithmetical operations such as add, and, total, subtract, minus, take away, from, times, multiply, share, divide, ten percent of, a quarter of, double.

##### ***Interpretation***

- j) Relate meaning of the numerical concepts in the text to personal experience, beliefs, opinions or expectations in response to teacher prompting.

#### **Content range**

- Information could include newspaper articles, advertising materials, public information documents or leaflets from councils, utilities, services, etc.
- Numbers should include whole numbers up to millions and decimals to hundredths, and simple percentages such as 10%, 25% and multiples of these.
- Only one or two operations per task and percentage calculations without a calculator should be for simple percentages such as 10%, 25% and multiples of these.
- Calculations with fractions should only include common fractions such as  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{10}$ .
- Formal operations on fractions not required.
- Long division by pen and paper not required.

#### **Examples of possible assessment tasks/activities for learning outcome 6**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Compare the various deals that are offered by pizza places, for example compare fraction with percentage discounts.
- Compare the purchase of an item on terms compared to paying cash. Don't forget the GST.
- Use a newspaper article on a topical issue, for example to interpret and compare commonly used fractions, decimals and percentages; to relate the meaning of the numerical concepts in the article to personal experience, beliefs, opinions or expectations.
- Interpret information from a newspaper article or road safety website including percentages, fractions, decimals.

## INTEGRATED ASSESSMENT TASKS/ACTIVITIES FOR INTERMEDIATE LEVEL

Assessment tasks/activities similar in complexity to these examples are recommended.

### Sample task 1: How much is that?

The task is to cost the placing/replacing of the plastic edging around the edge of the class room tables.

Many classroom tables have plastic edging around them. If this is not the case then the situation could be posed to the student that they have been employed to place protective edging on the tables.

At Intermediate level the problem would be introduced collectively to the group of students. They should be given time to think through the problem-solving process and to come up with an estimate. During this process they will ask for the price of the edging material. This can be given to them or they set their own price.

Students should then report back either orally or in written form on the estimate and the process they used.

Now an accurate costing is carried out.

Students should choose an appropriate measuring tool from a variety of measuring equipment such as carpenter's tape, metre rule, 30/40 cm rule, dressmaker's tape.

Students should then write up what they have found including their initial estimates; all calculations and reflections on their estimates are then compared to the actual answer.

#### ***Learning outcomes and elements covered***

This task has the potential to satisfy all the elements of Numeracy for Practical Purposes – Measuring, learning outcome 2.

The methods and calculations used by the student can also be a good indicator of the preparedness for Senior level. For example, if the student approaches this problem very independently, uses formulae in their calculations (or short cuts which indicate that they are aware of the perimeter formulae) and makes a numerically 'mature' comparison of the answer to the estimate then it is a clear indication the student is capable of operating at Senior level in this area.

### Sample task 2: A walk around town

Using an appropriate map ask students to plan a short walking route around a town for a group of people. Appropriate maps may be, for example, a tourist map of Beechworth and surrounds for students in North East Victoria or the Melway or a tourist map of Melbourne Central Business District for city students or country students planning a trip to Melbourne.

The planned route should pass some places of interest and should take approximately a prescribed time, for example 1 hour or  $\frac{1}{2}$  day.

Students could work individually or in pairs.

The route chosen is described by a set of written instructions using appropriate location language and distance indicators. Questions could be asked along the way. The answers will indicate that the correct location has been arrived at.

These instructions are then swapped with another student or pair of students who then check the workability of the instructions in the location or if this is not possible, against the actual map. Street names, answers to questions, and a sketch map should be recorded by the checking students.

Feedback to the instruction originators can then be given (for example, precise instructions could be circled and confusing ones underlined) and incorrect or confusing instructions can be corrected together.

#### ***Learning outcomes and elements covered***

This task has the potential to satisfy all the elements of Numeracy for Personal Organisation – Location, learning outcome 4 assuming that the information is taken from a standard map with keys and scales.

The task could easily be extended to include measurement (learning outcome 2) by experimenting with students' paces and walking speeds or by working out comfortable weights for carrying in day back packs. Alternatively it could be extended to include elements from Numeracy for Personal Organisation – Money and Time, learning outcome 3 by planning costs and times for a trip by public transport or by costing a shared lunch for the group and travelling by car, etc.

**Extension to Senior level**

- Students could prepare a scale map of their route with accompanying written instructions.
- Students could organise a longer trip (for example, from Melbourne to the Grampians) or a trip covering several days around Victoria. This organisation could include maps of the proposed route, suggested times and locations for meal breaks and overnight stays.

**Extension to other units**

- Read about the places of interest (Reading and Writing: Reading for Knowledge, learning outcome 7).
- Each student to tell the other students in the group about one of the places of interest (Oral Communication: Oracy for Knowledge, learning outcome 2).
- Write a personal response or a report on one of the places of interest (Reading and Writing: Writing for Self Expression, learning outcome 1; Reading and Writing: Writing for Knowledge, learning outcome 3).

**INTEGRATED ASSESSMENT TASKS/ACTIVITIES ACROSS VCAL STRANDS**

The following tasks /activities are examples of how more than one learning outcome can be integrated and assessed across the Literacy and Numeracy Skills, Personal Development Skills and Work Related Skills Strands:

- Complete a survey on personal health and fitness (Reading and Writing: Writing for Practical Purposes, learning outcome 2; Reading and Writing: Reading for Practical Purposes, learning outcome 6).
- Identify adolescent health concerns and possible ways to address them. (Reading and Writing: Writing for Knowledge, learning outcome 3; Reading and Writing: Writing for Public Debate, learning outcome 4; Reading and Writing: Reading for Knowledge, learning outcome 7; Reading and Writing: Reading for Public Debate, learning outcome 8).
- Develop an awareness of safety and responsible use of equipment (Reading and Writing: Reading for Practical Purposes, learning outcome 6).
- Evaluate program and complete a report (Reading and Writing: Writing for Knowledge, learning outcome 3).
- It is also possible to cover Numeracy Skills learning outcomes (for example, Numeracy for Interpreting Society – Data, learning outcome 5) in relation to this program; for example, when investigation of health issues includes reading statistical information, personal health statistics and other numerical information.
- Linking a unit like the one above to the Industry Specific Skills unit is also possible. Where a student or group of students has a part-time job at the local aquatic centre, it would be possible to complete units of competency from an appropriate VET certificate.

# NUMERACY SKILLS SENIOR

## Unit name

Numeracy Skills Senior

## Nominal duration

100 hours – 1 credit

## Unit purpose

The purpose of this unit is to enable students to explore mathematics beyond its familiar and everyday use to its application in wider, less personal contexts such as newspapers and other media reports, workplace documents and procedures, and specific projects at home or in the community.

At the end of the unit students will have the capacity to interpret and analyse how mathematics is represented and used. They can recognise and use some of the conventions and symbolism of formal mathematics. The mathematics involved would include measurement, graphs and simple statistics, use of maps and directions and an introductory understanding of the use of formulae and problem-solving strategies.

Completion of this unit would prepare students for the Advanced Numeracy Skills Senior unit.

## Content summary

The content range relevant to each learning outcome can be found in the learning outcome details.

## Learning outcomes and elements

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit.

### *Summary of learning outcomes*

#### **1. Numeracy for Practical Purposes – Design**

Can translate between two-dimensional and three-dimensional real life objects and their diagrammatic representations for the purposes of measurement, design, and interpretation.

#### **2. Numeracy for Practical Purposes – Measuring**

Can use measurements, the metric system and simple measurement formulae for the purpose of interpreting, making or purchasing materials in practical situations.

#### **3. Numeracy for Personal Organisation – Location**

Can use the conventions of distance, location and direction to read, create and use maps.

#### **4. Numeracy for Interpreting Society – Data**

Can create, use and interpret tables and graphs, and calculate and use averages, in order to reflect on information of relevance to self, work or community.

#### **5. Numeracy for Interpreting Society – Numerical Information**

Can use, and calculate with, fractions, percentages, decimals, rates and large numbers, to reflect on aspects of personal, work or community life.

#### **6. Numeracy for Knowledge – Further Study in Maths (formulae)**

Can develop and use simple formulae to describe and represent relationships between variables in real life contexts.

#### **7. Numeracy for Knowledge – Further Study in Maths (problem solving)**

Can use simple mathematical problem-solving techniques to interpret and solve straightforward mathematical problems.

## Elements

The elements give the detailed criteria for satisfying the learning outcome. The learning outcome is achieved when the student can demonstrate competence in all the elements. However, it is not expected that one assessment task or activity can or should cover all the elements.

The elements are grouped according to three categories: Mathematical knowledge and techniques; Mathematical language; and Interpretation.

### **Mathematical knowledge and techniques**

The specific mathematical skills, knowledge and techniques required for each learning outcome are specified within this category of the elements.

Within this section specific techniques are not laid down as mandatory requirements in order to allow for the variety of idiosyncratic methods which students bring to the numeracy classroom. It is hoped that such personal techniques will be encouraged, discussed and valued alongside any new formal or informal techniques learned.

An exception, however, is calculator use which is regarded as a fundamental skill in our modern technological society. Students should therefore be exposed to a variety of ways to use calculators.

### **Mathematical language**

There is no point in just developing a range of mathematical skills, knowledge and techniques without being able to interpret mathematical information and be able to communicate this to others, either orally or in writing. So an important aspect of learning mathematics and being numerate is understanding and developing the associated mathematical language (both formal and informal), and because it is vital, relevant elements are named and described under this category for each learning outcome.

### **Interpretation**

Two important aspects of numeracy and mathematics are addressed under the Interpretation category of the elements. The first is checking results against initial estimates such as: decides on reasonableness of calculations through rough approximations and decides on reasonableness of measurement through visualisation and/or prior knowledge. The second aspect relates to the issue of using mathematics critically. Students are expected to relate the meaning of mathematical tasks or activities, personal experience, implications, beliefs, and social consequences. At the initial levels, often this critical aspect needs to be supported and encouraged through teacher prompting.

## **Educational practices**

### **Teaching/learning strategies**

Strategies adopted should be appropriate to the learning situation and should include:

- small group and whole group activities
- undertaking out-of-class activities or investigations such as: trips to learn about reading and using maps and costing of such trips; investigations and experiments to collect data for a statistical analysis; planning, designing, costing and planting a garden
- classroom based activities, investigations, problem solving, etc.
- using the Internet to find out about maths topics or to find and analyse data
- oral presentations
- listening to guest speakers
- written essays, reports, timelines, posters, flowcharts
- production of multimedia and/or WWW reports or documents
- undertaking research projects.

Other principles of good teaching practice should also be used which:

- ensure that all students experience success and hence develop their confidence
- use appropriate everyday and mathematical language as part of the teaching of numeracy and mathematics to explain ideas, concepts, and terminology that can be understood by students and applied by them in talking, reading, writing and listening
- encourage students to learn through interaction and cooperation – via discussion, asking questions, giving explanations and presentations, and working cooperatively in pairs or small groups
- use practical and hands-on materials and resources – through out-of-class or classroom based demonstrations, activities, investigations, and puzzle or problem solving
- teach concepts in contexts relevant to the students, utilising their backgrounds, interests and experiences; this should include putting mathematics into its historical and cultural contexts

- teach in a holistic way, integrating other skills areas such as oral communication, and reading and writing into the numeracy and mathematics learning and teaching, and vice versa
- raise awareness about social and community issues and practices that influence and impact on students' lives.

### ***Learning-to-learn***

Teaching, learning and assessment at this level should explicitly model and validate a wide range of learning-to-learn strategies which are integral to the development of effective numeracy skills.

These learning-to-learn strategies may include:

- risk taking (having a go)
- investigating self generated questions/issues
- asking for and accepting help/advice/feedback from a variety of sources
- reviewing and reflecting, for example 'Is the answer reasonable?' – check answer against estimate
- linking new information to existing knowledge
- learning from mistakes
- changing the approach
- voicing experiences and responding to the diverse experiences of others.

### **Assessment**

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit.

#### ***Conditions of assessment***

The conditions of assessment for the Numeracy Skills Senior unit are that students:

- use concrete, relevant contexts and materials where the mathematical content is accessible
- rely on prior knowledge, personal experience and mathematical knowledge to derive meaning, make predictions and check reasonableness
- perform where advice/modelling is available and recourse to first/other language is acceptable
- use a blend of personal 'in the head' methods, pen and paper and calculator procedures (and software programs where appropriate)
- use a combination of oral and written mathematical and general language, symbols, abbreviations and diagrams.

#### ***Assessment method***

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical application over a period of time. It will require a combination of evidence collected through teacher observations and collection of written records of students' attempts at tasks and problem-solving activities.

It will often be possible to assess aspects of more than one learning outcome within one assessment task, for example a task which involves the practical application of measurement knowledge and skills (practical purposes – measurement) may also allow demonstration of ability to calculate with money (personal organisation).

It is not expected, however, that all elements for an outcome can be assessed within one single task. It might require a number of tasks collected or observed to completely assess any given outcome.

Where an element includes a list of items of mathematical knowledge (for example, in Numeracy for Practical Purposes – Measuring, learning outcome 2, use the words, symbols and conventions for measurement units and rates such as metres squared,  $m^2$ , hectare, building square, cc,  $cm^3$ ,  $m^3$ , \$/m,  $$/m^2$ ) it is assumed that most of these will be included as part of the teaching/learning program. It is not envisaged that all the listed items be assessed individually – competence in one or two being sufficient evidence that the element can be met.

A range of assessment options should be used according to the needs of the student group and the learning situation, for example in the workplace, assessment could be from observation of students performing on-the-job tasks, whereas these may have to be simulated in a classroom environment.

A folio of evidence could be collected through a combination of the following:

- records of teacher observations of students' activities, oral presentations, practical tasks, etc.
- samples of students' written work
- written reports of investigations or problem-solving activities
- student self-assessment sheets, reflections, or journal entries
- pictures, diagrams, models created by students.

## LEARNING OUTCOME DETAILS

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit, although they should cover all learning outcomes in the teaching/learning context.

### LEARNING OUTCOME 1

#### **Numeracy for Practical Purposes – Design**

Can translate between two-dimensional and three-dimensional real life objects and their diagrammatic representations for the purposes of measurement, design, and interpretation.

##### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Apply ratio to scale drawings or plans.
- b) Estimate, draw and measure angles using a protractor or compass.
- c) Interpret plans and diagrams of three-dimensional objects.
- d) Draw diagrams which include appropriate use of conventions such as scales expressed in ratio form, clear indications of dimensions, clear labeling.

##### ***Language***

- e) Describe shapes using the language of shape such as rectangle, triangle, isosceles, equilateral, regular, polygon, hexagon, diagonal, sphere, cube, cylinder, pyramid and descriptions such as symmetrical, horizontal, vertical, perpendicular and parallel.
- f) Use the symbols and conventions for scales and angles such as  $^{\circ}$ .

##### ***Interpretation***

- g) Judge whether models, diagrams or plans are representative of original object or vice versa.

##### **Content range**

- Two-dimensional drawings should be to scale, three-dimensional drawings not necessarily accurately scaled.
- Relevant three-dimensional shapes could include packaging, buildings, origami, machines/machine parts, furniture
- Ratios for scales in the form of 1:25 etc. should be understood.

#### **Examples of possible assessment tasks/activities for learning outcome 1**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Interpret, use and draw scale diagrams or models.
- Use a scale diagram of a particular room (for example, bedroom, lounge room, classroom) and a relevant list of furniture to measure the furniture items and decide on the arrangement of the furniture. Students' answers can be presented as a scale diagram or a model drawn to scale.
- Organise a trip to Melbourne with students required to visit six locations using public transport and to take digital photos at each location. Research timetables and public transport system and allocate maximum time allowed.

## LEARNING OUTCOME 2

### Numeracy for Practical Purposes – Measuring

Can use measurements, the metric system and simple measurement formulae for the purpose of interpreting, making or purchasing materials in practical situations.

#### Elements

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Interpret and use the concepts and units of temperature, length, mass, perimeter, area and volume.
- b) Make an initial estimate of measurements.
- c) Choose appropriately accurate measuring instrument and use it correctly to measure.
- d) Read and interpret detailed calibrations on a range of measuring instruments.
- e) Convert between metric units by applying knowledge of metric prefixes including decimal forms.
- f) Choose and use appropriate formulae to calculate perimeters, areas, including surface areas and volumes of common shapes including, where appropriate, composite shapes by using knowledge of standard areas and volumes.
- g) Choose and perform arithmetic operations where appropriate.

##### ***Language***

- h) Use the words, symbols and conventions for measurement units and rates such as metres squared,  $\text{m}^2$ , hectare, building square, cc,  $\text{cm}^3$ ,  $\text{m}^3$ ,  $$/\text{m}$ ,  $$/\text{m}^2$ .

##### ***Interpretation***

- i) Use estimation skills such as mental arithmetic, visualisation of size and quantity to check outcomes against initial estimates and rough calculations.
- j) Evaluate the measurements and calculations in terms of the purpose of the practical situation.

#### **Content range**

- Standard areas and volumes could include rectangle, triangle (as half of rectangle), circle, cube, cuboid and cylinder and may also include volumes of other solids such as sphere, pyramid.
- Measurement instruments may include tape measures, rulers, kitchen and bathroom scales, letter/parcel scales, thermometers, measuring cups/cylinders, etc.
- Use  $\pi$  in the context of the ratio between the circumference and diameter of a circle, and use it to calculate circumferences and areas of circles. Irregular shapes could include swimming pools, packaging, gardens, rooms, houses etc.

#### **Examples of possible assessment tasks/activities for learning outcome 2**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Design a smartie box with the same volume but a different size/shape. Then calculate the area of material required for the new box and comment on the feasibility of the different possible shapes.
- An open ended task where students develop a plan to redecorate a room. Calculations of the cost of painting, wallpapering, carpeting, tiling, installing an appropriate size airconditioner etc. can be made.
- An open ended task where students develop a plan to landscape an area of their choice or the area of the class room. Costing and calculations could include soil, tanbark, and edging requirements as well as the amount of lawn seed or lawn carpet, and plant quantities.
- Estimate distances for parking or dimensions of the room, then measure using pacing.
- Use a recipe to reduce to the simplest ratios and calculate amounts for changed number of serves.
- Students to fill identical canisters with a variety of materials, for example paper clips, plasticine. They are to attempt to get one canister to float, one to stay suspended in a beaker of water and one that sinks. When this is achieved, students can then find the densities of the identical canisters by measuring volume and mass then calculating densities using appropriate units.

It is suggested that when using an open ended task the student presents an outline of his/her intentions so it can be checked that the required elements will be covered.

## LEARNING OUTCOME 3

### **Numeracy for Personal Organisation – Location**

Can use the conventions of distance, location and direction to read, create and use maps.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Estimate and determine distances on maps and street directories.
- b) Apply rates concepts such as speed, fuel consumption rates, price rates, to practical calculations of time and cost related to distances to be travelled.
- c) Estimate and measure angles relating to direction and use this to describe the location of places, for example N, NE or bearings such as N50°E.
- d) Describe routes using oral or written instructions or using accurate sketch maps with scale and direction details.

##### ***Language***

- e) Interpret and use symbols for distance, speed and rates, including ratio notation, visual keys, terminology such as km/h, kph, litres/100 km, \$/l.

##### ***Interpretation***

- f) Decide whether descriptions are accurate by self checking and observations of other interpretations.
- g) Evaluate calculations through a combination of estimation techniques and reference to prior experience and knowledge.

#### **Content range**

- Use problem-solving tasks such as comparative studies of time or costs for journeys by car versus other available transport using maps to calculate average speed for walking, riding, running or driving from actual measurements; time or costs for journeys with distances estimated from a map; etc.
- Types of maps may include street directory, local maps, state maps, maps of Australia, survey or bushwalking maps, plans of large workplaces or institutions, or any other relevant maps which have keys and defined scales.
- Estimates of travel time should incorporate some formal rate calculations.

#### **Examples of possible assessment tasks/activities for learning outcome 3**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

Students could plan a day walk. Venues could be around the city business area, or in National or State Parks. The plan should have details of the expected distance covered, time to walk this distance, location and time of breaks, quantity and expected cost of fuel used in travelling to the starting point.

## LEARNING OUTCOME 4

### **Numeracy for Interpreting Society – Data**

Can create, use and interpret tables and graphs, and calculate and use averages, in order to reflect on information of relevance to self, work or community.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Collect and represent data in graphical form using appropriate scales and axes.
- b) Use whole numbers, percentages, decimals, fractions and ratios found in statistical information in text, tables and graphs.
- c) Calculate, and interpret the meaning of – mean, median and mode for sets of ungrouped data.

##### ***Language***

- d) Use a range of descriptive language of graphs, tables and averages such as maximum, minimum, increasing, decreasing, constant, slope, fluctuating, average, above/below average.

##### ***Interpretation***

- e) Interpret the meaning of data and the accompanying text in terms of personal implications, social consequences, and their validity and accuracy.

#### **Content range**

- The types of graphs could include pie charts, bar graphs, line graphs, pictograms, etc. of the kind found in newspapers, on household bills, information leaflets, etc.
- Scales created should be appropriate to the data collected or being analysed.

#### **Examples of possible assessment tasks/activities for learning outcome 4**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Students select an article which is of interest to them and which contains numerical information. The information could be collected from the electronic, audio or print media. The information could then be represented in appropriate tabular and graphical form. The relevant averages, and other calculations (for example, percentage changes) could be carried out, followed by a discussion of the data.
- Students choose a question or issues of interest to them to investigate. After clearly stating what this is, they gather and record data in appropriate tables and graphs and discuss the meaning of their findings and calculations on averages and other relevant numerical calculations (for example, percentage changes).
- Any topic could be used but it is suggested that topics are discussed to ensure that the intentions of the student satisfy the elements.
- Invest in the stock market. Students play a game where they are given a hypothetical amount of money (say \$50 000) to invest on the stock market. Students select their stocks, continue to record their value over a period of time (for example, six months) then sell their shares and calculate the value of their portfolio. Data is recorded in appropriate tables, graphs. The software package, Microsoft Excel, could be used as a tool in this task.
- The Stock Market Game can also satisfy many of the elements in the learning outcome 5.
- Use Microsoft Excel to construct a table of values and then using Chart Wizard to illustrate it in graphical form.

## LEARNING OUTCOME 5

### **Numeracy for Interpreting Society – Numerical Information**

Can use, and calculate with, fractions, percentages, decimals, rates and large numbers, to reflect on aspects of personal, work or community life.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Determine an appropriate mathematical procedure to solve the problem.
- b) Make a rough estimate to numerical calculations.
- c) Select the appropriate arithmetical operation and accurately calculate with large whole numbers, fractions, decimals, percentages, rates and ratios.
- d) Convert between equivalent values for fractions, decimals, percentages and ratios, choosing a form appropriate to the calculation.

##### ***Language***

- e) Read and write decimal numbers such as point two four five, 0.245, two and five thousandths, 2.005.
- f) Use appropriately the common words, phrases and symbols for mathematical procedures such as percentage, rate, and arithmetical operations.

##### ***Interpretation***

- g) Check the reasonableness of calculations against initial rough estimates and interpret the meaning of the result in terms of personal and/or social consequences.

##### ***Content range***

- Texts could include newspaper articles; financial information such as taxation returns; public information documents or leaflets from councils, utilities, services, documents from unions, employers, workplaces, etc.
- Procedures involving rates should include rates such as km/hr, \$/m, one in ten, 86% of.
- Procedures and numbers involving probabilities should include events such as chance of rain from weather data, gambling.
- Procedures involving ratios should relate to situations such as mixing domestic and garden chemicals, recipes.

### **Examples of possible assessment tasks/activities for learning outcome 5**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Calculate the amount of tax to be paid on different incomes. Comparisons can be made between PAYG rates and company rates. The software package, Microsoft Excel, could be used as a tool in this task.
- Calculate the amount and value of gold in various gold carats, for example 18 carat/12 carat/9 carat gold. Gold prices are given in the business section of the papers and are quoted in \$US for a troy ounce which is equal to approximately 31 grams.
- Make a comparison of mobile phone deals.
- Compare densities of countries or the states of Australia.
- Find the current levels of the water storages and work out the percentage full for each and overall.
- Produce Year 12 or team jumper. Calculate timelines, costs and sizes.

## LEARNING OUTCOME 6

### **Numeracy for Knowledge – Further Study in Maths (formulae)**

Can develop and use simple formulae to describe and represent relationships between variables in real life contexts.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Develop simple formulae and algebraic expressions which generalise straightforward number patterns or relationships between variables in familiar contexts such as cooking, repair charges, mixing chemicals, areas and volumes.
- b) Substitute appropriately into developed formulae to find particular values.
- c) Translate simple worded problems involving unknown quantities into simple equations.
- d) Solve simple equations using informal techniques such as backtracking; or guess, check and improve.

##### ***Language***

- e) Make verbal generalisations of the number patterns or relationships being investigated using language such as doubling, halving, squaring, '\$25 plus \$60 per hour'.
- f) Use informal and some symbolic notation and representation of algebraic expressions such as letters, brackets, squares, cubes and square roots, conventions for multiplication and division in algebra.

##### ***Interpretation***

- g) Decide on the effectiveness of the developed formulae by substituting known values.
- h) Interpret the results obtained in the context of the original problem.

#### **Content range**

- Expressions and equations should involve only one or two arithmetical steps.
- Informal representations using words or meaningful symbols such as  $\square$ s for unknowns, t for tonne, P for profit are sufficient for written generalisations (use of x and y is not necessary).

#### **Examples of possible assessment tasks/activities for learning outcome 6**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Form word and symbolic formulae for income/profits from a selling situation such as selling paintings at a market for \$25 each, and paying \$80 to rent the stall. Analyse what happens for selling different numbers of paintings, etc.
- Form word and symbolic formulae for power charges. Verify if these work and use the formula to calculate charges.
- Generate word and symbolic formulae for football scores. Verify if these work and use the formula to predict final scores for games. Students could carry out the same procedure for a hypothetical scoring system of another game, real or imaginary.

## LEARNING OUTCOME 7

### **Numeracy for Knowledge – Further Study in Maths (problem solving)**

Can use simple mathematical problem-solving techniques to interpret and solve straightforward mathematical problems.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Interpret and extract relevant information from text or problem-solving activity by using appropriate techniques such as restating/rewriting, drawing diagrams or sketch.
- b) Use a range of appropriate problem-solving techniques selected from strategies such as guess and check, elimination, making a table, diagram or sketch, using patterns, simplifying, concrete modelling.
- c) Assess the reasonableness of the result and utilise alternative problem-solving techniques where appropriate.

##### ***Language***

- d) Use appropriately both oral and written language to explain procedures used and to communicate the outcomes of the problem.

##### ***Interpretation***

- e) Interpret and comment upon the results obtained in the context of the original problem.

#### **Content range**

- Expressions or patterns developed should involve only one or two arithmetical steps.
- Problems selected would be those requiring strategies other than standard application of arithmetical processes.
- Problem solving at this level would be modelled by the teacher/tutor and guidance and directions made available via provision of graded steps and/or leading questions.
- A variety of problem-solving techniques should be encouraged to be used flexibly. It is not recommended that students be taught a set number of steps as being the right problem-solving approach.

#### **Examples of possible assessment tasks/activities for learning outcome 7**

Assessment tasks should be developed to reflect the learning style and context of the students' experiences.

- Work out how many ways it may be possible to solve a problem, for example the number of possible different routes to deliver some parcels and find the shortest route; how many ways to paint a room given a number of available colour choices.
- Find a formula for the sum of the internal angles of many sided figures.
- Find a way of generalising the sum of the numbers from one to one hundred by starting with sums of smaller sets of numbers.

## INTEGRATED ASSESSMENT TASKS/ACTIVITIES FOR SENIOR LEVEL

Assessment tasks similar in complexity to these examples are recommended.

### Sample task: How many handshakes?

The task for the student is to work out a rule which applies to the number of handshakes between people in a room.

Everyone is to shake hands with everyone else in the room. Students could estimate the number of handshakes then work out the exact number. Students should then arrive at a quick way of working out this answer once the pattern is established. Students then calculate and record in a table the number of handshakes for the number of people.

**Example:**

Number of people	Number of handshakes
4	
6	
9	
12	

These numbers should be kept small until the pattern and rule has been established.

Develop a formula. Express this in words and symbols.

Use this formula to calculate the number of handshakes for larger groups of people, say 20, 50, 100 etc. Record the results in the table.

Draw a graph of the information.

### ***Learning outcomes and elements covered***

This sort of activity has the potential to cover Numeracy for Knowledge – Further Study in Maths (formulae), learning outcome 6.

## INTEGRATED ASSESSMENT TASKS/ACTIVITIES ACROSS VCAL STRANDS

The following tasks /activities are examples of how more than one learning outcome can be integrated and assessed across the Literacy and Numeracy Skills, Personal Development Skills and Work Related Skills Strands at Intermediate level. **These tasks/activities serve as an example only and could be adapted for the Senior level units.**

- Complete a survey on personal health and fitness (Reading and Writing: Writing for Practical Purposes, learning outcome 2; Reading and Writing: Reading for Practical Purposes, learning outcome 6).
- Identify adolescent health concerns and possible ways to address them (Reading and Writing: Writing for Knowledge, learning outcome 3; Reading and Writing: Writing for Public Debate, learning outcome 4; Reading and Writing: Reading for Knowledge, learning outcome 7; Reading and Writing: Reading for Public Debate, learning outcome 8).
- Develop an awareness of safety and responsible use of equipment (Reading and Writing: Reading for Practical Purposes, learning outcome 6)
- Evaluate program and complete a report (Reading and Writing: Writing for Knowledge, learning outcome 3).
- It is also possible to cover Numeracy Skills learning outcomes (for example, Numeracy for Interpreting Society – Data, learning outcome 5) in relation to this program; for example, when investigation of health issues includes reading statistical information, personal health statistics and other numerical information.
- Linking a unit like the one above to the Industry Specific Skills unit is also possible. Where a student or group of students has a part-time job at the local aquatic centre, it would be possible to complete units of competency from an appropriate VET certificate.

# ADVANCED NUMERACY SKILLS SENIOR

## **Unit name**

Advanced Numeracy Skills Senior

## **Nominal duration**

100 hours – 1 credit

## **Unit purpose**

The purpose of this unit is to provide students with a solid introduction to the knowledge and skills belonging to several formal areas of mathematics. The mathematics involved will include: numerical calculations and analysis of graphical data required for interpreting information about society; the use of formulae, algebraic techniques and problem-solving strategies; and familiarity with fundamental processes of at least two other selected specialist mathematical areas.

At the end of the unit students will be able to confidently perform calculations using a variety of methods. They will be able to interpret and use the formal symbols, conventions and basic processes of the chosen fields of mathematics in order to solve problems, and to communicate their problem-solving processes in writing using a variety of informal and formal language.

## **Content summary**

The content range relevant to each learning outcome can be found in the learning outcome details.

## **Learning outcomes and elements**

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit.

### ***Summary of learning outcomes***

#### **1. Numeracy for Interpreting Society – Data**

Can use tables and graphs and measures of central tendency and spread to interpret, analyse and describe information of relevance to self, work or community.

#### **2. Numeracy for Interpreting Society – Numerical Information**

Can calculate and use rational numbers to analyse and evaluate relevant aspects of personal, work or community life.

#### **3. Numeracy for Knowledge – Further Study in Maths (formulae and graphs)**

Can develop and use formulae and their graphs to describe and represent relationships between variables in a range of contexts.

#### **4. Numeracy for Knowledge – Further Study in Maths (algebraic techniques)**

Can use algebraic techniques to investigate and solve mathematical problems.

#### **5. Numeracy for Knowledge – Further Study in Maths (Area A)**

Can use formal maths techniques relevant to an area of further study to interpret, investigate and solve mathematical problems.

#### **6. Numeracy for Knowledge – Further Study in Maths (Area B)**

Can use formal maths techniques relevant to an area of further study to interpret, investigate and solve mathematical problems.

#### **7. Numeracy for Knowledge – Further Study in Maths (problem solving)**

Can use mathematical problem-solving techniques to interpret, investigate and solve mathematical problems.

## ***Elements***

The elements give the detailed criteria for satisfying the learning outcome. The learning outcome is achieved when the student can demonstrate competence in all the elements. However, it is not expected that one assessment task or activity can or should cover all the elements.

The elements are grouped according to three categories: Mathematical knowledge and techniques; Mathematical language; and Interpretation.

### **Mathematical knowledge and techniques**

The specific mathematical skills, knowledge and techniques required for each learning outcome are specified within this category of the elements.

Within this section, specific techniques are not laid down as mandatory requirements in order to allow for the variety of idiosyncratic methods which students bring to the numeracy classroom. It is hoped that such personal techniques will be encouraged, discussed and valued alongside any new formal or informal techniques learned.

An exception, however, is calculator use which is regarded as a fundamental skill in our modern technological society. Students should therefore be exposed to a variety of ways to use calculators.

### **Mathematical language**

There is no point in just developing a range of mathematical skills, knowledge and techniques without being able to interpret mathematical information and be able to communicate this to others, either orally or in writing. So an important aspect of learning mathematics and being numerate is understanding and developing the associated mathematical language (both formal and informal), and because it is vital, relevant elements are named and described under this category for each learning outcome.

### **Interpretation**

There are two important aspects of numeracy and mathematics that are addressed under the Interpretation category of the elements. The first is checking results against initial estimates such as: decides on reasonableness of calculations through rough approximations and decides on reasonableness of measurement through visualisation and/or prior knowledge. The second aspect relates to the issue of using mathematics critically. Students are expected to relate the meaning of mathematical tasks or activities, personal experience, implications, beliefs, and social consequences. At the initial levels, often this critical aspect needs to be supported and encouraged through teacher prompting.

## **Educational practices**

### **Teaching/Learning strategies**

Strategies adopted should be appropriate to the learning situation and should include:

- small group and whole group activities
- undertaking out-of-class activities or investigations such as: investigations and experiments to collect data for a statistical or algebraic and graphical analysis
- classroom based activities, investigations, problem solving, etc.
- using the Internet to find out about maths topics or to find data etc. to analyse etc.
- oral presentations
- listening to guest speakers
- written essays, reports, timelines, posters, flowcharts
- production of multimedia and/or WWW reports or documents
- undertaking research projects.

Other principles of good teaching practice should also be used which:

- ensure that all students experience success and hence develop their confidence
- use appropriate everyday and mathematical language as part of the teaching of numeracy and mathematics to explain ideas, concepts, and terminology that can be understood by students and applied by them in talking, reading, writing and listening
- encourage students to learn through interaction and cooperation – via discussion, asking questions, giving explanations and presentations, and working cooperatively in pairs or small groups
- use practical and hands-on materials and resources – through out-of-class or classroom based demonstrations, activities, investigations, and puzzle or problem solving
- teach concepts in contexts relevant to the students, utilising their backgrounds, interests and experiences; this should include putting mathematics into its historical and cultural contexts
- teach in a holistic way, integrating other skills areas such as oral communication, and reading and writing into the numeracy and mathematics learning and teaching, and vice versa
- raise awareness about social and community issues and practices that influence and impact on students' lives.

### ***Learning-to-learn***

Teaching, learning and assessment at this level should explicitly model and validate a wide range of learning-to-learn strategies which are integral to the development of effective numeracy skills.

These learning-to-learn strategies may include:

- risk taking (having a go)
- investigating self generated questions/issues
- asking for and accepting help/advice/feedback from a variety of sources
- reviewing and reflecting, for example ‘Is the answer reasonable?’ — checking answer against estimate
- linking new information to existing knowledge
- learning from mistakes
- changing the approach
- voicing experiences and responding to the diverse experiences of others.

### **Assessment**

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit.

#### ***Conditions of assessment***

The conditions of assessment for Advanced Numeracy Skills Senior are that students:

- use relevant contexts and materials where the mathematical content may be hidden
- use a range of mathematical experiences and knowledge to derive meaning, reflect and critically review the mathematics involved
- perform where some clarification and discussion of strategies is available if required and recourse to first/other language is acceptable
- use processes flexibly and interchangeably, selecting from pen and paper, mental and electronically assisted strategies, including calculators (both statistical and graphing calculators) and software programs where appropriate. The application of spreadsheets is highly recommended as a learning tool
- use a combination of oral and written mathematical and general language, symbols, abbreviations and diagrams.

#### ***Assessment methods***

Assessment should be undertaken as an ongoing process which integrates knowledge and skills with their practical application over a period of time. It will require a combination of evidence collected through teacher observations and collection of written records of students’ attempts at tasks and problem-solving activities.

It will often be possible to assess aspects of more than one learning outcome within one assessment task, for example a task which involves the application of formulae and graphs (learning outcome 3) may also allow demonstration of ability with algebraic techniques (learning outcome 4).

It is not expected, however, that all elements for an outcome can be assessed within one single task. It might require a number of tasks collected or observed to completely assess any given outcome.

Where the elements include a list of items of mathematical knowledge or language (for example, in Numeracy for Interpreting Society – Data, learning outcome 1: ‘use the descriptive language of graphs, charts and measures of central tendency and spread such as maximum, minimum, increasing, decreasing, constant, slope, fluctuating, average, above/below average, distorted, top 10%’) it is assumed that most of these will be included as part of the teaching/learning program. It is not envisaged that all the listed items be assessed individually — competence in one or two being sufficient evidence that the element can be met.

A range of assessment options should be used according to the needs of the student group and the learning situation, for example in the workplace, assessment could be from observation of students performing on-the-job tasks, whereas these may have to be simulated in a classroom environment.

A folio of evidence could be collected through a combination of the following:

- records of teacher observations of students’ activities, oral presentations, practical tasks, etc.
- samples of students’ written work
- written reports of investigations or problem-solving activities
- student self-assessment sheets, reflections, or journal entries
- pictures, diagrams, models created by students.

## LEARNING OUTCOME DETAILS

Students must demonstrate competence in six out of the seven learning outcomes to be credited with this unit, although they should cover all learning outcomes in the teaching/learning context.

### LEARNING OUTCOME 1

#### **Numeracy for Interpreting Society – Data**

Can use tables and graphs and measures of central tendency and spread to interpret, analyse and describe information of relevance to self, work or community.

##### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Collect, group and represent statistical data in appropriate tabular and graphical form, including using software programs or a graphing calculator.
- b) Use whole numbers, percentages, decimals or ratios used in a range of statistical information.
- c) Find the three measures of central tendency – mean, median and modal class – for grouped data.
- d) Calculate common measures of spread such as the range, common percentiles, and standard deviation.
- e) Represent bi-variate data as a scatter plot.

##### ***Language***

- f) Use the descriptive language of graphs, and measures of central tendency and spread, for example maximum, minimum, increasing, decreasing, constant, slope, fluctuating, average, above/below average, distorted, top 10%.
- g) Use appropriately words and symbols for graphs, and measures of central tendency and spread such as frequency,  $f$ ,  $x$ .
- h) Scatter plot, correlation, correlation coefficient.

##### ***Interpretation***

- i) Analyse the meaning of data, tables and graphs, any measures of central tendency and spread, and the accompanying text in terms of personal implications, social consequences, and their validity and accuracy.
- j) Identify and discuss whether graphs or statistics have been used to distort or exaggerate.
- k) Interpret data presented as a scatter plot in terms of the strength of relationship (strong or weak) and the direction (positive or negative).
- l) Describe the appearance of a scatter plot if the correlation coefficient is  $-1$ ,  $1$  or  $0$ .

##### **Content range**

- The types of graphs or charts could include pie charts, frequency graphs such as bar graphs, scatter diagrams, box and whisker plots, line graphs, and cumulative frequency graphs. Software programs such as spreadsheets, or word processing graphing packages, or graphing calculators should be used to plot graphs.
- An understanding of the properties of the normal distribution should be included.
- Axes and scales created should be appropriate to the data collected or being analysed.
- Distortions of axes and scales covered should include examples such as changing the scale, having gaps in the scale, using pictograms inappropriately to exaggerate scales.
- Median should be found from a cumulative frequency graph.

##### **Examples of possible assessment tasks/activities for learning outcome 1**

- Do a statistical analysis of the behaviour of house prices in different areas.
- Choose a question or issues of interest to students to investigate. Students gather and record data in appropriate tables and graphs and discuss the meaning of their calculations on measures of central tendency and data spread.
- Select a situation where you believe there may be a relationship between two measures such as height and weight; goals kicked and Brownlow votes for the year and the cost of a hamburger. Either conduct a set of measurements (at least 20 pairs of data) or obtain data from a published source and create a scatter plot. Describe the scatter plot in terms of the strength and direction of the relationship as illustrated in the scatter plot.

Any topic could be used but it is suggested that topics be discussed to ensure that the intentions of the student do satisfy the elements and that the investigation will involve grouped data. The Internet is a valuable resource.

## LEARNING OUTCOME 2

### **Numeracy for Interpreting Society – Numerical Information**

Can calculate and use rational numbers to analyse and evaluate relevant aspects of personal, work or community life.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Choose appropriate mathematical procedures to solve a problem.
- b) Make a rough estimate of numerical calculations.
- c) Accurately calculate with rational numbers, including numbers expressed in index form and scientific notation.
- d) Apply the concepts of probability and perform appropriate calculations.

##### ***Language***

- e) Use appropriately words, phrases and symbols for rational numbers and mathematical procedures.

##### ***Interpretation***

- f) Analyse the use of the numbers and mathematical concepts and reflect on the meaning of the solutions in terms of their validity and accuracy and their personal implications and social consequences.

#### **Content range**

- Texts could include newspaper articles, data on social issues such as gambling, financial information such as banking loans, public information put out by councils, utilities, services.
- Mathematical procedures and numbers could include rates, ratios and proportions but also probabilities of events such as winning Tattslotto, horse racing odds, throwing of dice.

#### **Examples of possible assessment tasks/activities for learning outcome 2**

- Calculate the number of bacteria present after given periods of time.
- Investigate a particular game played in a casino. Explore such things as the probability of winning/losing and the return to the casino.
- Given the top eight teams in the AFL competition, calculate the probability of an interstate team (or a Victorian team) winning the Grand Final in Aussie Rules.

## LEARNING OUTCOME 3

### **Numeracy for Knowledge – Further Study in Maths (formulae and graphs)**

Can develop and use formulae and their graphs to describe and represent relationships between variables in a range of contexts.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

#### ***Mathematical knowledge and techniques***

- a) Use algebraic rules, formulae, graphs and their conventions.
- b) Identify general shapes and major characteristics of linear and simple non-linear graphs (for example, parabolas and hyperbolas) and interpret their real world meanings.
- c) Create own equations, rules or sketch graphs from worded problems or observed situations.
- d) Develop algebraic expressions, rules, formulae, or sketch graphs to generalise straightforward number patterns or observable relationships between variables.
- e) Draw graphs using techniques such as plotting points; sketching from known main features of an algebraic function; and using technology like a graphing calculator or computer package.
- f) Use graphical techniques to solve equations.

#### ***Language***

- g) Use symbolic notation and the representation of algebra such as simple indices, square roots, brackets, alternative conventions for division, and signed numbers to express and interpret formulae, rules and equations.

#### ***Interpretation***

- h) Interpret and evaluate results obtained in the context of the original problem.

#### ***Content range***

- Generalisations or formulae created might describe linear and simple non-linear number patterns (simple polynomial graphs); direct or inverse variation between variables in real or simulated situations; exponential growth or decay.
- Equations to be solved by graphical techniques could include solving simultaneous equations.
- Where experimental data is plotted, lines of best fit to be drawn by eye only or using graphing calculators or software programs.

#### **Examples of possible assessment tasks/activities for learning outcome 3**

A white goods sales company needs an additional sales representative and is considering paying either:

- (i) a retainer of \$15 000 per annum plus 7.5% commission on all sales
- (ii) a straight commission of 12.5% on all sales.

What don't we know – what other information do you need to make realistic judgments? Gather that information or decide as a group what you believe are realistic figures to base your analysis on.

Consider this from the point of view of both the company and the sales person. Which is the best option for each?

Approach the analysis from both a graphical and an algebraic perspective. Which do you think is the most effective?

## LEARNING OUTCOME 4

### **Numeracy for Knowledge – Further Study in Maths (algebraic techniques)**

Can use algebraic techniques to investigate and solve mathematical problems.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Demonstrate knowledge of the conventions and use of algebra.
- b) Create equations in problem-solving situations which involve one or two unknowns.
- c) Recognise the potential for algebraic techniques in problem-solving situations.
- d) Substitute appropriately in formulae or algebraic expressions to find particular values.
- e) Solve a range of equations using a variety of techniques such as: same operation on both sides; backtracking; factorising; or guess, check and improve.

##### ***Language***

- f) Use symbolic notation and the representation of algebra such as indices, square roots, brackets, alternative conventions for division, and signed numbers to express and interpret formulae, rules and equations.

##### ***Interpretation***

- g) Interpret and evaluate results obtained in the context of the original problem.

#### **Content range**

- Indices should include positive, negative and simple fractional values and application of the index laws.
- Conventions of algebra should include transformations, simplification, factorisation, and some manipulation of algebraic fractions.
- Range of equations that can be solved should include a variety of types such as linear, quadratic, and simultaneous equations, which emerge from problem-solving situations.

#### **Examples of possible assessment tasks/activities for learning outcome 4**

The assessment tasks for this learning outcome should be related to practical problems, and assess both the application and the knowledge of the formal mathematical concepts and techniques.

## LEARNING OUTCOME 5

### **Numeracy for Knowledge – Further Study in Maths (Area A)**

Can use formal maths techniques relevant to an area of further study to interpret, investigate and solve mathematical problems.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Identify a range of appropriate mathematical knowledge for the area being studied.
- b) Apply and use appropriate mathematical skills and techniques from the area to solve mathematical problems.
- c) Use specialised calculator functions relevant to the mathematical area such as trigonometric, statistical, power functions.

##### ***Language***

- d) Use appropriately both oral and formal written language and symbols related to the maths area.

##### ***Interpretation***

- e) Determine the appropriate degree of accuracy required for the situation.
- f) Interpret and comment upon the results obtained in the context of the original problem.

#### **Content range**

Mathematical concepts and techniques should provide students with the opportunity to be introduced to ONE selected study area which is relevant to the future study needs of the student. Possible study areas would include:

- trigonometry
- introduction to calculus
- further statistics (for example hypothesis testing, linear regression)
- probability
- scalars and vectors
- business maths, etc.
- networks (for example critical pathways).

Mathematical concepts and techniques developed through this learning outcome should be initially developed out of and related to practical problems. However, it is expected that the related abstract mathematical concepts and techniques will need to be taught formally so that the learning forms the basis for future formal study in the area.

The application of spreadsheets is highly recommended as a learning tool.

#### **Examples of possible assessment tasks/activities for learning outcome 5**

The assessment tasks for this learning outcome should be related to practical problems, and assess both the application and the knowledge of the formal mathematical concepts and techniques.

## LEARNING OUTCOME 6

### **Numeracy for Knowledge – Further Study in Maths (Area B)**

Can use formal maths techniques relevant to an area of further study to interpret, investigate and solve mathematical problems.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Identify a range of appropriate mathematical knowledge for the area being studied.
- b) Apply and use appropriate mathematical skills and techniques from the area to solve mathematical problems.
- c) Use specialised calculator functions relevant to the mathematical area such as trigonometric, statistical, power functions.

##### ***Language***

- d) Use appropriately both oral and formal written language and symbols related to the maths area.

##### ***Interpretation***

- e) Determine the appropriate degree of accuracy required for the situation.
- f) Interpret and comment upon the results obtained in the context of the original problem.

#### **Content range**

Mathematical concepts and techniques should provide students with the opportunity to be introduced to ONE selected specialist maths area which is relevant to the future study needs of the student. Possible study areas would include:

- trigonometry
- introduction to calculus
- further statistics (for example, hypothesis testing, linear regression)
- probability
- scalars and vectors
- business maths, etc.

Mathematical concepts and techniques developed through this learning outcome should be initially developed out of and related to practical problems. However, it is expected that the related abstract mathematical concepts and techniques will need to be taught formally so that the learning forms the basis for future formal study in the area.

The application of spreadsheets is highly recommended as a learning tool.

#### **Examples of possible assessment tasks/activities for learning outcome 6**

The assessment tasks for this learning outcome should be related to practical problems, and assess both the application and the knowledge of the formal mathematical concepts and techniques.

## LEARNING OUTCOME 7

### **Numeracy for Knowledge – Further Study in Maths (problem solving)**

Can use mathematical problem-solving techniques to interpret, investigate and solve mathematical problems.

#### **Elements**

Not all elements need to be met in the one assessment task or activity.

##### ***Mathematical knowledge and techniques***

- a) Interpret and extract relevant information from text or problem-solving activity by using appropriate techniques such as restating/rewriting, drawing diagrams or sketch.
- b) Use a range of appropriate problem-solving techniques selected from strategies such as guess and check; elimination; making a table, diagram or sketch; using patterns, rules, relationships; simplifying; or using a model or graph.

##### ***Language***

- c) Use appropriately both oral and written language of problem solving and related mathematical areas to explain procedures used to solve a context based problem and to communicate the outcomes of the problem.

##### ***Interpretation***

- d) Interpret and comment upon the results obtained in the context of the original problem.

#### **Content range**

- Any expressions or patterns developed should only use mathematical procedures relevant to other learning outcomes of this level of the certificate.
- It is not recommended that students be taught a set number of steps as being the right problem-solving approach, but that a variety of techniques be encouraged to be used flexibly.
- Students should be able to independently develop and use their own problem-solving strategies where some clarification and discussion of strategies is available from the teacher/tutor.

#### **Examples of possible assessment tasks/activities for learning outcome 7**

Student investigates a self generated problem/question. The tasks should assess both the application and the knowledge of formal mathematical problem-solving techniques.

Combinations and permutations is a possible area that could be investigated and used for this learning outcome.

## INTEGRATED ASSESSMENT TASKS/ACTIVITIES FOR ADVANCED SENIOR LEVEL

Assessment tasks/activities similar in complexity to this example are recommended.

### **Sample task: How far is it to the horizon?**

An appropriate assessment task at this level is where the student answers a question they or the teacher have posed, for example 'How far is it to the horizon?'

This would involve identifying and investigating the mathematical knowledge required and applying appropriate mathematical skills and techniques. A written report on the investigation would be required.

### ***Learning Outcomes and elements covered***

This sort of task could be used for Numeracy for Knowledge – Further Study in Maths, learning outcome 3 or 4.



## Section 4 – Resources

The following are resources that could be used to support the delivery of the VCAL Numeracy Skills units.

This list is not exhaustive.

### FOUNDATION

#### Real life resources

Wherever possible students should work from real life, hands-on materials and resources, especially materials from their own life experience. These may include:

- newspapers
- magazines
- information leaflets and materials, for example about mobile phones, allowances, concession cards
- shopping and advertising materials
- goods and materials including food stuffs
- packaging and containers such as packaging, bottles, tins
- domestic measuring equipment such as scales, cups, builders' and dressmakers' tapes
- clocks, watches, calendars
- Internet sites and materials
- videos of TV shows, including sports shows and performances or games
- local maps, plans, street directories.

#### Information and communications technology

Students should have access to:

- calculators
- computers with Internet access
- Internet access can be used for a range of purposes, including:
  - searching for information and texts
  - finding answers to specific questions
  - using educational software and teaching sites
- appropriate software should be available, such as:
  - Microsoft Excel
  - Microsoft Word (including its drawing and graphing package)
  - Microsoft PowerPoint
  - Educational software
- other ICT that may be relevant includes:
  - mobile phones
  - digital cameras.

## Hands-on materials

There is a wide range of ‘hands-on’ mathematical teaching materials that are required for teaching at this level. Teachers should have access to materials such as:

- dice, including ten-sided dice
- place value materials such as MAB blocks, straws
- fraction materials such as fraction circles
- rulers, paper, card, scissors, glue.

## Print based resources

The references listed below include teacher and student resources. It is not a definitive list and should be updated on a regular basis.

de Klerk, Judith, 1990, *Illustrated Maths Dictionary for Australian Schools*, Longman Cheshire, Melbourne

Downie, D, Slesnick, T, Stenmark J K, 1981, *Math for Girls and Other Problem Solvers*, Lawrence Hall of Science, University of California, Berkeley, California

Erickson, Tim, 1989, *Get it Together: Math Problems for Groups Grades 4–12*, Lawrence Hall of Science, University of California, Berkely, California

Ford, Kevin (ed.), 1985, *Mathematics for Living (series): Car Mathematics, Mathematics Around the Home, Outdoor Mathematics, Rural Mathematics, Travel Mathematics*, Holmes McDougall and Educational Supplies, Brookvale, NSW

Goddard, R, Marr, B, Martin, J, 1991, *Strength in Numbers: A resource book for teaching adult numeracy*, Holmesglen College of TAFE, Holmesglen, Victoria

Goddard, Ruth and Regan, Margaret, 1995, *The Value of Time: Numeracy for workers in manufacturing*, Council of Adult Education, Melbourne

Howe, Elizabeth, 2007, Cambridge University Press, Melbourne

Howe, Elizabeth, 2007, *Hands-on Numeracy Book 2*, Cambridge University Press, Melbourne

Kimball, Dolores Byrne, 1990, *Math for the Real World: Book One*, New Reader Press, Syracuse, New York

Kimball, Dolores Byrne, 1990, *Math for the Real World: Book Two*, New Readers Press, Syracuse, New York

Lawrence, G and Moule, J, 1989–90, *Mathematics in practice series (Accommodation, Design, Health, Social Issues, The Consumer, Travel, Transport)*, Harcourt Brace Jovanovich, Marrickville, NSW

Lowe, Ian, 2001, *Mathematics at Work*, (CD-ROM), AAMT, Adelaide

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Marr, Beth and Helme, Sue with Tout, Dave, 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, Beth, Anderson, Chris and Tout, Dave, 1994, *Numeracy on the Line: Language Based Numeracy Activities for Adults*, National Automotive Industry Training Board, Melbourne

Ritchhart, R, 1994, *Making Numbers Make Sense: A Sourcebook for Developing Numeracy*, Addison-Wesley, USA

Schmitt, Mary Jane and Steinback, Myriam (eds), 2004–2005, *Math: EMPower series*, Key Curriculum Press, California, USA

Stenmark, J K, Thompson, V, Cossey, R, 1986, *Family Math*, Lawrence Hall of Science, University of California, Berkeley, California

Tout, Dave, 2007, *Having Fun with Maths: Activities and Games for Developing Maths Language and Skills*, Multifangled P/L, Yarraville

Vize, Anne, 2005, *Maths Skills for Living*, Phoenix Education, Putney, NSW

Vize, Anne, 2005, *Maths Skills for Working*, Phoenix Education, Putney, NSW

Weber, Lauris, 2003, *The Language of Maths (Secondary Level)*, AEE Publishing, Queensland

## Multimedia and CD-ROMs

Tout, Dave and Marr, Beth, 1997, *Measuring up: an interactive multimedia computer resource for numeracy students*, Protea Textware, Melbourne

Lowe, I, *Mathematics at Work*, (CD-ROM) Adelaide: AAMT

## Online resources

TAFE VC online resources <[www.tafevc.com.au](http://www.tafevc.com.au)> under ‘Courses’ click on ‘Courses Catalogue’ and search for:

- Brush up on your skills
- Citizen numeracy level 1
- The sporting life
- Where’s the party at?
- Numeracy for practical purposes levels 1 and 3
- Money.

*Math in Daily Life*: [www.learner.org/interactives/dailymath/](http://www.learner.org/interactives/dailymath/)

*Maths300*: [www.curriculum.edu.au/math300/](http://www.curriculum.edu.au/math300/)

*Online Data in mathematics, science and technology education*: [www.mste.uiuc.edu/data/data.html](http://www.mste.uiuc.edu/data/data.html)

*Knot a Braid of Links*: <http://www.cms.math.ca/Kabol/>

*Math Archives*: <http://archives.math.utk.edu/topics/>

*The Math Forum*: <http://mathforum.org/>

## Flexible learning Toolboxes

To view all general toolboxes: <http://flexiblelearning.net.au/toolbox/>

Your Online Learning Assistant (YOLA): [www.flexiblelearning.net.au/products/yola.htm](http://flexiblelearning.net.au/products/yola.htm)

Basic Skills in the Cybercentre: <http://flexiblelearning.net.au/toolbox/demosites/series4/424/index.htm>

Where’s the party at?: [http://toolbox.vetonline.vic.edu.au/519/entry\\_page.htm](http://toolbox.vetonline.vic.edu.au/519/entry_page.htm)

## Reference materials

Boaler, Jo, 1997, *Experiencing School Mathematics*, Open University Press Buckingham, England

Hightet, Kristine, 1995, *Maths matters: teaching numeracy to adults*, Foundation Studies Training Division, Western Sydney Institute of TAFE, Sydney

Marr, Beth and Helme, Sue with Tout, Dave, 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Tout, Dave and Motteram, Gary, 2006, *Foundation Numeracy in Context*, ACER Press, Camberwell, Victoria

Tout, David and Johnston, Betty, 1995, *Adult Numeracy Teaching: making meaning in mathematics*, National Staff Development Committee for Vocational Education and Training, Melbourne

## Associations

The Mathematical Association of Victoria

[www.mav.vic.edu.au](http://www.mav.vic.edu.au)

Victorian Applied Learning Association

[www.vala.asn.au/](http://www.vala.asn.au/)

# INTERMEDIATE

## Real Life Resources

Wherever possible students should work from real life, hands-on materials and resources, especially materials from their own life experience. These may include:

- newspapers
- magazines
- information leaflets and materials, for example about mobile phones, allowances, concession cards
- shopping and advertising materials
- goods and materials including food stuffs
- packaging and containers such as packaging, bottles, tins
- domestic measuring equipment such as scales, cups, builders' and dressmakers' tapes
- clocks, watches, calendars
- Internet sites and materials
- videos of TV shows, including sports shows and performances or games
- local maps, plans, street directories.

## Information and communications technology

Students should have access to:

- calculators
- computers with Internet access
- Internet access can be used for a range of purposes, including:
  - searching for information and texts
  - finding answers to specific questions
  - using educational software and teaching sites
- appropriate software should be available, such as:
  - Microsoft Excel
  - Microsoft Word (including its drawing and graphing package)
  - Microsoft PowerPoint
  - Educational software
- other ICT that may be relevant includes:
  - mobile phones
  - digital cameras.

## Hands-on materials

There is a wide range of 'hands-on' mathematical teaching materials that are required for teaching at this level. Teachers should have access to materials such as:

- dice, including ten-sided dice
- place value materials such as MAB blocks, straws
- fraction materials such as fraction circles
- rulers, paper, card, scissors, glue.

## Print based resources

The references listed below include teacher and student resources. It is not a definitive list and should be amended and updated on a regular basis.

Anderson, Chris, Tout, Dave and Westney, Candida, 1993, *I can do that!: a reading, writing and maths refresher course for the Plastics and Chemicals Industries: maths modules 11–20*, Holmesglen College of TAFE, Melbourne

Blake Education (various dates), *Maths in ... Instant Lessons series (Television, Technology, Science, Disasters, Crime, Travel, Sport, Environment, Workplace, Food, Community, Building Design)*, Blake Education, Clayton

Castles, I, 1992, *Surviving Statistics: A User's Guide to the Basics*, Australian Bureau of Statistics, Canberra

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7– 10*, Book 1, Blake Education, Clayton

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7–10*, Book 2, Blake Education, Clayton

de Clerk, Judith, 1990, *Illustrated Maths Dictionary for Australian Schools*, Longman Cheshire, Melbourne

Downie, D, Slesnick, T, Stenmark J K, 1981, *Math for Girls and Other Problem Solvers*, Lawrence Hall of Science, University of California, Berkeley, California

Erickson, Tim, 1989, *Get it Together: Math Problems for Groups Grades 4–12*, Lawrence Hall of Science, University of California, Berkely, California

Ford, Kevin (ed.), 1985, *Mathematics for Living (series): Car Mathematics, Mathematics Around the Home, Outdoor Mathematics, Rural Mathematics, Travel Mathematics*, Holmes McDougall and Educational Supplies, Brookvale, NSW

Forster, Ian, et al, 1997, *Hands-on Maths in Practice*, Pearson Education Australia, Melbourne

Goddard, R, Marr, B, Martin, J, 1991, *Strength in Numbers: A resource book for teaching adult numeracy*, Holmesglen College of TAFE, Holmesglen, Victoria

Goddard, Ruth and Regan, Margaret, 1995, *The Value of Time: Numeracy for workers in manufacturing*, Council of Adult Education, Melbourne

Gunningham, Sue, 2006, *Cambridge Numeracy Workbook for VCAL*, CUP, Melbourne

Hagston, J, Kindler, L, and Tout, D, 2006, *Victorian Certificates of Applied Learning (VCAL) Road Safety units*, VicRoads, Kew

Hagston, Jan and Tout, Dave, 1999, *Football, meat pies, kangaroos and Toyotas: book 1 social change and the Australian people. A study book for literacy and numeracy*, Skill Ed, Melbourne

Howe, Elizabeth, 2007, *Hands-on Numeracy Book 1*, Cambridge University Press, Melbourne

Howe, Elizabeth, 2007, *Hands-on Numeracy Book 2*, Cambridge University Press, Melbourne

Kimball, Dolores Byrne, 1990, *Math for the Real World: Book Two*, New Readers Press, Syracuse, New York

Kindler, Jan and Tout, Dave, 1998, *Australian studies: places in Australia*, TAFE frontiers, Melbourne

Kindler, Jan and Tout, Dave, 1998, *Health and lifestyle: healthy living*, TAFE frontiers, Melbourne

Lawrence, G and Moule, J, 1989–90, *Mathematics in practice series (Accommodation, Design, Health, Social Issues, The Consumer, Travel, Transport)*, Harcourt Brace Jovanovich, Marrickville, NSW

Lawrence Hall of Science, 1982, *SPACES: Solving Problems of Access to Careers in Engineering and Science*, Dale Seymour Publications, Palo Alto, California

Lowe, Ian, 2005, *Active Learning Series (Measurement, Chance and data; Number and Algebra and Space)*, Mathematical Association of Victoria, Melbourne

Marr, B, Helme, S and Tout, D, 1991, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne, 2003

Marr, Beth and Helme, Sue with Tout, Dave, 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, Beth; Anderson, Chris; Tout, Dave, 1994, *Numeracy on the Line: Language Based Numeracy Activities for Adults*, National Automotive Industry Training Board, Victoria

Ritchhart, R, 1994, *Making Numbers Make Sense: A Sourcebook for Developing Numeracy*, Addison-Wesley, USA

Ross, Linda, 1997, *The numeracy workbook*, NSW AMES, Sydney

Schmitt, Mary Jane and Steinback, Myriam (eds), 2004–2005, *Math: EMPOWER series*, Key Curriculum Press, California, USA

Soccio, Debbie, Ridley, Corinna, Tout, Dave and Kindler, Jan, 1998, *Law: you and the law*, TAFE frontiers, Melbourne

Soccio, Debbie, Ridley, Corinna, Tout, Dave and Kindler, Jan, 1998, *Work: getting the message*, TAFE frontiers, Melbourne

Stenmark, J K, Thompson, V, Cossey, R, 1986, *Family Math*, Lawrence Hall of Science, University of California, Berkeley, California

Thomson, Sue and Forster, Ian, 2007, *Access to Prevocational Maths 2*, Pearson Education Australia, Melbourne

Thomson, Sue and Forster, Ian, 2006, *Access to Prevocational Maths*, Pearson Education Australia, Melbourne

Tout, Dave, 2006, *Car Costs II: A numeracy and maths workbook*, CAE, Melbourne

Tout, Dave, 2007, *Having Fun with Maths: Activities and Games for Developing Maths Language and Skills*, Multifangled P/L, Yarraville

Vize, Anne, 2005, *Maths Skills for Living*, Phoenix Education, Putney, NSW

Vize, Anne, 2005, *Maths Skills for Working*, Phoenix Education, Putney, NSW

Warner, Jack, 1993, *Graph Attack! Understanding Charts and Graphs*, Regents / Prentice Hall, Englewood Cliffs, New Jersey

Weber, Lauris, *The Language of Maths (Secondary Level)*, 2003, AEE Publishing, Queensland

Wignall, Louise, Kindler, Jan and Tout, Dave, 1998, *Science and the environment: how does your garden grow?* TAFE frontiers, Melbourne

Wignall, Louise, Tout, Dave and Kindler, Jan, 1998, *Media: a look at the news*. TAFE frontiers, Melbourne

### **Multimedia and CD-ROMs**

Hagston, Jan and Tout, Dave, 2001, *Brush up on your skills*, TAFE Frontiers, Victoria

Kaufmann, H and Westwood, V, 2001, *The CGEA CD-ROM: an interactive multimedia computer resource for adult literacy and numeracy*, Protea Textware, Hurstbridge, Victoria

Lowe, I, 2001, *Mathematics at Work*, (CD-ROM) AAMT, Adelaide

Lowe, Ian, 2003, *People Count: Numeracy for Adults* (CD-ROM), Ian Lowe, Melbourne

Sharp Tack Productions, 2003, *Maths & Cricket* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions

Sharp Tack Productions, 2002, *Maths & Soccer* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions, Melbourne

Tout, Dave and Marr, Beth, 1997, *Measuring up: an interactive multimedia computer resource for numeracy students*, Protea Textware, Melbourne

### **Online resources**

TAFE VC online resources <[www.tafevc.com.au](http://www.tafevc.com.au)> under ‘Courses’ click on ‘Courses Catalogue’ and search for:

- Brush up on your skills
- The sporting life
- Where’s the party at?
- Numeracy for practical purposes levels 1 and 3
- Money.

*Math in Daily Life*: [www.learner.org/interactives/dailymath/](http://www.learner.org/interactives/dailymath/)

*Maths300*: [www.curriculum.edu.au/math300/](http://www.curriculum.edu.au/math300/)

*Online Data in mathematics, science and technology education*: [www.mste.uiuc.edu/data/data.html](http://www.mste.uiuc.edu/data/data.html)

*Knot a Braid of Links*: <http://www.cms.math.ca/Kabol/>

*Math Archives*: <http://archives.math.utk.edu/topics/>

*The Math Forum*: <http://mathforum.org/>

### **Flexible learning Toolboxes**

To view all general toolboxes: <http://flexiblelearning.net.au/toolbox/>

Your Online Learning Assistant (YOLA): [www.flexiblelearning.net.au/products/yola.htm](http://flexiblelearning.net.au/products/yola.htm)

Basic Skills in the Cybercentre: <http://flexiblelearning.net.au/toolbox/demosites/series4/424/index.htm>

Where's the party at?: [http://toolbox.vetonline.vic.edu.au/519/entry\\_page.htm](http://toolbox.vetonline.vic.edu.au/519/entry_page.htm)

### **Reference materials**

Boaler, Jo, 1997, *Experiencing School Mathematics*, Open University Press Buckingham, England

Hightet, Kristine, 1995, *Maths matters: teaching numeracy to adults*, Foundation Studies Training Division, Western Sydney Institute of TAFE, Sydney

Marr, Beth and Helme, Sue with Tout, Dave, 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Tout, Dave and Motteram, Gary, 2006, *Foundation Numeracy in Context*, ACER Press, Camberwell, Victoria

Tout, David and Johnston, Betty, 1995, *Adult Numeracy Teaching: making meaning in mathematics*, National Staff Development Committee for Vocational Education and Training, Melbourne

### **Associations**

The Mathematical Association of Victoria

[www.mav.vic.edu.au](http://www.mav.vic.edu.au)

Victorian Applied Learning Association

[www.vala.asn.au/](http://www.vala.asn.au/)

# SENIOR

## Real Life Resources

Wherever possible students should work from real life, hands-on materials and resources, especially materials from their own life experience. These may include:

- newspapers
- magazines
- information leaflets and materials, for example about mobile phones, allowances, concession cards
- shopping and advertising materials
- goods and materials including food stuffs
- packaging and containers such as packaging, bottles, tins
- domestic measuring equipment such as scales, cups, builders' and dressmakers' tapes
- clocks, watches, calendars
- Internet sites and materials
- videos of TV shows, including sports shows and performances or games
- local maps, plans, street directories.

## Information and communications technology

Students should have access to:

- calculators
- computers with Internet access
- Internet access can be used for a range of purposes, including:
  - searching for information and texts
  - finding answers to specific questions
  - using educational software and teaching sites
- appropriate software should be available, such as:
  - Microsoft Excel
  - Microsoft Word (including its drawing and graphing package)
  - Microsoft PowerPoint
  - Educational software
- other ICT that may be relevant includes:
  - mobile phones
  - digital cameras.

## Hands-on materials

There is a wide range of 'hands-on' mathematical teaching materials that are required for teaching at this level. Teachers should have access to materials such as:

- dice, including ten-sided dice
- fraction materials such as fraction circles
- rulers, paper, card, scissors, glue.

## Print based resources

The references listed below include teacher and student resources. It is not a definitive list and should be amended and updated on a regular basis.

Anderson, C, Kindler, J, Tout, D and Wignall, L, 1999, *Health and lifestyle: recreation*, TAFE frontiers, Melbourne

Anderson, Chris, Tout, Dave, and Westney, Candida, 1993, *I can do that!: a reading, writing and maths refresher course for the Plastics and Chemicals Industries: maths modules 11–20*, Holmesglen College of TAFE, Melbourne

Blake Education (various dates), *Maths in ... Instant Lessons series (Television, Technology, Science, Disasters, Crime, Travel, Sport, Environment, Workplace, Food, Community, Building Design)*, Blake Education, Clayton

Castles, I, 1992, *Surviving Statistics: A User's Guide to the Basics*, Australian Bureau of Statistics, Canberra

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Commerce*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Consuming Planet Earth*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Health & Wellbeing*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning Maths*, Consumer Affairs Victoria, Melbourne

Costello, Pat, Jones, Peter and Phillips, Brian, 1984, *Mathematics and Community Services*, Institution of Engineers, Parkville, Victoria

Costello, Pat, Jones, Peter and Phillips, Brian, 1986, *Mathematics and Manufacturing*, Institution of Engineers, Parkville, Victoria

Costello, Pat, Jones, Peter and Phillips, Brian, 1985, *Mathematics and Recreation*, Institution of Engineers, Parkville, Victoria

Costello, Pat, Jones, Peter and Phillips, Brian, 1984, *Mathematics and Supply*, Institution of Engineers, Parkville, Victoria

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7–10, Book 1*, Blake Education, Clayton

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7–10, Book 2*, Blake Education, Clayton

de Clerk, Judith, 1990, *Illustrated Maths Dictionary for Australian Schools*, Longman Cheshire, Melbourne

Downie, D, Slesnick, T, Stenmark J K, 1981, *Math for Girls and Other Problem Solvers*, Lawrence Hall of Science, University of California, Berkeley, California

Erickson, Tim, 1989, *Get it Together: Math Problems for Groups Grades 4–12*, Lawrence Hall of Science, University of California, Berkeley, California

Flittman, E and Sharrock, H, 2000, *Foundation Mathematics for the Real World*, Longman, Melbourne

Ford, Kevin (ed.), 1985, *Mathematics for Living (series): Car Mathematics, Mathematics Around the Home, Outdoor Mathematics, Rural Mathematics, Travel Mathematics*, Holmes McDougall and Educational Supplies, Brookvale, NSW

Forster, Ian, et al, 1997, *Hands-on Maths in Practice*, Pearson Education Australia, Melbourne

Goddard, Ruth and Regan, Margaret, 1995, *The Value of Time: Numeracy for workers in manufacturing*, Council of Adult Education, Melbourne

Gunningham, Sue, 2006, *Cambridge Numeracy Workbook for VCAL*, CUP, Melbourne

Hagston, J, Kindler, L, and Tout, D, 2006, *Victorian Certificates of Applied Learning (VCAL) Road Safety units*, VicRoads, Kew

Helme, S and Marr, B (eds), 1987, *Mathematics: A New Beginning: A Resource Book for Teachers of Adults Returning to Study*, State Training Board, Victoria, Melbourne

Helme, Sue and Marr, Beth, 1995, *Some Beginnings in Algebra*, Northern Metropolitan College of TAFE, Melbourne

Johnston, J, Kissane, B, Lowe, I, and Willis, S, 1993, *Access to Algebra: Books 1, 2 and 3*, Curriculum Corporation, Carlton, Victoria

Kindler, J and Soccio, D, 1999, *Law: issues in law*, TAFE frontiers, Melbourne

Kindler, J and Tout, D, 1999, *Australian studies: Australia, a nation*, TAFE frontiers, Melbourne

Kindler, J and Tout, D, 1999, *Science and the environment: Australia, a unique country*, TAFE frontiers, Melbourne

Kindler, J, Soccio, D and Tout, D, 1999, *Work: a world of work*, TAFE frontiers, Melbourne

Kindler, J, Tout, D and Wignall, L, 1999, *Media: advertising*, TAFE frontiers, Melbourne

Lawrence, G and Moule, J, 1989–90, *Mathematics in practice series (Accommodation, Design, Health, Social Issues, The Consumer, Travel, Transport)*, Harcourt Brace Jovanovich, Marrickville, NSW

Lowe, Ian, 2005, *Active Learning Series (Measurement, Chance and data; Number and Algebra and Space)* Mathematical Association of Victoria, Melbourne

Marr, B and Helme, S, 1987, *Mathematics: a new beginning*, State Training Board, Victoria

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Marr, Beth, Anderson, Chris and Tout, Dave, 1994, *Numeracy on the Line: Language Based Numeracy Activities for Adults*, National Automotive Industry Training Board, Victoria

O'Connor, M and Gaton, B, 2000, *Foundation Mathematics*, Oxford, Melbourne

Schmitt, Mary Jane and Steinback, Myriam (eds), 2004–2005, *Math: EMPOWER series*, Key Curriculum Press, California, USA

Lawrence Hall of Science, 1982, *SPACES: Solving Problems of Access to Careers in Engineering and Science*, Dale Seymour Publications, Palo Alto, California

Thomson, Sue and Forster, Ian, 2007, *Access to Prevocational Maths 2*, Pearson Education Australia, Melbourne

Thomson, Sue and Forster, Ian, 2006, *Access to Prevocational Maths*, Pearson Education Australia, Melbourne

Tout, Dave, 2006, *Car Costs II: A numeracy and maths workbook*, CAE, Melbourne

Tout, Dave, 2007, *Having Fun with Maths: Activities and Games for Developing Maths Language and Skills*, Multifangled P/L, Yarraville

Vize, Anne, 2005, *Maths Skills for Living*, Phoenix Education, Putney, NSW

Vize, Anne, 2005, *Maths Skills for Working*, Phoenix Education, Putney, NSW

Warner, Jack, 1993, *Graph Attack! Understanding Charts and Graphs*, Regents / Prentice Hall, Englewood Cliffs, New Jersey

Weber, Lauris, 2003, *The Language of Maths (Secondary Level)*, AEE Publishing, Queensland

### **Multimedia and CD-ROMs**

Kaufmann, H and Westwood, V, 2001, *The CGEA CD-ROM: an interactive multimedia computer resource for adult literacy and numeracy*, Protea Textware, Hurstbridge, Victoria

Lowe, I, 2001, *Mathematics at Work*, (CD-ROM) AAMT, Adelaide

Lowe, Ian, 2003, *People Count: Numeracy for Adults* (CD-ROM), Ian Lowe, Melbourne

Sharp Tack Productions, 2003, *Maths & Cricket* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions

Sharp Tack Productions, 2002, *Maths & Soccer* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions, Melbourne

Tout, Dave and Marr, Beth, 1997, *Measuring up: an interactive multimedia computer resource for numeracy students*, Protea Textware, Melbourne

Video Education Australasia, 2001, *ALGEBRA: A Piece of Cake!*, Video Education Australasia, Bendigo

Video Education Australasia, 2007, *Algebraic Notation – Maths as a Foreign Language*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Into the Negative Zone! Working with Integers*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Let's Get Straight: Linear Equations and Their Graphs*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Life by the Numbers series*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Making Sense of Percentages*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *That's a Bit Steep*, Video Education Australasia, Bendigo

## Online resources

TAFE VC online resources <[www.tafevc.com.au](http://www.tafevc.com.au)> under ‘Courses’ click on ‘Courses Catalogue’ and search for:

- Brush up on your skills
- Citizen numeracy level 1
- The sporting life
- Where’s the party at?
- Numeracy for practical purposes levels 1 and 3
- Money.

*Math in Daily Life*: [www.learner.org/interactives/dailymath/](http://www.learner.org/interactives/dailymath/)

*Maths300*: [www.curriculum.edu.au/math300/](http://www.curriculum.edu.au/math300/)

*Online Data in mathematics, science and technology education*: [www.mste.uiuc.edu/data/data.html](http://www.mste.uiuc.edu/data/data.html)

*Knot a Braid of Links*: <http://www.cms.math.ca/Kabol/>

*Math Archives*: <http://archives.math.utk.edu/topics/>

*The Math Forum*: <http://mathforum.org/>

## Flexible learning Toolboxes

To view all general toolboxes: <http://flexiblelearning.net.au/toolbox/>

Your Online Learning Assistant (YOLA): [www.flexiblelearning.net.au/products/yola.htm](http://flexiblelearning.net.au/products/yola.htm)

Basic Skills in the Cybercentre: <http://flexiblelearning.net.au/toolbox/demosites/series4/424/index.htm>

Where’s the party at?: [http://toolbox.vetonline.vic.edu.au/519/entry\\_page.htm](http://toolbox.vetonline.vic.edu.au/519/entry_page.htm)

## Reference materials

Boaler, Jo, 1997, *Experiencing School Mathematics*, Open University Press Buckingham, England

Highet, Kristine, 1995, *Maths matters: teaching numeracy to adults*, Foundation Studies Training Division, Western Sydney Institute of TAFE, Sydney

Marr, Beth and Helme, Sue with Tout, Dave, 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Tout, Dave and Motteram, Gary, 2006, *Foundation Numeracy in Context*, ACER Press, Camberwell, Victoria

Tout, David and Johnston, Betty 1995, *Adult Numeracy Teaching: making meaning in mathematics*, National Staff Development Committee for Vocational Education and Training, Melbourne

## Associations

The Mathematical Association of Victoria

[www.mav.vic.edu.au](http://www.mav.vic.edu.au)

Victorian Applied Learning Association

[www.vala.asn.au/](http://www.vala.asn.au/)

## ADVANCED SENIOR

### Real life resources

Wherever possible students should work from real life resources, especially materials from their own life experience. There is a wide range of equipment and materials that are required for teaching at this level. Teachers and students may need access to resources such as:

- scientific calculators including graphing calculators
- computers and appropriate mathematical, graphical, statistical or spreadsheet software
- plans, maps, measuring equipment, etc.

### Information and communications technology

Students should have access to:

- calculators
- computers with Internet access
- Internet access can be used for a range of purposes, including:
  - searching for information and texts
  - finding answers to specific questions
  - using educational software and teaching sites
- appropriate software should be available, such as:
  - Microsoft Excel
  - Microsoft Word (including its drawing and graphing package)
  - Microsoft PowerPoint
  - Educational software
- other ICT that may be relevant includes:
  - mobile phones
  - digital cameras.

### Print based resources

The references listed below include teacher and student resources. It is not a definitive list and should be amended and updated on a regular basis.

Anderson, Chris, Tout, Dave, and Westney, Candida, 1993, *I can do that!: a reading, writing and maths refresher course for the Plastics and Chemicals Industries: maths modules 11–20*, Holmesglen College of TAFE, Melbourne

Blake Education (various dates), *Maths in ... Instant Lessons series (Television, Technology, Science, Disasters, Crime, Travel, Sport, Environment, Workplace, Food, Community, Building Design)*, Blake Education, Clayton

Castles, I, 1992, *Surviving Statistics: A User's Guide to the Basics*, Australian Bureau of Statistics, Canberra

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Commerce*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Consuming Planet Earth*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning about Health & Wellbeing*, Consumer Affairs Victoria, Melbourne

Consumer Affairs Victoria, 2007, *Consumer Stuff: A resource for teaching and learning Maths*, Consumer Affairs Victoria, Melbourne

Costello, Pat; Jones, Peter and Phillips, Brian, 1984, *Mathematics and Community Services*, Institution of Engineers, Parkville, Victoria

Costello, Pat; Jones, Peter and Phillips, Brian, 1986, *Mathematics and Manufacturing*, Institution of Engineers, Parkville, Victoria

Costello, Pat; Jones, Peter and Phillips, Brian, 1985, *Mathematics and Recreation*, Institution of Engineers, Parkville, Victoria

Costello, Pat; Jones, Peter and Phillips, Brian, 1984, *Mathematics and Supply*, Institution of Engineers, Parkville, Victoria

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7–10*, Book 1, Blake Education, Clayton

Day, Dennis, 2007, *Solving Real-Life Stuff with Maths for Years 7–10*, Book 2, Blake Education, Clayton

Downie, D, Slesnick, T, Stenmark J K, 1981, *Math for Girls and Other Problem Solvers*, Lawrence Hall of Science, University of California, Berkeley, California

Erickson, Tim, 1989, *Get it Together: Math Problems for Groups Grades 4-12*, Lawrence Hall of Science, University of California, Berkeley, California

Flittman, E and Sharrock, H, 2000, *Foundation Mathematics for the Real World*, Longman, Melbourne

Helme, S and Marr, B (eds), 1987, *Mathematics: A New Beginning: A Resource Book for Teachers of Adults Returning to Study*, State Training Board, Victoria, Melbourne

Helme, Sue and Marr, Beth, 1995, *Some Beginnings in Algebra*, Northern Metropolitan College of TAFE, Melbourne

Johnston, J, Kissane, B, Lowe, I, and Willis, S, 1993, *Access to Algebra: Books 1, 2 and 3*, Curriculum Corporation, Carlton, Victoria

Johnston, J, Kissane, B, Lowe, I and Willis, S, 1993, *Access to Algebra: Books 1, 2 and 3*, Curriculum Corporation, Carlton, Victoria

Kindler, J and Tout, D, 1999, *Health and lifestyle: getting fit*, TAFE frontiers, Melbourne

Kindler, J and Tout, D, 1999, *Science and the environment: chemicals around the home*, TAFE Frontiers, Melbourne

Kindler, J, Soccio, D and Tout, D, 1999, *Work: meetings and monitoring at work*, TAFE frontiers, Melbourne

Lowe, Ian, 2005, *Active Learning Series (Measurement, Chance and data; Number and Algebra and Space)*, Mathematical Association of Victoria, Melbourne

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

O'Connor, M and Gaton, B, 2000, *Foundation Mathematics*, Oxford, Melbourne

Lawrence Hall of Science, 1982, *SPACES: Solving Problems of Access to Careers in Engineering and Science*, Dale Seymour Publications, Palo Alto, California

Thomson, Sue and Forster, Ian, 2007, *Access to Prevocational Maths 2*, Pearson Education Australia, Melbourne

Thomson, Sue and Forster, Ian, 2006, *Access to Prevocational Maths*, Pearson Education Australia, Melbourne

Tout, D, 2001, *Numeracy and Mathematics: Health and fitness*, TAFE frontiers, Melbourne

Tout, D, 2001, *Numeracy and Mathematics: Science and work*, TAFE frontiers, Melbourne

### **Multimedia and CD-ROMs**

Kaufmann, H and Westwood, V, 2001, *The CGEA CD-ROM: an interactive multimedia computer resource for adult literacy and numeracy*, Protea Textware, Hurstbridge, Victoria

Lowe, I, 2001, *Mathematics at Work*, (CD-ROM) AAMT, Adelaide

Lowe, Ian, 2003, *People Count: Numeracy for Adults*, (CD-ROM), Ian Lowe, Melbourne

Sharp Tack Productions, 2003, *Maths & Cricket* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions

Sharp Tack Productions, 2002, *Maths & Soccer* (Video with resource CD) – DVD or VHS versions), Sharp Tack Productions, Melbourne

Tout, Dave and Marr, Beth, 1997, *Measuring up: an interactive multimedia computer resource for numeracy students*, Protea Textware, Melbourne

Video Education Australasia, 2001, *ALGEBRA: A Piece of Cake!*, Video Education Australasia, Bendigo

Video Education Australasia, 2007, *Algebraic Notation – Maths as a Foreign Language*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Into the Negative Zone! Working with Integers*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Let's Get Straight: Linear Equations and Their Graphs*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Life by the Numbers series*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *Making Sense of Percentages*, Video Education Australasia, Bendigo

Video Education Australasia, 2001, *That's a Bit Steep*, Video Education Australasia, Bendigo

### **Online resources**

*Math in Daily Life*: [www.learner.org/interactives/dailymath/](http://www.learner.org/interactives/dailymath/)

*Maths300*: [www.curriculum.edu.au/math300/](http://www.curriculum.edu.au/math300/)

*Online Data in mathematics, science and technology education*: [www.mste.uiuc.edu/data/data.html](http://www.mste.uiuc.edu/data/data.html)

*Knot a Braid of Links*: <http://www.cms.math.ca/Kabol/>

*Math Archives*: <http://archives.math.utk.edu/topics/>

*The Math Forum*: <http://mathforum.org/>

*The EE-Oz pre-apprenticeship self assessment site*: [www.nateeqsba.com/](http://www.nateeqsba.com/)

*Vocational numeracy site, with pdfs and online navigation*: [www.dest.gov.au/archive/ty/litnet/numeracy/default.htm](http://www.dest.gov.au/archive/ty/litnet/numeracy/default.htm)

### **Flexible learning Toolboxes**

To view all general toolboxes: <http://flexiblelearning.net.au/toolbox/>

Your Online Learning Assistant (YOLA): [www.flexiblelearning.net.au/products/yola.htm](http://www.flexiblelearning.net.au/products/yola.htm)

### **Reference materials**

Boaler, Jo, 1997, *Experiencing School Mathematics*, Open University Press Buckingham, England

Hightet, Kristine, 1995, *Maths matters: teaching numeracy to adults*, Foundation Studies Training Division, Western Sydney Institute of TAFE, Sydney

Marr, Beth and Helme, Sue with Tout, Dave 1991, *Breaking the Maths Barrier: A Kit for Building Staff Development Skills in Adult Numeracy*, Department of Employment, Education and Training, Canberra

Marr, B, Helme, S and Tout, D, 2003, *Rethinking Assessment: Strategies for holistic adult numeracy assessment*, Language Australia, Melbourne

Tout, Dave and Motteram, Gary, 2006, *Foundation Numeracy in Context*, ACER Press, Camberwell, Victoria

Tout, David and Johnston, Betty, 1995, *Adult Numeracy Teaching: making meaning in mathematics*, National Staff Development Committee for Vocational Education and Training, Melbourne

### **Associations**

The Mathematical Association of Victoria

[www.mav.vic.edu.au](http://www.mav.vic.edu.au)

Victorian Applied Learning Association

[www.vala.asn.au/](http://www.vala.asn.au/)

## GLOSSARY

**Accredited course** A course that leads to an Australian Qualifications Framework (AQF) qualification or Statement of Attainment that is nationally recognised. The accredited course has been endorsed by either a state or national authority responsible for accrediting courses against agreed principles of accreditation. In Victoria, the statutory authority is the Victorian Registration and Qualifications Authority (VRQA).

**Adult and Community Education (ACE) Organisation** A community-based organisation that may be an RTO or recognised VCE or VCAL provider.

**Assessment task** A task set by the teacher to assess students' achievements of unit or learning outcomes (see also Outcomes).

**Australian Qualifications Framework (AQF)** The national framework for all qualifications in post-compulsory education and training.

**Australian Quality Training Framework (AQTF)** The nationally agreed set of regulatory arrangements that ensure the high quality of VET services in Australia.

**Award level** In the VCAL there are three award levels: Foundation, Intermediate and Senior.

**Credit – VCAL** In the VCAL, students are awarded one credit for completion of accredited curriculum in accordance with the course requirements for VCAL.

**Curriculum Planning Guide – VCAL** The VCAL Curriculum Planning Guide provides delivery and assessment advice for the VCAL curriculum strands. It specifies the purpose of the strand, provides guidance on selection of curriculum components for the strand and includes how the students' work is to be assessed.

**Elements** Elements are provided to further describe the learning outcomes and are intended as a guide for teachers to ensure consistency in the way learning outcomes are interpreted and assessed. When developing a task/s to meet a learning outcome/s teachers need to ensure that the task/s incorporate/s all the elements for that learning outcome/s.

**Employability Skills** A set of eight skill areas that employers have identified as desirable in all employees in all workplaces across Australia.

**Enterprise** Enterprise involves creating and maintaining a project, and need not necessarily involve profit making. It encourages the recognition of a significant and innovative opportunity, the appropriate management of risk-taking and the mobilisation of resources to enable the successful completion of a project.

**Further Education (FE)** Qualifications that provide training in adult literacy and basic education, access and preparatory education and English as a Second Language. Further Education certificates are accredited under the Australian Quality Training Framework.

**Industry** Industry includes a broad range of business or social organisations involved in the same type of productive activity.

**Information and Communications Technology (ICT)** ICT is the hardware, such as a computer, digital camera and printer, and software, such as spreadsheets and web authoring, that enables data to be processed, stored and communicated.

**Learning Program (VCAL)** Curriculum selected for delivery by the VCAL provider to meet each student's interest and abilities and to meet minimum VCAL course requirements.

**Local Learning and Employment Networks (LLENs)** Networks established across Victoria to support young people's connections with local education and training organisations, employers and community groups.

**Mapping** In the VCAL, mapping refers to aligning the content of locally developed programs and activities to the learning outcomes of a VCAL unit.

**Module** A distinct component of vocational training curriculum, comprising specified learning outcomes, assessment criteria and other information to support the delivery of training and conduct of assessment. Modules are identifiable as Units of Competency (UoC) on VASS.

**Nominal hours** The scheduled hours required for the delivery and assessment of vocational training as determined by Skills Victoria.

**Occupational Health and Safety Risk** The likelihood of injury or illness arising from exposure to any hazard at work.

**Outcomes** What a student must know and be able to do in order to satisfactorily complete a unit as specified in the VCE study design or VCAL unit.

**Provider** Refers to an organisation or institution that is registered by the VRQA and authorised by the VCAA to deliver VCE and VCAL.

**Quality assurance (QA)** The process to assure the quality of delivery and consistency in interpretation of learning outcomes and relevant levels. For example, assessment of VCAL units is subject to a QA process.

**Recognition of Prior Learning (RPL)** Recognition of prior learning (RPL) means recognition of current competencies held. An assessment may be conducted to determine the student's eligibility to be awarded a VCAL unit in the Work Related Skills (WRS) or Personal Development Skills (PDS) strands. The student needs to demonstrate that he/she has met the learning outcomes in the unit.

**Registered Training Organisation (RTO)** An organisation that is approved and registered by the VRQA to deliver Vocational Education and Training (VET) and Further Education (FE) within a defined Scope of Registration.

**Risk** The chance of something happening that will have an impact on objectives.

**Risk assessment** The overall process of risk identification, risk analysis and risk evaluation.

**Risk Management Process** The systematic application of management policies, procedures and practices to the tasks of, establishing the context, identifying, analysing, estimating, evaluating, treating, monitoring and communicating risk.

**Satisfactory Completion – VCAL** The school or other VCAL provider decision that a student has demonstrated achievement of the outcomes for a VCAL unit. Students receive an S for the satisfactory completion of a unit. If they do not satisfactorily complete a unit, they receive an N for not yet complete. Students qualify for the VCAL when they achieve sufficient credits to satisfy the course requirements. Units not yet completed are not printed on the Statement of Results.

**School** Refers to both home and assessing schools, providers and any other institutions that provide training and/or education at senior secondary level.

**School Based Apprenticeships (SBA)** Structured training arrangements, usually involving on and off the job training, for a person employed under an apprenticeship/traineeship training contract. These may include apprenticeships, part-time apprenticeships or traineeships.

**Scope of Registration** The defined scope for which a training organisation is registered that identifies the particular services and products that can be provided. An RTO may be registered to provide either training delivery and/or assessment services or products and issue AQF qualifications and Statement of Attainment. The scope of registration is further defined by AQF qualifications and/or endorsed units of competency.

**Semester** One half of the academic year. VCE and VCAL units are designed to be completed in one semester.

**Senior Secondary Qualification** The VCE and the VCAL are senior secondary qualifications that are designed to be completed in Years 11 and 12.

**Statement of Attainment** A record of recognised learning, that may contribute towards a qualification outcome, either as attainment of competencies within a training package, partial completion of a course leading to a qualification or completion of a nationally accredited short course that may contribute towards a qualification through recognition processes.

**Strand** The VCAL contains four curriculum strands; Literacy and Numeracy Skills, Industry Specific Skills, Work Related Skills and Personal Development Skills.

**Technology** Refers to the equipment and processes used to enhance, maintain and modify the environment and resources in order to support human endeavour. It involves the purposeful application of knowledge, skills, equipment, materials, energy and data to create useful products.

**Training Package** A document that sets out the training framework determined by industry for an industry sector. National competency standards, assessment guidelines and national qualifications form the endorsed components of training packages. Assessment materials, learning strategies and professional development materials may support these as non-endorsed components.

**Training Plan** A program of training and assessment which is required under an Apprenticeship/Traineeship Training Contract.

**Unit of competency (UoC)** Unit of competency means the specification of knowledge and skills and the application of that knowledge and skills to the standard of performance expected in the workplace. The RTO assesses competence.

**Units – VCAL** VCAL units contain accredited learning outcomes that enable content to be developed and/or planned at the local level.

**Units – VCE** The components of a VCE study. There are usually four units in a VCE study, numbered 1, 2, 3 and 4.

**Victorian Assessment Software System (VASS)** The Internet-based system used by schools to register students and enter VCE and VCAL enrolments and results directly onto the VCAA central database.

**Victorian Certificate of Applied Learning (VCAL)** An accredited senior secondary school qualification undertaken by students in Years 11 and 12.

**VCAL learning program** A program of accredited curriculum that leads to the award of a VCAL Certificate.

**VCAL provider** A school or other organisation authorised to offer the VCAL.

**VCE/VCAL Certificate** The certificate awarded to students who meet the requirements for graduation of the VCAL and/or VCE. See also Statement of Results.

**Vocational Education and Training (VET)** Nationally recognised vocational certificates. These certificates may be integrated within a VCE or VCAL program.

**VCE VET** Nationally recognised VET certificates developed into full programs of study within the VCE and contributing to satisfactory completion of the VCE under the same recognition arrangements as for VCE studies.

**Workplace** A place, whether or not in a building or structure, where employees or self-employed persons work.

## NOTES

## NOTES

## NOTES



For further information visit the VCAA website  
[www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

1800 134 197

**VCAL**  The hands-on option for Years 11 & 12 students

Published by



**VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY**  
41 St Andrews Place East Melbourne Victoria 3002 Australia  
TELEPHONE +61 3 9651 4300 FACSIMILE +61 3 9651 4324  
EMAIL [vcaa@edumail.vic.gov.au](mailto:vcaa@edumail.vic.gov.au)  
WEB [www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

