Numeracy In Focus

BUILDING VET PRACTITIONER AWARENESS OF NUMERACY IN THE WORKPLACE

A Professional Development Resource

Funded under the Workplace English Language and Literacy (WELL) Program by the Australian Government Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education.

ISBN: 978-0-9874157-2-1

DEVELOPERS

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ACKNOWLEDGEMENTS

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ABOUT THIS RESOURCE

WHAT IS IT?

This is a professional development resource to support the development and recognition of numeracy training skills and knowledge of Vocational Education and Training (VET) practitioners consistent with the requirements of the Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice.

The resource is a companion to *Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners*. Both this resource and *Numeracy in Practice* are available for download from the WELL practitioners' website at www.wellpractitioners.com.au and www.oggiconsulting.com/resources/.

The resource can be used to support the following competencies from the TAE10 Training and Education Training Package:

- TAELLN401A Address adult language, literacy and numeracy skills, in the Certificate IV in Training and Assessment (TAE40110)
- TAELLN702A Analyse and apply adult numeracy teaching practices, in the Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice (TAE70111)
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills, in the Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice (TAE70111)

The resource draws on research and resources available to view at www.oggiconsulting.com/projects/numeracy/. These were current at the time the resource was published but things often change. Users are advised to access the most up-to-date information.

WHO IS THIS RESOURCE FOR?

This resource is designed to be used by VET practitioners who are responsible for supporting adults to develop their numeracy skills for the workplace.

The roles and responsibilities of individuals involved in workplace numeracy assessment and delivery vary and may include vocational specialists, language and literacy specialists, numeracy specialists and employers. Users need to adapt the resource to their own job role and work context.

WHY USE THIS RESOURCE?

Numeracy is an important core skill. All VET practitioners must be up to date and confident in their own numeracy skills, their numeracy training skills and their understanding of typical workplace numeracy activities.

This resource is designed to meet the professional development needs of VET practitioners who:

- Have basic numeracy skills but need to update in respect to changing technology and numeracy practices
- Have basic numeracy skills but need to contextualise to the world of work
- Have numeracy skills but need to increase their numeracy confidence
- Are reluctant to assess and teach numeracy skills in the workplace
- Are not sure if their numeracy skills are sufficient to complete TAE70111 Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice

HOW CAN THIS RESOURCE BE USED?

This resource can be used in a variety of ways. It can be used in its entirety to gain an overview of numeracy skills in the workplace. Alternatively, it can be used as a reference to provide specific support when needed. The resource can also be used as a workbook for an individual or for a group of individuals to assist with self assessment against the units.

This is a professional development resource that must not only be read. To fully benefit from the resource users should engage with it actively by completing the reflections and activities found in dashed line boxes like this.

PROFESSIONAL DEVELOPMENT

This section has been designed to raise awareness of the skills needed to effectively develop workplace numeracy skills, and to help VET practitioners to identify their strengths and limitations and develop a plan to address any skills gaps.

MANAGING MATHS ANXIETY

People often say that they feel uncomfortable about learning maths. Typically they describe feeling alienated, inadequate, angry, ashamed, frustrated, resentful, helpless and fearful. They think that maths is hard and that they cannot do it.

The feelings can be so uncomfortable that people avoid doing maths and learning maths. The feelings are believed to stem back to how they were treated at school and how they felt they were not supported to learn maths. This is possibly because of how they were taught through decontextualised, abstract, rote learning.

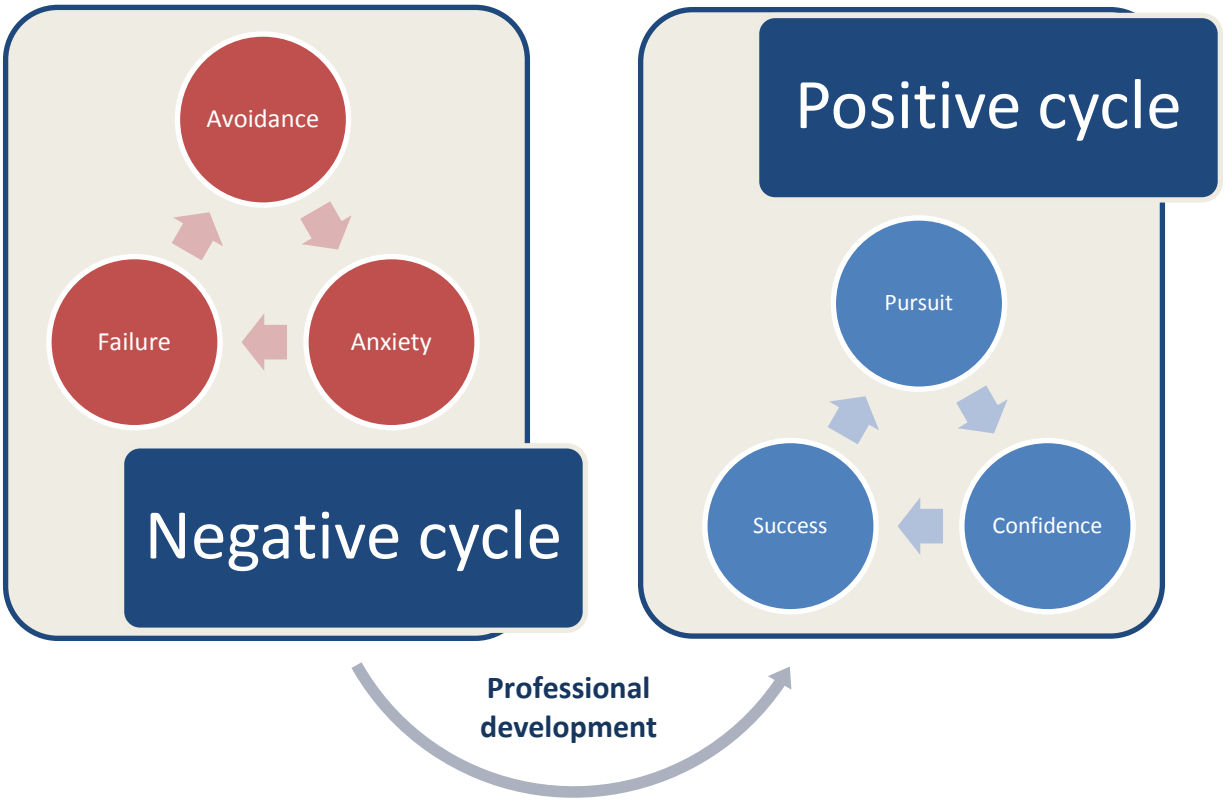
VET PRACTITIONER MATHS ANXIETY

If a VET practitioner has numeracy skills gaps, then they too may be familiar with these feelings of anxiety. Their past negative maths experiences and maths anxieties can affect how they approach learning and teaching numeracy today.

It's not unusual for adults to underestimate their numeracy skills. In fact, adults often discount tasks involving numeracy skills in their day-to-day activities as easy and inconsequential and only label the numeracy they feel uncomfortable about as maths.

Examples of common tasks involving numeracy skills include working with schedules, calendars and timetables, developing and managing financial plans and budgets, organising events including bookings, catering and costings, managing resources, reading maps and diagrams and analysing data.

Professional development and practice helps to turn the negative cycle into a positive cycle, allowing individuals to acknowledge the numeracy skills that they do have and develop the skills they need to confidently deliver numeracy training in the workplace.



OVERCOMING MATHS ANXIETY

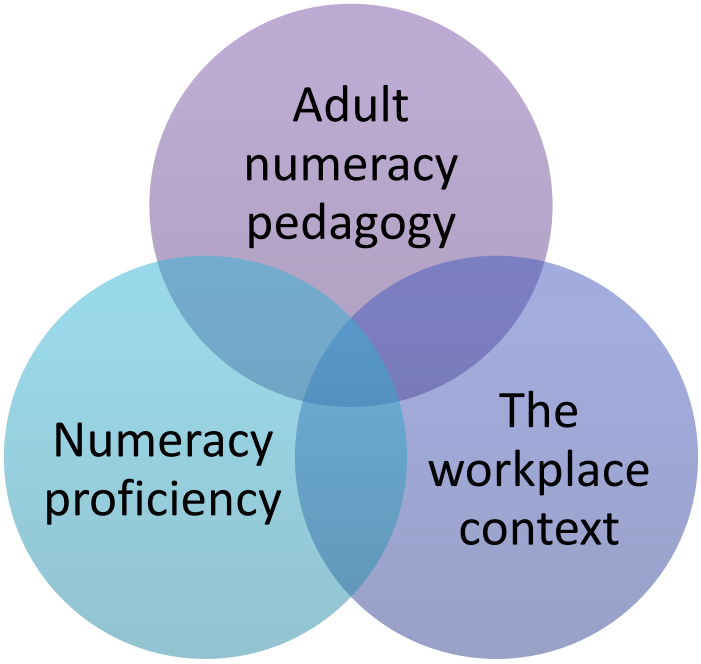
Sheila Tobias, in her book *Overcoming Math Anxiety* (Tobias 1993), has the following advice for people renewing their relationships with mathematics:

Challenge your maths anxiety. Write down a list of strategies that you can use to overcome maths anxiety.

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

VET PRACTITIONER SKILLS REQUIREMENTS

Effective workplace numeracy delivery requires VET practitioners with strong numeracy proficiency and pedagogical training and an in-depth understanding of the workplace context.



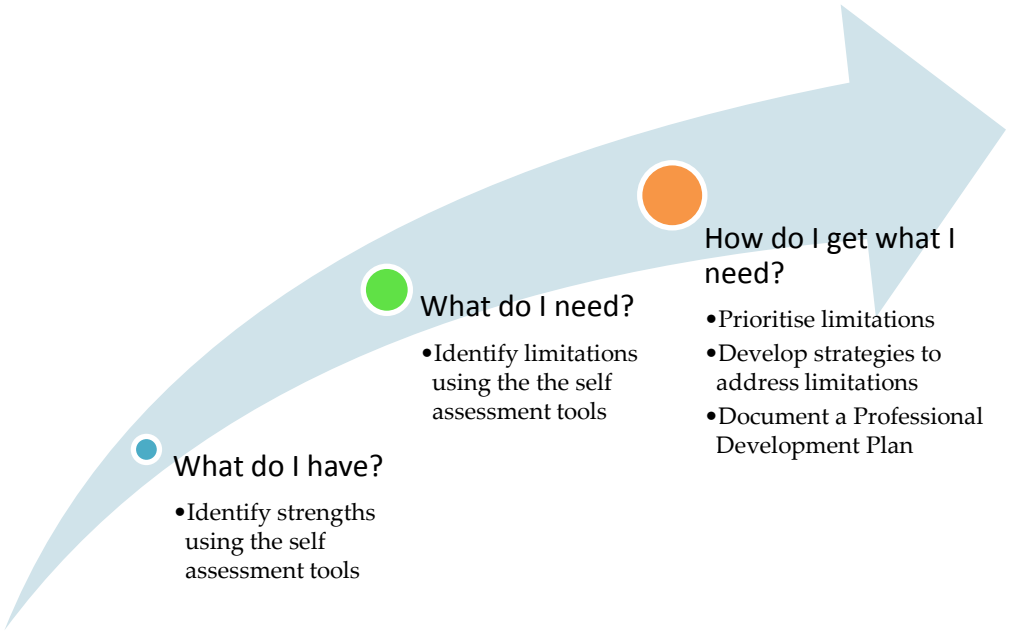
The 2013 NCVER report *Seeking the N in LLN* (Berghella and Molenaar 2013) found that there may be a gap between the numeracy skills needs of existing workers and the capacity of the VET workforce to meet those needs. This finding is consistent with international research.

SELF ASSESSMENT

Self assessment helps individuals to identify their strengths and limitations and prioritise professional development needs. Knowing their numeracy capabilities allows them to work to their strengths and think about how to manage their limitations, for example by undertaking further training or seeking appropriate help.

Individuals need to ask themselves:

- What competencies do I have that support others in maintaining and achieving adult numeracy skills development in the workplace?
- What limitations do I have that may limit my capacity to support others in maintaining and achieving adult numeracy skills development in the workplace?
- What do I need to do to address my limitations?



ABOUT NUMERACY PROFICIENCY ASSESSMENT

Adults often have a low self-awareness of their own numeracy skills because those with low numeracy skills tend to use effective survival strategies and live a productive life. Adults usually only become aware of their own lack of numeracy skills when they are assessed or when they are faced with a situation that they cannot avoid, such as when a child asks for help with their mathematics homework.

Studies also show that adults are often not aware of the numeracy skills that they do have. This is because people often see the numeracy they can do as unremarkable and just common sense, and the numeracy they cannot do as maths.

Therefore, it is always important to assess numeracy skills using a numeracy assessment tool, as asking adults to report on their own numeracy levels is very unreliable.

How good are you at self assessing your numeracy skills level? Complete the Numeracy Self Assessment Tool provided in the appendices. Compare this to your performance against the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry available in ***Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners****.*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

ASSESSMENT TOOLS

Assessment tools are available to assess both numeracy teaching skills and knowledge, and numeracy proficiency skills.

The following tools are aligned with the ACSF numeracy core skill and can be used to assess numeracy proficiency skills:

- Numeracy in Practice: Numeracy Proficiency Assessment Tool – Process Manufacturing Industry
- Precision Consultancy ACSF Assessment Tasks
- Manufacturing Skills Australia Putting the Jigsaw Together Numeracy Indicator Tool for the Certificate III in Engineering - Fabrication Trade
- Community Services and Health Industry Skills Council WELL Skills Check

These tools available to use at www.oggiconsulting.com.au/projects/numeracy/.

The following tools are aligned with the Vocational Graduate Certificate (VGC) in Adult Literacy and Numeracy Practice (TAE70111). They can be used to assess numeracy training skills and knowledge:

- Skills Recognition Guide: TAELLN702A Analyse and apply adult numeracy teaching practices

- Skills Recognition Guide: TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills

These tools are found in the User Guide for TAE70110 and TAE80110 (Innovation and Business Skills Australia 2010).

DEVELOPING A PLAN

Use the results of the self assessment to document a Professional Development Plan.

The following strategies for addressing limitations may be helpful:

Here's an example of what a Professional Development Plan might look like:

Professional development goal	Strategies to achieve this goal
1. *To obtain qualifications to deliver numeracy in the workplace*	*Enrol in TAE70111 Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice*
2. *To increase mathematical knowledge of data and statistics to minimum ACSF level 3 contextualised to the manufacturing industry*	*Identify and practise data and statistics skills in my own work and life* *Find a mentor experienced in numeracy delivery to adults in a manufacturing workplace* *Work through the relevant sections of Numeracy in Focus to identify how data and statistics are used in the workplace* *Work through the relevant sections of Numeracy in Practice to develop data and statistics knowledge and skills* *Obtain authentic workplace examples from at least three different manufacturing worksites and practise data and statistics skills with mentor's help*
3. *To increase skills and confidence using spreadsheets to analyse and present data*	*Complete Excel beginners and intermediate courses*

Assess your numeracy skills using the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry available in ***Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners***.

Use the information to develop a Professional Development Plan. A template is provided in the appendices. Discuss with a trusted peer or mentor.

Review

This section focuses on the skills VET practitioners need to have to effectively address workplace numeracy skills needs.

Take a few minutes to reflect on this section by answering these questions:

- *What did you learn?*
- *How does what you learnt relate to your practice?*
- *What actions will you take?*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

This contributes to the achievement of the following units of competency:

- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills
- TAELLN401A Address adult language, literacy and numeracy skills

If you think that you need to further develop your knowledge and skills in these areas, add these units of competency to your Professional Development Plan.

EXPLORING NUMERACY

This section has been designed to broaden understandings of numeracy and its importance by firstly looking at definitions of numeracy and then presenting a collection of the latest research findings.

NUMERACY DEFINED

There is no accepted definition of numeracy or its relationship to mathematics. Coben's 2003 report *Adult numeracy: review of research and related literature* devotes many pages to describing the debate and declares:

> *… numeracy is a deeply contested and notoriously slippery concept, the subject of lively debate (Coben 2003).*

The WELL Guidelines define numeracy as:

> *The knowledge and skills required to effectively manage and respond to the mathematical demands of work, education, social interaction and negotiation of everyday living (DIICCSRTE 2013).*

The Australian Core Skills Framework (ACSF) definition of numeracy is:

> *Numeracy in the ACSF is about using mathematics to make sense of the world and applying mathematics in a context for a social purpose. Numeracy gives meaning to mathematics and mathematics is the tool (the knowledge and skills) to be used efficiently and critically.*
>
> *Numeracy is concerned with dealing with situations that involve the use and application of a range of mathematical skills and knowledge which arise in the three Domains of Communication: personal and community, workplace and employment, and education and training.*
>
> *Numeracy involves understanding and applying mathematical skills. It also involves drawing on knowledge of the context in deciding when to use mathematics, extracting the mathematical information from the context and choosing the appropriate mathematics to use. Numeracy requires reflecting on and evaluating the use of the mathematics, and being able to represent and communicate the mathematical result (DIICCSRTE 2012).*

The Adult Literacy and Life Skills Survey (ALLS) framework defines numeracy as:

> *… the knowledge and skills required to effectively manage and respond to the mathematical demands of diverse situations (Australian Bureau of Statistics 2008).*

These definitions capture not only maths knowledge but also the skills needed to act on maths knowledge in context.

Numeracy is measured by observing numerate behaviour.

The ALLS includes the following definition of numerate behaviour:

> *Numerate behaviour is observed when people manage a situation or solve a problem in a real context; it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge, factors, and processes (Gal, van Groenestijn et al. 2003).*

Numerate behaviour involves

managing a situation or solving a problem in a real context

everyday life

work

societal

further learning

by responding

identifying or locating or acting upon

- order/sort
- count
- estimate
- compute
- measure
- model

interpreting

communicating about

to information about mathematical ideas

quantity and number

dimension and shape

pattern and relationships

data and chance

change

that is represented in a range of ways

objects and pictures

numbers and symbols

formulas

diagrams and maps

graphs

tables

texts

and requires activation of a range of enabling knowledge, behaviours and processes.

mathematical knowledge and understanding

mathematical problem solving skills

literacy skills

beliefs and attitudes

WHAT THE RESEARCH SAYS

Some of the following research findings may challenge the current thinking of VET practitioners. For example, VET practitioners may not know that research shows that numeracy skills are more important than literacy skills.

The importance of numeracy is often underestimated. Generally speaking, people are not bothered by low numeracy. Many people, including VET practitioners, will readily admit that they are 'no good' at maths and show little or no interest in addressing the gaps. Literacy is considered much more important than numeracy. A recent NCVER study *Seeking the N in LLN* (Berghella and Molenaar 2013) found that there is very little numeracy focus in VET training and very few VET practitioners, including vocational specialists and LLN specialists, are qualified in numeracy delivery.

NUMERACY LEVELS ARE LOWER THAN ADULT LITERACY LEVELS

The 2006 Adult Literacy and Life Skills Survey assessed the skills of Australian participants across five skill domains including prose literacy, document literacy, numeracy, problem solving and health literacy. The participants were assessed across five skill levels, with level 1 being the lowest and level 5 the highest. Level 3 is considered the 'suitable minimum for coping with the increasing and complex demands of modern life and work' (McHugh 2008).

The survey found that 53% of adults in Australia had poor (level 2) or very poor (level 1) numeracy skills compared with 46% and 47% for prose literacy and document literacy (Australian Bureau of Statistics 2008).

NUMERACY MATTERS MORE THAN LITERACY

Studies (Bynner and Parsons 1997; Gleeson 2005; Parsons and Bynner 2005) found that poor numeracy skills had more impact on an individual's life than poor literacy skills.

> *People without numeracy skills suffered worse disadvantage in employment than those with poor literacy skills alone. They left school early, frequently without qualifications, and had more difficulty in getting and maintaining full-time employment. The jobs entered were generally low grade with limited training opportunities and poor pay prospects (Bynner and Parsons 1997).*

More recent analysis of the Adult Literacy and Life Skills surveys conducted in Australia and internationally support 'the argument that numeracy plays potentially a stronger role in regards to human capital and economic returns than does literacy' (Tout 2008).

NUMERACY MATTERS MORE FOR WOMEN

The 2006 Adult Literacy and Life Skills Survey shows that women have lower levels of numeracy than men: 58% of females were assessed at skill levels 1 or 2 compared with 48% for males (Australian Bureau of Statistics 2008).

This makes women more vulnerable in society.

> *For women, while the impact of low literacy and numeracy is substantial, low numeracy has the greatest negative effect, even when it is combined with competent literacy ... Poor numeracy skills make it difficult to function effectively in all areas of modern life, particularly for women (Parsons and Bynner 2005).*

NUMERACY LEARNERS HAD MORE NEGATIVE SCHOOL EXPERIENCES THAN LITERACY LEARNERS

Studies show that adult numeracy students are more likely to have had negative school experiences than literacy students, impacting on their motivation to learn.

> *Students who learn math as adults may well have had feelings and experiences of inadequacy and failure in math in earlier education. In addition, feelings about math may be linked to more general negative experiences with schooling in the past (Dingwall 2000).*

This is supported by research in the workplace.

> *Most workers displayed signs of anxiety when discussing secondary school mathematics education, which they saw as useless, abstract, and taught without relevance. Commonly their mathematics learning experiences have resulted in a negative self-image with respect to numeracy and a consequent lack of recognition of their existing ability. This was despite competence in the fundamental arithmetic skills of addition, subtraction and multiplication (Marr and Hagston 2007).*

WORKPLACE NUMERACY DEMANDS ARE INCREASING

Studies (Hoyles, Wolf et al. 2002) show that there is an increasing demand for numeracy skills at all job levels in the workplace.

Numeracy demands are being driven by globalisation and the need to be competitive, new technologies and increasing industry compliance requirements. Information and communication technology (ICT) is a particularly important driver.

> *In a modern, knowledge based economy and society in which networked computers are becoming ubiquitous, numeracy is increasingly important, and indeed essential both at the more basic and the more advanced levels (Dingwall 2000).*

This is supported by feedback from industry such as the recent Australian Industry Group report finding that:

> *… a large proportion of the workforce did not have adequate literacy, numeracy and problem solving skills to operate effectively in the workplace (Australian Industry Group 2008).*

WORKPLACE NUMERACY HAS SIGNIFICANT COMPLEMENTARY SKILLS DEMANDS THAT ARE CONTEXT SPECIFIC

Studies have found that workplace numeracy involves the application of a range of numeracy skills in a way that also incorporates critical thinking, analysis and problem-solving skills.

> *… studies found that workplace numeracy went beyond routine, procedural use of mathematical skills, to their application in 'problem-solving' situations, to cope with changing circumstances or to initiate economic and quality improvements (Marr and Hagston 2007).*

This finding has implications for the way in which workplace numeracy skills need to be developed.

> *… the development of numeracy capabilities involves not only the acquisition of knowledge and skills, but their application in real situations for varying sets of purposes, supported or impeded by different attitudes and mind sets (e.g., confidence vs. anxiety). Improving numeracy can be a complex and difficult task (Dingwall 2000).*
>
> *The purpose of workplace education is to make sure that people have the skills they need for the job – to keep their jobs, upgrade their qualifications, and sustain and enhance a high level of performance. Each job or work*

situation has its own specific set of numeracy requirements. For example, a crane operator will need to know about angles and centres of gravity, while a carpenter will need to know about measurement, areas, etc. Within the set of requirements for a particular job, it is increasingly important for people to have very high levels of competence. For example, they may have to make very precise measurements (e.g., auto mechanics) or do exact calculations of what will fit where (e.g., carpet layers). An approximate knowledge of general math will not be sufficient, although this is certainly helpful (Dingwall 2000).

NUMERACY IN THE WORKPLACE CAN BE INVISIBLE

Researchers (FitzSimons, Mlcek et al. 2005) have highlighted what is described as the phenomenon of 'invisibility' of numeracy in the workplace. By this they mean that numeracy is often so highly integrated with other workplace tasks that it is not identified and acknowledged as numeracy. This is even when numeracy skills are being used frequently. Explanations proposed include workers' negative self image with respect to numeracy skills and the highly contextualised nature of numeracy in the workplace (Marr and Hagston 2007).

NUMERACY IN VET PRODUCTS CAN BE INVISIBLE

It has been acknowledged that numeracy is often invisible in Training Packages (National Quality Council 2009). Numeracy skills have been so well integrated into the competencies that they can be hard to find and easily overlooked. Training Package policy is changing to address this issue.

WORKPLACE NUMERACY IS NOT THE SAME AS CLASSROOM NUMERACY

Researchers (Hoyles, Wolf et al. 2002; FitzSimons, Mlcek et al. 2005) have highlighted the differences between workplace numeracy and numeracy taught in a classroom environment, with significant implications for teaching practice.

Unlike school mathematics practices, workplace numeracy tasks are performed using idiosyncratic methods developed within the workplace and couched in task-specific language particular to the industry or workplace. They are also performed with differing degrees of accuracy, as appropriate to the task and its consequences, with 'in the head' calculation strategies and estimation of measurements a common feature, especially when making judgements on the adequacy of material stocks, productions rates or occupational health and safety decisions about lifting and storage (Marr and Hagston 2007).

> *In the workplace the object is to get the job done as effectively and efficiently as possible, assisted as appropriate by the incorporation of numeracy as but one tool. In the classroom, the object is generally to produce more text, utilising textual and other mediating artefacts, with the intended outcome of learning being more mathematics. Clearly the conditions for teaching and learning numeracy are very different in these two sites. Even when a classroom lesson is designed to simulate the workplace, it can never completely capture the exigencies of actual practice (FitzSimons, Mlcek et al. 2005).*

WORKPLACE NUMERACY INVOLVES A RANGE OF NUMERACY SKILLS

Various studies have identified the numeracy skills important in the workplace. Marr and Hagston compiled the following list from the research (Marr and Hagston 2007):

- Calculation – with and without calculators or computers
- Mental calculations/estimations
- Calculation and interpretation of percentage
- Measurement, such as length, volume, weight, temperature, speed
- Use of ratio and proportion
- Creation and use of formulas (possibly using spreadsheets)
- Display and interpretation of data
- Use and interpretation of graphs, charts and tables
- Use and interpretation of scale drawings, plans and diagrams
- Recognition of patterns and anomalies with measurement and data
- Communication of mathematically related ideas
- Use of computers/technology in relation to mathematical tasks
- Use of mathematical ideas and concepts to model or analyse workplace situations
- Use of mathematical ideas and concepts to evaluate and critique workplace practices and monitoring systems

FEAR AND LACK OF NUMERACY CONFIDENCE ARE THE BIGGEST BARRIERS

Studies have found that adult fear and lack of confidence with maths are a serious barrier to numeracy skills development. Many adults identify what they can't do as maths and identify what they can do as not really maths but common sense (Coben 2003).

This is supported by case studies prepared by Marr and Hagston:

> *Even when they had learned new numeracy skills in the workplace, such as complex tallying strategies and calculating freight costs, there was a tendency for the less confident to regard them as merely part of the job or 'common sense', perhaps because they no longer resembled mathematics learned at school. Unfortunately, tacit use of numeracy skills neither alters a negative self-image nor increases worker confidence to engage with further numeracy-related learning. It is therefore important to encourage exploration of their tacit knowledge and its conversion to 'explicit' knowledge. In this way workers will become more confident in using and transferring their existing skills and realising that they are capable of learning the additional skills required for positions of responsibility (Marr and Hagston 2007).*

NUMERACY AND LITERACY ARE ENTWINED

Numeracy cannot be separated from literacy as explained in a recent report:

> *In workplace practice, these skills are often used in conjunction with one another. To address a work problem or complete a workplace task might entail gathering and analysing information; using number or mathematical skills; reading, writing and reporting (verbally and/or in writing); using a computer or another piece of plant or equipment; working with other people, perhaps in a team; and quite possibly demonstrating some initiative. In this way, language, literacy, numeracy and generic or employability skills are linked with notions of employability and work performance (Townsend and Waterhouse 2008).*

Are you challenged by any of the research findings? Find the source documents and read them. Make a list of research findings that challenge your current thinking.

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

Review

This section focuses on definitions of numeracy and the importance of numeracy.

Take a few minutes to reflect on this section by answering these questions:

- *What did you learn?*
- *How does what you learnt relate to your practice?*
- *What actions will you take?*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

This contributes to the achievement of the following units of competency:

- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills
- TAELLN401A Address adult language, literacy and numeracy skills

If you think that you need to further develop your knowledge and skills in these areas, add these units of competency to your Professional Development Plan.

WORKPLACE NUMERACY EXAMPLES

Workplace numeracy is highly contextualised and integrated with work functions. This section looks at the different types of numeracy skills found in the workplace and presents some specific job task examples that VET practitioners may encounter in the workplace in different industries. Note that many workplace tasks often involve a combination of different types of numeracy skills.

This section deliberately contains examples but not solutions. This is because:

- Workplace numeracy is highly contextualised and it is inappropriate to take it out of the workplace context
- There are often many equally valid ways of arriving at the answer to a numerical problem
- Different people prefer to complete the same numerical task in different ways
- Completing numerical tasks is more complex that just performing the calculation
- Examples away from the workplace context perpetuate numeracy teaching approaches inappropriate in the workplace

Take for example a '20% off the marked price' sale at a clothing store where retail assistants are expected to answer customer queries about the sale price of items:

Example	Solution
1	One retail assistant makes a list of all the prices in the store (e.g. $9.99, $19.99, $29.99 etc.) and using a calculator calculates the sale price for each item. They enter the original price and multiply it by 0.8. They keep their list beside the register as a quick reference
2	One retail assistant keeps a calculator in their pocket. Each time a question is asked they calculate the answer in front of the customer. They enter the original price, press multiply, enter 80 and then press the percentage key
3	One retail assistant can confidently perform mental calculations. They mentally calculate the 10% value, double it and subtract it from the original price in their head

*If you want to know more about workplace numeracy calculations it is best to do so in the workplace context. To find out about engaging employers access **WELL Considered: How to Effectively Develop a WELL Training Solution and Prepare a Winning Well Training Application**.*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

*If you don't have the numeracy skills and knowledge needed to deliver the workplace examples that follow, you may benefit from working through the activities in the companion resource **Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners**.*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

*If you experience feelings of anxiety and negative thoughts such as 'I can't do this' while reading this section, don't be discouraged – you're not alone. As you read through the section imagine yourself in the role of a WELL practitioner teaching the numeracy skills and record your thoughts and feelings as they arise. More advice on how to do this is available in **Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners**.*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

CALCULATION

Most jobs require workers to do calculations, particularly addition, subtraction, multiplication and division. Calculations may be performed manually or using a calculator, mobile phone or a computer and may involve whole numbers, decimals and fractions. Even when using technology such as calculators and computers, workers often have to think through a problem first to work out the right calculations to perform according to the situation. They also need to know how to use the technology.

Examples of workplace calculations include adding up times on a timesheet, scaling a recipe up or down, subtracting a value from the total to calculate the remainder, converting units of measure, converting fractions and decimals, identifying ratios and calculating averages and ranges.

The following is an example of a simple timesheet used in a workplace. Calculations needed include addition and subtraction of time using whole numbers and fractions. More complicated examples may include allocations of hours against different jobs, services or funding streams, calculations involving overtime, time in lieu and other leave types, and the inclusion of expense claim calculations.

Time Sheet				
Better Care Services Pty Ltd				
Employee name: *Joe Mall*				
Week commencing: *7/2/2011*				
Day	**Start**	**End**	**Breaks**	**Total Hours**
Monday	*7 am*	*1 pm*	*30 min*	*5 ½ hours*
Tuesday	*7 am*	*1.30 pm*	*30 min*	*6 hours*
Wednesday	*7 am*	*1 pm*	*30 min*	*5 ½ hours*
Thursday	*7 am*	*1.15 pm*	*30 min*	*5 ¾ hours*
Friday	--	--	--	--
Total				*22 ¾ hours*

The following is a simple example of an order form. Calculations include addition and multiplication of whole numbers and decimals. More complicated examples may include discounts and GST, freight charges and deposits.

Order form			
Jen's Supplies Pty Ltd			
Name: *ABC Plumbing*			
Item code	**Quantity**	**Item price**	**Total**
23543	*5*	*$1.19*	*$5.95*
56743	*14*	*$2.34*	*$32.76*
56378	*3*	*$12.40*	*$37.20*
23975	*55*	*$5.30*	*$291.50*
Total			***$367.41***

Some occupations, such as carpentry, rely heavily on calculation skills. For example, a carpenter may calculate the number of two-by-four studs needed in a wall of a given length, including extra two-by-fours needed around doors and windows and at the top and bottom of the wall. More complex examples include calculations for building staircases where carpenters need to calculate stringers, risers and treads.

Workers in commercial kitchens often prepare daily food production reports. Information in the reports may include yield tests, proportions and ratios relevant to food costs

Taxi drivers calculate the change to be returned when a fare is paid using subtraction

Clerical workers use maths to give an accurate count of work completed or work to be completed and use equations to estimate the cost of production items. Clerical workers may also set up work schedules, calculate discounts, check invoices for accuracy and keep accurate records for petty cash and supplies

A childcare worker is looking after 11 children. The children are seated at 3 tables and there are 20 apples to be cut up and distributed. The worker mentally calculates how many quarters should be placed on each table using division, multiplication and rounding using whole numbers and fractions

Thinking about a workplace training project you are familiar with, what other calculation examples have you encountered? Are you confident in your own numeracy skills to do the calculations?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

MENTAL CALCULATIONS AND ESTIMATIONS

Mental calculations and estimations are performed quickly and often automatically without using a calculator or being written down. Estimations can take the place of a precise calculation where precision is not required, or can be used to mentally check whether an error has been made. For example, if when entering 2 + 10 in a calculator the multiplication sign was pressed instead of the plus sign, a quick mental check shows that an error had been made. Rounding is also a form of estimation.

Examples of mental calculations and estimations include estimating how much material to add to a hopper to finish a job, mentally calculating how long it will take to drive to an appointment, mentally calculating how many cuts can be made from a length of timber and estimating how long it will take to finish a job.

Oyster pickers estimate the size of an oyster by comparing it to the size of their hands

Grain farmers estimate crop yield by selecting a plant and counting how many seeds are on the head. Then, looking at the acreage and estimating the number of heads, farmers calculate an approximation of the yield

Café owners estimate the time that it will take for a meal to be prepared, based on past knowledge and how busy the restaurant is, so that they can inform the clients

A production run is nearing its end but the hopper needs refilling. The production worker mentally works out how much is needed using addition and subtraction of time and an estimation of quantity needed in the hopper to finish the job

A disability support worker has three main tasks they must complete in their 3-hour shift. They must take the client to the doctor and back, they must make lunch for the client and they must complete their reporting requirements. The worker estimates how long each task will need, taking into account priorities and contingencies, and they plan their shift accordingly

Cleaners estimate the time to complete jobs. Factors to take into consideration include the extent of cleaning, the size of the building, problems encountered the last time and unforeseen factors such as pests

Thinking about a workplace training project you are familiar with, what other mental calculation and estimation examples have you encountered? Are you confident in your own numeracy skills to do the mental calculations and estimations?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

PERCENTAGES

Percentages apply to many functions in the workplace and workers need to understand what they mean and how to work with them.

Workplaces use percentages to communicate workplace information such as productivity and performance data. This information can be provided verbally such as 'last week we improved productivity by 10%' or displayed as text or graphs. Here's a table example:

First Quarter Safety Incidents		
Safety incident	**Frequency**	**Percentage**
Trip	*7*	*39%*
Burn	*5*	*28%*
Eye injury	*4*	*22%*
Stress	*2*	*11%*
Total	*18*	*100%*

Percentages can also be embedded in job tasks. For example, the hydrogen peroxide that hairdressers use comes in different strengths, typically 3%, 6%, 9% and 12%. Hairdressers must choose the right strength of hydrogen peroxide and mix it in the right quantity to get the desired effect.

In some occupations workers need not only understand what percentages mean but must also be able to calculate them.

Retailers discount sales items by a percentage of the original price. The discounted prices may or may not be marked on the product and the retail worker must know how to calculate the discounted price

A production worker completes a 5S audit sheet and records a score of 62 out of a possible 78. They calculate what this is as a percentage and compare it to the percentage score from the previous audit

Contractors prepare simple quotes for labour plus 10% GST. More complicated quotes include a percentage mark up for materials, a payment schedule and a discount for early payment

Paid workers are taxed according to Australian Tax Office income tax rates and many employment conditions include provisions for loadings. For a worker to understand their pay packet they must have an understanding of percentages

An automotive mechanic is filling a 15 litre radiator. They calculate the volumes needed for a solution that is 60% coolant and 40% water

Thinking about a workplace training project you are familiar with, what other percentage examples have you encountered? Are you confident in your own numeracy skills to calculate and use percentages?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

MEASUREMENT

Measurement is a complex activity where a worker may be involved in any or all of the following activities:

- Identifying the purpose of the measurement
- Identifying the physical properties to be measured such as length, volume, weight, temperature, speed
- Understanding and following sampling procedures
- Understanding and following measurement procedures
- Performing and/or checking calibration
- Selecting and using measuring equipment correctly and safely
- Checking measured results against estimated results
- Checking measured results against standards
- Rounding decimals
- Using the correct units of measure
- Converting units of measure
- Reporting results and recording results
- Taking action

Measuring equipment may also show readings in more than one unit of measurement. For example, a pressure gauge like the one below gives readings in both pounds per square inch (psi) and bar.

Workers in all occupations measure time using digital and analogue clocks

Sheet metal workers lay out, measure, and mark dimensions and reference lines on materials such as roofing panels, according to drawings or templates, using calculators, scribes, dividers, squares and rulers

Cooks measure by weight or volume using various types of measuring equipment such as measuring spoons, cups and scales or estimates such as handfuls and pinches. Cooks may also convert between metric and imperial units of measure and distinguish between British teaspoons and tablespoons and American teaspoons and tablespoons

Harvesting labourers weigh baskets of strawberries to check that sufficient fruit is being packed in each basket

Farm hands take pump pressure and engine temperature readings and make adjustments to keep readings within the acceptable range

Mine labourers take readings on pressure valves to check that equipment is operating in a safe zone.They check gauges on rock machines when mixing slurry with rocks, opening or closing valves to increase or decrease the quantity of slurry in the mix

Boilermakers measure angles to cut tubing to specifications

Materials handlers measure the length, width and height of a truck trailer and the length, width and height of filled pallets to find out how many pallets of products can fit in the trailer

Truck drivers measure tyre treads to establish that the tyre treads are at a safe thickness

Healthcare workers measure the height and weight of patients

Machine setters such as at a paper manufacturer measure, space, and set saw blades, cutters, and perforators, according to product specifications

Thinking about a workplace training project you are familiar with, what other measurement examples have you encountered? Are you confident in your own numeracy skills to perform measurements?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

RATIO AND PROPORTION

Many workers need to be able to use ratios and proportions such as when mixing ingredients and using scale drawings and maps.

For example, bricklayers use four main materials for making mortar: cement, lime, sand and water. One ratio they may use is 1:1:5:1. They then use proportion to make up the correct volume to complete a job.

Cleaners may dilute a cleaning fluid in a 1:8 ratio and use proportion to make up the correct volume

Correction officers may monitor the ratio of staff to residents to make sure the required ratio is maintained

Kitchen staff may need to make up fruit juices from concentrates in a 1:5 ratio using proportion to make up specified volumes

Construction workers use geometric ratios. If a roof slope is 1 to 12 they need to know what angle to cut the rafter beams so that the ends are vertical and visually pleasing

Chefs often need to scale recipes up or scale down using proportion

Plumbers need to understand the ratio between pipe size and volume output

Transport workers use scaling to proportionately work out driving distances, for example, where a 1 km measurement equals 10 mm on the map

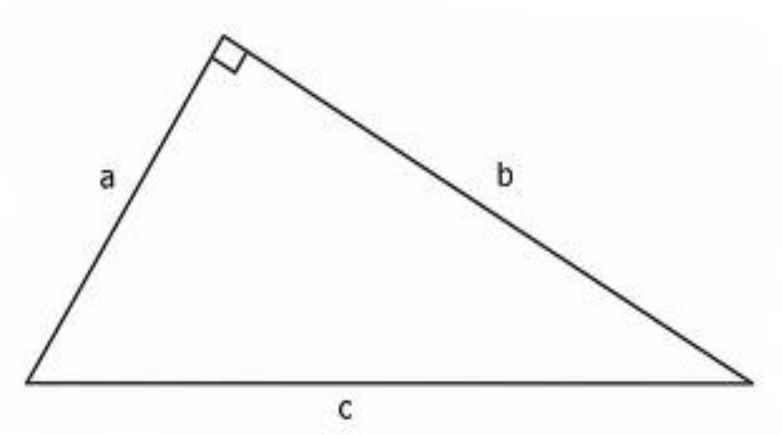
Thinking about a workplace training project you are familiar with, what other ratio and proportion examples have you encountered? Are you confident in your own numeracy skills to use ratios and proportions?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

FORMULAS

Often workers need to confidently perform calculations not only using whole numbers, decimals, ratios and fractions but also using formulas such as when calculating areas, volumes, dimensions and flow rates.

For example, carpenters use Pythagoras's theorem ($a^2 + b^2 = c^2$) to measure and double-check right angles. In the trade it's called the 3-4-5 rule. To achieve a square corner the carpenter will measure 300 mm from the corner and make a mark. On the opposite side of the corner, they will measure 400 mm from the corner and make a mark. To check if the corner is square they will then measure the distance between the two marks. If the distance is 500 mm, the corner is square.



Forestry workers may measure the length, average diameter and circumference of logs using measuring tools and then calculate the volume using the formula: $\pi r^2 h$

Plumbers may calculate the area of an elliptical water tank using the formula: V = H x W x 0.7854 x L

Machinists use formulas to calculate missing dimensions on drawings such as calculating the heights and angles on a triangular part and the circumference of circular parts

Boilermakers calculate the diameter of a steel wire needed to hold a certain load using the formula: $d = \sqrt{(w/8)}$

Tilers calculate job costs. For a room measuring 3 metres by 6 metres and charging $25 per square metre for the tiles and $25 per square metre for the labour the following formula is used: Total cost = 0.1 x length x width (labour + materials)

Fruit farmers may calculate the high volume application rate of pesticide using the formula: Litres/hectare = Tree row volume/1000 x Spray volume factor

Thinking about a workplace training project you are familiar with, what other formula examples have you encountered? Are you confident in your own numeracy skills to use formulas?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

DATA INTERPRETATION

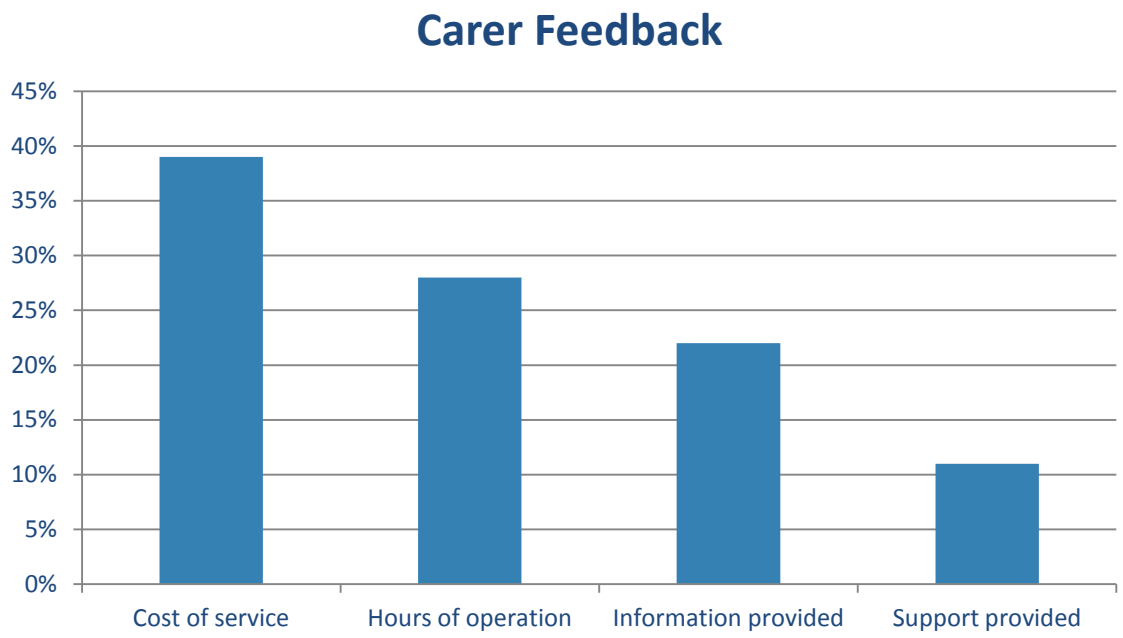
The ability to interpret mathematical data is essential to the workplace, particularly in problem solving and quality improvement.

For example, warehouse workers need to process inwards goods and may need to check quality certificates against quality specifications.

Here's an example of a quality certificate:

ABC Metals P/L **Certificate of Conformance**			
Job number	*672836*		
Part number	*BELT8973*		
Date of manufacture	*15/1/2011*		
Test	**Unit**	**Specification**	**Result**
Tensile strength	Mpa	15 min	*16.1*
Elongation at break	%	350 min	*502*
Abrasion	mm3	250 max	*198*
Conclusion	**I certify that this product has been manufactured in accordance with the required specifications.**		
Signature	*D. Gold*	**Date:**	*15/1/2011*

Often data interpretation can include a number of other numeracy skills. For example, a quality team at a disability service was given the task of analysing the feedback received from carers regarding how they think the service can be improved. The team sorts the feedback into a number of different categories and counts the total responses for each category and ranks the categories from largest to smallest. They then calculate the percentage and the accumulative percentage for each category and construct a Pareto chart.



An automotive mechanic checks the compression of four cylinders. If there is more than a 25% difference between the readings they must perform additional tests to assess cylinder leakage. They take the readings and calculate the range of acceptable readings by subtracting 25% from the highest reading. All the readings fit within the acceptable range and therefore they conclude that no further testing is required

Oil and gas workers monitor computer screens to see variations in readings on wire line units. These are shown in graph and schematic form

A machinist measures a part and identifies that an additional 0.45 mm needs to be removed. The machine controls are calibrated in inches and the machinist has to convert the measurement to inches

Laundry workers measure articles such as drapes and wool sweaters before and after cleaning to record the shrinkage data for the customer or to restretch the items to their original sizes

Thinking about a workplace training project you are familiar with, what other data interpretation examples have you encountered? Are you confident in your own numeracy skills to interpret data?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

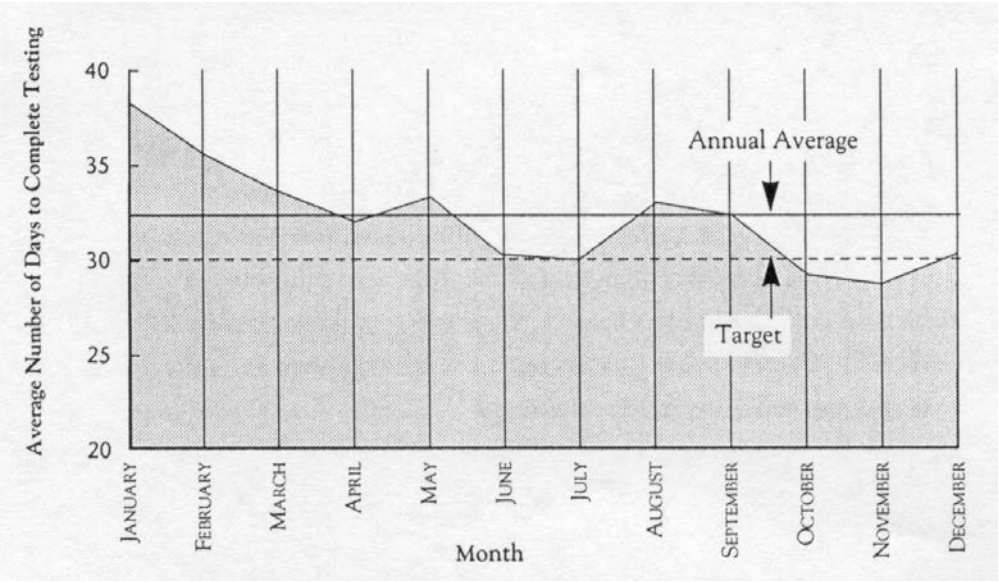
GRAPHS, CHARTS AND TABLES

In the workplace, numeracy information is represented not only as numbers and text but also as graphs, charts and tables.

For example, truck drivers calculate gas consumption and mileage using tables indicating average consumption for various types of vehicles. Truck drivers also use maps when driving.

Here are some typical examples:

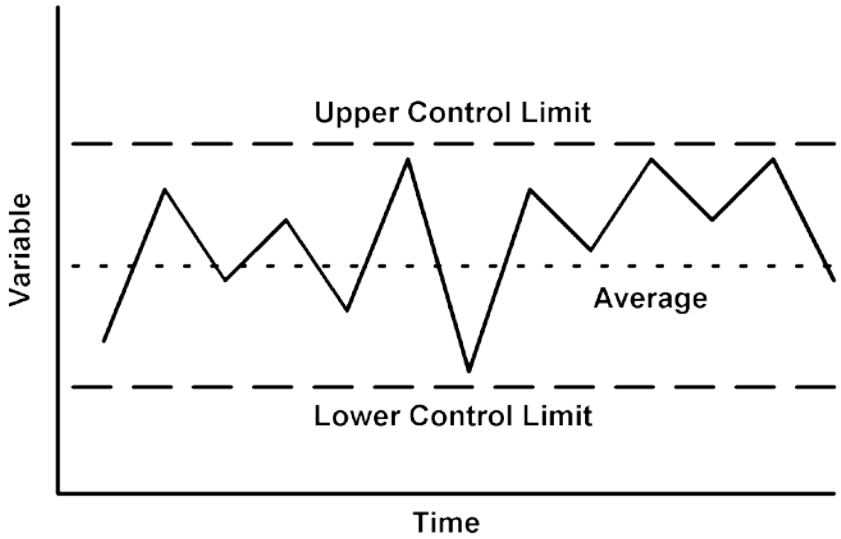
Run chart



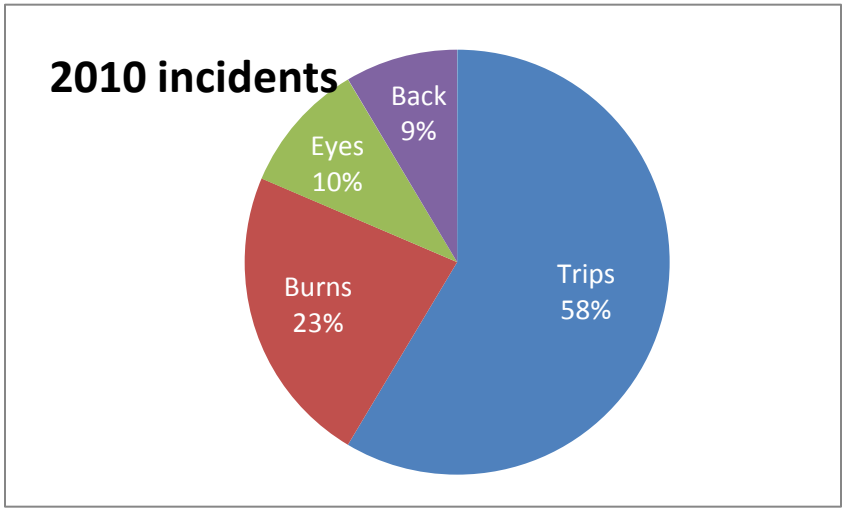
Table

Steel Sleeper Quality Specification	
Quality parameter	**Requirement**
Length	2500 mm to 2510 mm
Width (at base)	250 mm to 260 mm
Width (at seat)	150 mm to 160 mm
Depth	95 mm to 100 mm
Thickness (at shoulder)	7.5 mm to 10.0 mm

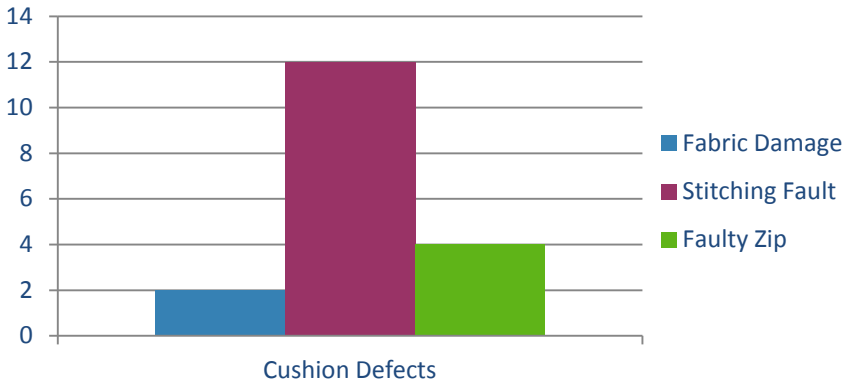
Statistical Process Control (SPC) chart



Pie chart



Bar chart



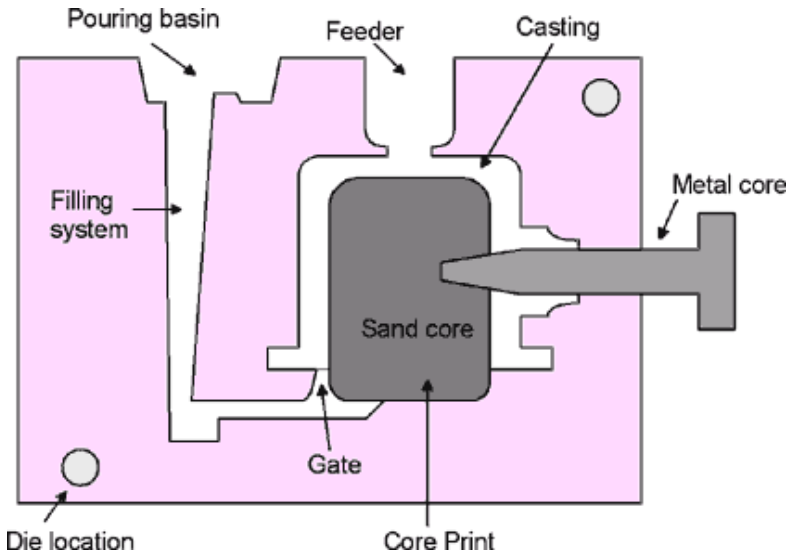
Thinking about a workplace training project you are familiar with, what other graph, chart and table examples have you encountered? Are you confident in your own numeracy skills to use graphs, charts and tables?

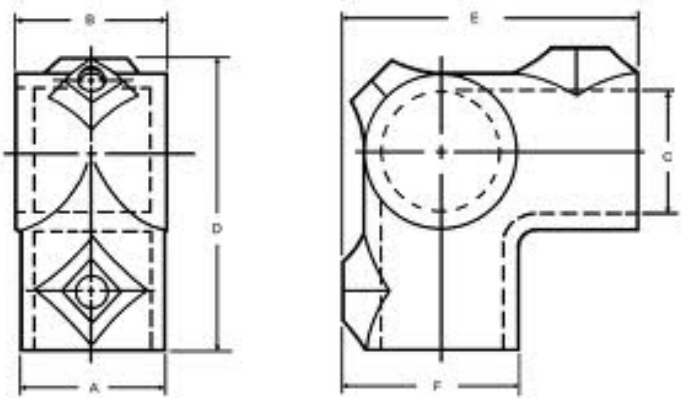
Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

SCALE DRAWINGS, PLANS AND DIAGRAMS

Many workers use drawings, plans and diagrams in their day-to-day jobs. For example, plumbers read plans and specifications and dressmakers read patterns.

Here's an example of a schematic of gravity die casting that a metal worker might use.





Machinists use very detailed pictures of what a product or component should look like, often from different angles like this one.

Thinking about a workplace training project you are familiar with, what other scale drawing, plan and diagram examples have you encountered? Are you confident in your own numeracy skills to use scale drawings, plans and diagrams?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

PATTERNS AND ANOMALIES WITH MEASUREMENT AND DATA

A worker needs to be able to look at mathematical data and recognise patterns and anomalies.

For example, a worker on a production line manufacturing plastic bottles uses statistical process control (SPC) to monitor the weight of the finished product. Every hour the worker measures the weight of five plastic bottles. The data is recorded on a form. The worker calculates the average and the range, and plots the values on a chart like the example below. The worker monitors the chart to identify patterns that indicate that there has been a real change in the process and an intervention may be needed.

Time		7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm
Weight (grams)	1	2.25	2.30	1.95	2.10	1.75	1.95	2.20	2.30	2.40
	2	1.85	1.90	1.65	2.15	2.20	2.00	1.65	1.70	1.90
	3	2.15	2.00	1.85	1.90	2.05	1.80	2.05	2.10	1.90
	4	1.80	1.90	2.05	2.05	1.90	2.10	1.90	1.90	2.10
	5	2.05	1.85	2.30	1.75	2.05	2.15	2.00	2.20	2.05
Sum		10.10	9.95	9.80	9.95	9.95	10.00	9.80	10.20	10.35
Mean		2.02	1.99	1.96	1.99	1.99	2.00	1.96	2.04	2.07
Range		0.45	0.45	0.65	0.40	0.45	0.35	0.55	0.60	0.50
Mean	**2.40**									
	2.30									
	2.20									
	2.10									
	2.00									
	1.90									
	1.80									
	1.70									
	1.60									
Range	**1.00**									
	0.80									
	0.60									
	0.40									
	0.20									
	0.00									

Dairy farmers monitor the reproductive cycles of cows and milk production to schedule the ideal time for breeding

Bakers analyse stock movement data to determine weekly and seasonal items to bake

Butchers compare the weights, lengths, temperatures and thicknesses of cuts of meat, poultry, fish and shellfish to specifications to verify that they meet quality standards

Production workers monitor operating conditions to ensure equipment is running within acceptable ranges, reporting problems or making adjustments as required

Quality assurance staff visually inspect products and identify shape anomalies

Machinists measure machined parts and compare them to measurements on scale drawings to ensure parts meet the specification

Thinking about a workplace training project you are familiar with, what other pattern and anomaly examples have you encountered? Are you confident in your own numeracy skills to recognise patterns and anomalies with measurement and data?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

COMMUNICATION OF MATHEMATICAL INFORMATION

Job tasks often involve the communication of mathematical information, both verbally and in writing.

For example, during a shift changeover on a production line, the outgoing operator may pass on information about scrap and downtime rates and concerns, processing conditions, product quality issues and estimated completion times.

Communication of mathematical information may include:

- Whole numbers, decimals, fractions and percentages
- Objects or pictures of objects
- Symbols
- Formulas
- Diagrams
- Charts and graphs
- Tables
- Maps
- Text

Homecare workers assist clients to develop the skills to manage a personal budget

Taxi drivers advise clients on the different ways to reach a destination with estimated travel times

Production managers meet with production teams to discuss performance against production targets

Childcare workers facilitate activities that introduce preschoolers to numeracy concepts

Administration staff schedule appointments for callers

Clerical workers deal with customer account balance queries

Thinking about a workplace training project you are familiar with, what other examples have you encountered? Are you confident in your own numeracy skills to communicate mathematical information?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

USE OF COMPUTERS AND TECHNOLOGY

Many workers use technology and computers to perform tasks requiring numeracy skills. Technology can range from using a basic calculator to using advanced testing equipment and customised computer programs.

Post office workers use scales to weigh parcels and process customer bills and banking requests

Couriers use GPS to navigate to their destinations and hand held devices to record deliveries

Meter readers read utility meters and accurately record the readings via hand held devices

Disability workers communicate with head office using mobile phones and email and record electronic case notes online using their home computers

Retail and hospitality staff use cash registers

Production team leaders enter production performance on a spreadsheet and produce charts for the employee noticeboard

Administration staff schedule appointments and book meeting venues using Outlook and Lotus Notes

Butchers weigh cuts of meat, measure freezer temperatures using thermometers and measure the lengths and girths of fish

Thinking about a workplace training project you are familiar with, what other computer and technology examples have you encountered? Are you confident in your own numeracy skills to use computers and technology?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

PROBLEM SOLVING AND DECISION MAKING

Many job tasks that involve problem solving and decision making use numeracy skills.

For example, forklift drivers have to be aware of mathematical concepts to drive safely. Forklifts have a 3-point suspension that forms the stability triangle. A forklift becomes unstable when the centre of gravity shifts outside the stability triangle, for example when there is an uneven load or when the driver makes an abrupt turn.

Retailers analyse sales data to draw conclusions about the types and quantities of stock to order

Production workers participate in an improvement team that designs, implements and analyses a survey of safety behaviours in the workplace

Couriers assess size and weight of a package before deciding on a lifting technique and which equipment to use

Truck drivers calculate the gross weight of a load and compare it to load limits to ensure that it is safe

Machinsists adjust their daily work schedule to accommodate changing priorities and disruptions and maximise workplace efficiency and customer satisfaction

Mental health workers assess client progress by comparing data from week to week

Electricians compare electrical resistance measurements to calculated values to identify fault locations

Farmers monitor the reproductive cycles of livestock to schedule breeding times

Extruder operators adjust process conditions and then weigh samples of extruded material and calculate average throughput rate

Team leaders compare and discuss changes and trends in performance data

Builders compare actual times with budgeted times to assess own productivity

Thinking about a workplace training project you are familiar with, what other problem solving and decision making examples have you encountered? Are you confident in your own numeracy skills to solve problems and make decisions?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

Review

This section provides an overview of numeracy in the workplace across a wide range of industries.

Take a few minutes to reflect on this section by answering these questions:

- *What did you learn?*
- *How does what you learnt relate to your practice?*
- *What actions will you take?*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

This contributes to the achievement of the following units of competency:

- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills
- TAELLN401A Address adult language, literacy and numeracy skills

If you think that you need to further develop your knowledge and skills in these areas, add these units of competency to your Professional Development Plan.

NUMERACY AND VET

The development of numeracy skills is supported through a range of Vocational Education and Training (VET) products and services. VET practitioners need to be familiar with and skilled in the use of these products.

TRAINING PACKAGES

Training packages specify the skills and knowledge required to perform effectively in the workplace. They comprise nationally endorsed components: units of competency, assessment requirements, qualifications and credit arrangements. Information about numeracy skills is found in the units of competency, assessment requirements and qualifications.

Units of competency specify the standards of performance required in the workplace. Assessment requirements specify the evidence and required conditions for assessment. Numeracy skills can be overt, such as the stand alone numeracy unit AURC251677A Use numbers in the workplace or MSAPMOPS101A Make measurements.

Numeracy skills can also be embedded and must be unpacked. VET practitioners need the skills to identify and unpack both the explicit and the implied numeracy skills in all sections of the unit.

Here's an example using a unit from MSA07 Manufacturing Skills Training Package:

MSAPMOPS100A Use equipment	**Possible numeracy skills and examples**
Description This unit covers the use of any item of equipment which is operated with limited application of knowledge.	Numeracy needed for 'operation with limited knowledge' of the particular equipment that the candidate uses For example, operating a compressor may require skills to read dials and indicators
Employability Skills This unit contains employability skills.	Numeracy included in the employability skills
Unit Sector: No sector assigned	

Elements	Performance criteria	
1. Follow workplace procedures	1.1 Find out what is required for the job 1.2 Identify and follow appropriate procedures 1.3 Complete all reporting as required 1.4 Recognise and report anything unusual	Numeracy (explicit and implied) found in the job requirements Numeracy (explicit and implied) found in procedures Numeracy needed to complete required reporting For example, reporting requirements may include start and finish times, number and percentage of faults, equipment readings
2. Monitor and use the equipment/ process	2.1 Turn the equipment on and off as required by procedure 2.2 Monitor equipment throughout the job using measurements, readings and senses as appropriate 2.3 Recognise deviations from standard/desired conditions 2.4 Take appropriate corrective action	Numeracy (explicit and implied) found in procedure for turning the equipment on and off Numeracy needed to monitor equipment Numeracy needed to recognise deviations Numeracy needed to take corrective action For example, monitoring may include reading dials and gauges, using measuring equipment, calculating averages and ranges, rounding numbers, charting results
Skills and Knowledge **Required skills:** Language, literacy and numeracy requirements. This unit has minimal literacy and numeracy requirements other than those required to start and stop the equipment and recognise common problems (e.g. reading gauges). **Required knowledge:** Minimal knowledge of the equipment and procedures but sufficient to recognise abnormal operating conditions and alert the appropriate individuals. Knowledge of organisation procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. Competence includes the ability for the practical completion of the job to:		Numeracy skills needed for the specific workplace context Numeracy needed to: • understand the equipment and procedures • recognise and report abnormal operating conditions • understand regulatory requirements • meet time constraints and work standards • meet safety requirements • recognise and take safe action • report information For example, workers may need to use equipment from different suppliers such as one compressor with an imperial gauge and one with a metric gauge

• **describe appropriate safety procedures concerning the operation of the equipment, procedures relating to the reporting of hazardous conditions, and appropriate shutdown procedures** • **recognise a situation requiring action and take the action specified in the procedures, and report the situation as specified in the procedures**	For example, meeting time constraints may include estimating job completion times For example, meeting safety requirements may include reading pressure gauges and understanding upper limits, lower limits and recognising trends
Range statement	
Context This competency applies to operators new to the job or operators at any level using equipment where significant understanding of the equipment or process is not required. It applies to any item of equipment which may be used in any sector. It may include: • **compressors (packaged plant)** • **refrigeration (packaged plant)** • **fans** • **blowers** • **other equipment with similar operating requirements**	Numeracy needed to operate specific equipment
Packaged plant Packaged plant includes all items of equipment which come in a 'ready to use' form, and are often skid mounted, portable or designed for use by untrained and inexperienced people.	Numeracy needed to operate specific equipment
Procedures All operations are performed in accordance with procedures. Procedures means all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.	Numeracy needed to follow workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards

Hazards Typical hazards include: • **rotating components** • **drive chains or belts** • **hot or cold equipment parts** • **dust, vibration, noise or fumes** • **oil spills** • **fuel leaks**	Numeracy needed to recognise hazards For example, workers may need to read temperatures to identify hot surfaces
Corrective action Taking appropriate corrective action includes reporting to the appropriate people or such other specific actions which have been previously defined for specific occurrences.	Numeracy needed to take corrective action For example, workers may need to report numeracy information such as equipment operating outside safe operating limits
Variables Key variables to be monitored include: • **equipment production outputs** • **equipment operating conditions** • **operating temperatures and pressures**	Numeracy needed to understand variables For example, equipment production outputs may include speed reading and calculations
Evidence guide	
Overview of assessment A holistic approach should be taken to the assessment. Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge.	Numeracy skills as defined by the elements, performance criteria and required skills and knowledge
Critical aspects for assessment and evidence required to demonstrate competency in this unit It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to: • **use the equipment for the specified purpose** • **operate the equipment within the**	Numeracy needed to meet critical aspects For example, workers may compare current operating conditions with previous results

prescribed operating limits

- **identify when the equipment is not operating as prescribed**
- **correctly monitor the equipment's operation**
- **report equipment malfunctions or problems according to procedures**

Consistent performance should be demonstrated.

For example, look to see that

- **standard procedures are followed**
- **deviations from desired conditions are recognised**
- **action specified in the standard procedures is carried out**
- **work is carried out safely**

Assessment method and context

Assessment will occur on an appropriate item of equipment and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- **on a processing plant allowing for operation under all normal and a range of abnormal conditions**
- **in a situation allowing the generation of evidence of the ability to respond to problems**
- **by using a suitable simulation and/or a range of case studies/scenarios**
- **through a combination of these techniques**

In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge, and theoretical assessment will be combined with appropriate practical/simulation or similar assessment. Assessors need to be aware of any cultural issues that may affect responses to questions.

Assessment processes and techniques must be

culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Specific resources for assessment

This section should be read in conjunction with the Range Statement for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Words that may help indicate possible numeracy requirements include:

- According to signs, codes and labels
- Adjust
- Allowance
- Calculate
- Check
- Collect data
- Compare
- Computations
- Convert
- Determine value
- Estimate
- Formula
- Interpret charts and graphs
- Levels
- Measuring techniques
- Monitor
- Tolerance
- Perform
- Proportion
- Requirement

(VETASSESS 2006; www.takingthelead.com.au/trigger-words)

Select a numeracy-specific competency and identify all the numeracy requirements. How confident are you that you have the skills to deliver training against that competency? How would you begin to deliver it?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

The Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice

The following has been taken from the User Guide for TAE70110 and TAE80110[1] (Innovation and Business Skills Australia 2010) available on the Innovation and Business Skills Australia website at www.ibsa.org.au and the TAE10 Training and Education Training package available at www.training.gov.au.

PURPOSE

The Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice (VGC), was developed by Innovation and Business Skills Australia (IBSA) to represent the skills and knowledge required to address the language, literacy and numeracy skills development of adult learners.

The course was developed in response to a need identified by the Australian Government for high quality, well trained adult language, literacy and numeracy VET practitioners. The new qualification, along with the higher level Vocational Graduate Diploma, is designed to provide standard national qualifications and professional development opportunities.

[1] In November 2012 TAE70110 was revised and updated to TAE70111. Then in August 2013 TAE was endorsed and TAE70111 was updated to TAE80113 Graduate Diploma of Adult Language, Literacy and Numeracy Practice. The new version was administrative only and included no changes to qualification content. Therefore, the User Guide is applicable to TAE70111 and TAE80113.

The qualification descriptor states:

> *This qualification reflects the roles of individuals who apply substantial specialised skills and knowledge in the field of language, literacy and numeracy practice. In these roles they make significant high level judgements to analyse, plan, deliver and evaluate specialised teaching functions with complex contexts.*

The VGC provides development of knowledge and skills to address the language, literacy and numeracy skills development of learners in a workplace, community or classroom setting. An outline of the qualification's structure is provided in the appendices.

TARGET GROUP

The VGC has been developed for a broad range of training contexts with a focus on delivery, including the following relevant to specialist numeracy training delivery in the workplace:

- Credentials for existing language, literacy and numeracy practitioners who may not have specific language, literacy and numeracy qualifications
- Skills refreshers for existing language, literacy and numeracy practitioners who may need specific skills for changing job requirements (such as an upgrade of numeracy skills or delivery to culturally and linguistically diverse learners)
- Professional development for existing language, literacy and numeracy practitioners who may want to shift their delivery practice from classroom to the workplace or vice versa
- Upskilling for practitioners wanting to move into literacy and numeracy teaching in VET from the schools sector
- An opportunity for vocational practitioners wanting to move from a vocational skill area into language, literacy and numeracy teaching to gain underpinning knowledge and skills
- Effective strategies to support vocational practitioners who want to better integrate language, literacy and numeracy skills development into their vocational training practice

NUMERACY CONTENT OF THE VGC

The content of the VGC recognises the importance of numeracy.

The Employability Skills Qualifications Summary for the VGC includes the following numeracy specific facets:

- Using formal and informal mathematical language, symbolic and diagrammatical representations and conventions of mathematics (Communication)

- Collecting, analysing and interpreting data using a variety of data collection methods (Problem solving)
- Identifying mathematical information and meaning in activities and texts (Problem solving)
- Solving a range of numeracy problems within adult contexts (Problem solving)
- Facilitating the learning of literacy and numeracy skills in diverse contexts (Initiative and enterprise)

VGC competencies also contain numeracy skills including two of the four core units:

- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills

The numeracy content of these competencies is extensive.

The unit, TAELLN702A Analyse and apply adult numeracy teaching practices, specifies the level of numeracy skills and knowledge a VET practitioner needs to apply effective adult numeracy teaching practices. This information can be found in the application of the unit and the applied knowledge.

> *Application of the unit:*
>
> *While most adult literacy and language course delivery will be at Australian Core Skills Framework (ACSF) levels 1 to 3, applications of numeracy in vocational contexts and within the community can often require ACSF level 4 or level 5 skills. An adult numeracy practitioner therefore requires skills and knowledge to deliver numeracy at a minimum of ACSF level 3.*
>
> *This unit aims to equip practitioners to analyse and apply numeracy teaching practices to a minimum of ACSF level 3. Numeracy teachers need to be aware of the limitations of their own mathematical skills and knowledge and may need to seek the assistance of a mathematics or technical specialist. They may also need to undertake professional development to increase their own skill levels for teaching contexts requiring numeracy beyond ACSF level 3.*
>
> *Applied knowledge:*
>
> *Mathematical knowledge as required for teaching purposes (minimum ACSF level 3):*
>
> - *data and statistics*
> - *measurement*
> - *quantity and number*
> - *space and location*

Mathematical knowledge to analyse and articulate a problem at ACSF levels 4 and 5, including to:

- *identify which operations are necessary*
- *give possible approaches without necessarily being able to successfully solve the problem*

This is an explanation of the intent of the unit provided during the consultation process by the developers:

This unit acknowledges that numeracy practitioners are not mathematics specialists and cannot be expected to have mathematical knowledge in all aspects at ACSF level 5. Nevertheless the unit is designed to 'upskill' practitioners' applied numeracy practices and covers mathematical knowledge at ACSF levels 1–3. It also contains an expectation that practitioners can recognise and speak about mathematics at levels higher than they can solve personally and can 'seek out expert help' from mathematics experts where appropriate. According to where the practitioner is working there will be differing demands on the level of numeracy they will be expected to apply, e.g. CSWE – lower levels, some vocationally specific applications – higher levels (Innovation and Business Skills Australia 2009).

The WELL Program

The WELL Program is an Australian Government funded initiative that has been operating continuously since it was first introduced as a result of the 1991 Australian Language and Literacy Policy.

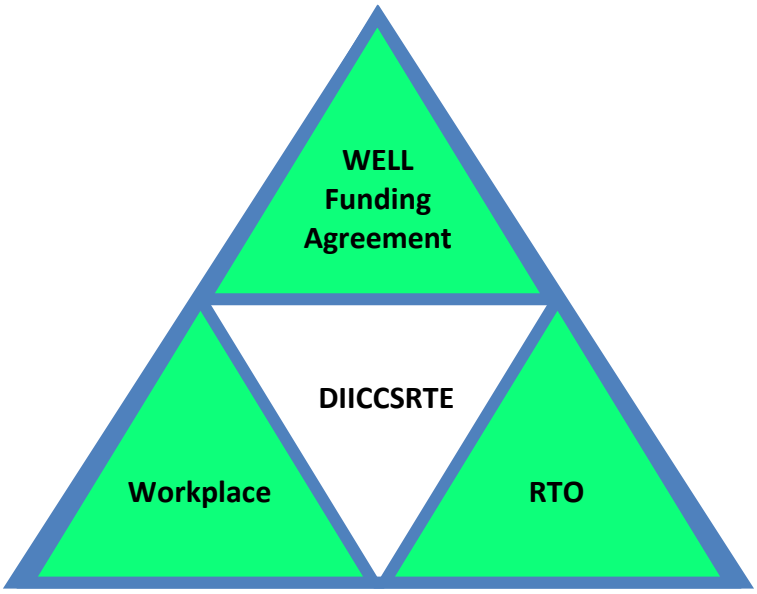
The WELL Program aims to:

- Assist existing employees to undertake training essential to retaining their employment and progressing in the workplace by integrating LLN training with vocational training delivered in the workplace
- Assist pre-employment Indigenous Employment Program (IEP) participants who require LLN training
- Assist employers to see the value of LLN training in achieving business and workplace training goals

Most WELL training projects are predominantly focused on the development of English language and literacy skills and not numeracy skills. Given what the research states about the critical

importance of numeracy, this is a serious concern. An exploration of the key players involved in WELL training projects helps shed light on where attention is needed to address this concern.

There are three key players involved in a WELL training project. They are the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICCSRTE), the workplace and the Registered Training Organisation (RTO).



The demand for numeracy skills development in industry is undisputed. As outlined previously in this resource, employers and the research indicate that numeracy is an area of increasing skills demand, even more critical than literacy skills.

The Australian Government recognises the importance of numeracy skills to the Australian economy and supports the development of numeracy skills in the workplace through the DIICCSRTE WELL Program. In the WELL Guidelines numeracy skills are equally as important as English language and literacy skills.

The WELL Guidelines state that:

> *Funding is available to all industry sectors for language, literacy and numeracy training integrated with vocational training, to help workers to meet their current and future employment and training needs (DIICCSRTE 2013).*

Despite this support WELL Coordinators and State Advisory Committee members report that they rarely see a numeracy focused WELL application.

The remaining player is the RTO, responsible for marketing and delivering WELL training projects. Research (Berghella, Molenaar et al. 2006; Berghella and Molenaar 2013) shows that most WELL practitioners are qualified and experienced in the development of English language and literacy skills, not numeracy skills. This is a reflection of the literacy workforce and is formalised in the recruitment selection criteria:

> *All managers said they required a teaching qualification in teaching English to speakers of other languages or adult literacy as well as the Certificate IV in Assessment and Workplace Training (Berghella, Molenaar et al. 2006).*

This bias towards English language and literacy teaching expertise is not unique to the WELL Program but a reflection of the language, literacy and numeracy workforce:

> *More often, numeracy and mathematics are taught within a broader program, e.g., a broader program of literacy. In many cases, the teachers may not have a background or extensive training in mathematics, may not be up-to-date on current practices in teaching mathematics, and may well have had difficulty with mathematics when they studied it (Dingwall 2000).*

The bias influences what an RTO is able to market and deliver in WELL training projects.

Consider a recent WELL training project that you are familiar with. What numeracy skills needs were identified and addressed? What numeracy skills needs may have been overlooked? Why? How could this be improved in the future?

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

THE ACSF

VET practitioners use the ACSF to assess and report on the LLN levels of learners and therefore must be skilled in its use across all five core skills including numeracy.

The following are the five ACSF numeracy indicators taken directly from the ACSF.

Level 1

1.09 Locates and recognises key mathematical information in simple activities or texts

1.10 Uses simple mathematical and personal problem solving strategies in highly familiar contexts

1.11 Uses everyday informal oral language or highly familiar written representation to communicate simple mathematical information

Level 2

2.09 Identifies and comprehends relevant mathematical information in familiar activities or texts

2.10 Selects and uses appropriate familiar mathematical problem solving strategies to solve problems in familiar contexts

2.11 Uses informal and some formal oral and written mathematical language and representation to communicate mathematically

Level 3

3.09 Selects and interprets mathematical information that may be partly embedded in a range of familiar, and some less familiar, tasks and texts

3.10 Selects from and uses a variety of developing mathematical and problem solving strategies in a range of familiar and some less familiar contexts

3.11 Uses a combination of both informal and formal oral and written mathematical language and representation to communicate mathematically

Level 4

4.09 Extracts and evaluates the mathematical information embedded in a range of tasks and texts

4.10 Selects from, and applies, an expanding range of mathematical and problem solving strategies in a range of contexts

4.11 Uses a range of informal and formal oral and written mathematical language and symbols to communicate mathematically

Level 5

5.09 Analyses and synthesises highly embedded mathematical information in a broad range of tasks and texts

5.10 Selects from, and flexibly applies, a wide range of highly developed mathematical and problem solving strategies and techniques in a broad range of contexts

5.11 Uses a wide range of mainly formal, and some informal, oral and written mathematical language and representation to communicate mathematically

(DIICCSRTE 2012)

Think about your numeracy skills compared with the ACSF levels. What level do you think you are? What level do you think you are confident training to? Complete the Numeracy Self Assessment Tool in the appendices if you haven't already.

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

Review

This section focuses on numeracy in the VET sector including selected VET products.

Take a few minutes to reflect on this section by answering these questions:

- *What did you learn?*
- *How does what you learnt relate to your practice?*
- *What actions will you take?*

Discuss this with a trusted peer or mentor and record any agreed actions in your Professional Development Plan.

This contributes to the achievement of the following units of competency:

- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills
- TAELLN401A Address adult language, literacy and numeracy skills

If you think that you need to further develop your knowledge and skills in these areas, add these units of competency to your Professional Development Plan.

APPENDICES

ACRONYMS

This resource uses the following acronyms:

ACSF	The Australian Core Skills Framework
ALLS	Adult Literacy and Life Skills Survey
AQF	Australian Quality Framework
DIICCSRTE	Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education
ICT	Information and Communication Technologies
IEP	Indigenous Employment Program
LLN	Language, literacy and numeracy
PD	Professional Development
RTO	Registered Training Organisation
VET	Vocational Education and Training
VGC	Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice
WELL	Workplace English Language and Literacy

WEBSITES

Important website references relevant to this resource are listed in the table below. For a more comprehensive list refer to the WELL practitioners' website.

Reference	Key content	Link
LiteracyNet, key information about Australian adult literacy activities and links to a range of additional programs, professional development, resource and research sites	WELL Program case studies WELL Program funded resources	www.innovation.gov.au/Skills/LiteracyAndNumeracy/LiteracyNet
The National Centre for Vocational Education Research (NCVER), Australia's principal provider of VET research and statistics	VET research and statistics A comprehensive list of VET terms and acronyms	www.ncver.edu.au www.voced.edu.au
The official National Register of information on Training Packages, qualifications, courses, units of competency and training providers	Training Packages Qualifications Courses Units of competency Training providers	www.training.gov.au
WELL practitioners' website	WELL resources Australian WELL Practitioners' Network WELL conferences and events	www.wellpractitioners.com.au

FURTHER READING

The resource draws on the following research and resources available to view at www.oggiconsulting.com/projects/numeracy/. These were current at the time the resource was published but things often change. Users are advised to access the most up-to-date information.

Australian Bureau of Statistics 2008, Adult Literacy and Life Skills Survey: summary results, ABS, Canberra

Australian Industry Group 2008, Skilling the existing workforce: final project report, Ai Group, Sydney

Berghella, T & Molenaar, J 2013, Seeking the N in LLN, NCVER, Adelaide

Berghella, T, Molenaar, J, et al. 2006, The professional development requirements of Workplace English Language and Literacy Programme practitioners, NCVER, Adelaide

Bynner, J & Parsons, S 1997, Does numeracy matter?: evidence from the National Child Development Study on the impact of poor numeracy on adult life, Basic Skills Agency, London

Coben, D 2003, Adult numeracy: review of research and related literature, NRDC, London

DIICCSRTE 2012, Australian Core Skills Framework. 5 Core Skills, 5 Levels of Performance, 3 Domains of Communication, DIICCSRTE, Canberra

DIICCSRTE 2013, Workplace English Language and Literacy Program. Program Guidelines for WELL Training Projects 06/2013, DIICCSRTE, Canberra

Dingwall, J 2000, 'Improving numeracy in Canada', viewed 14 January 2012, <http://www.nald.ca/library/research/nls/inpub/numeracy/improve/improve.pdf>

FitzSimons, G E, Mlcek, S, Hull, O & Wright, C 2005, Learning numeracy on the job: a case study of chemical handling and spraying, NCVER, Adelaide

Gal, I, van Groenestijn, M, et al. 2003, Adult numeracy and its assessment in the ALL survey: A conceptual framework and pilot results, Statistics Canada, Ottawa

Gleeson, L 2005, Economic returns to education and training for adults with low numeracy skills, NCVER, Adelaide

Hoyles, C, Wolf, A, Molyneux-Hodgson, S & Kent, P 2002, Mathematical skills in the workplace: final report to the Science, Technology and Mathematics Council, Institute of Education University of London & The Science, Technology and Mathematics Council, London

Innovation and Business Skills Australia 2010, User guide for TAE70110 and TAE80110, IBSA, Melbourne

Innovation and Business Skills Australia 2009, Targeted feedback on draft 2 of Vocational Graduate Certificate in literacy and numeracy practice and Vocational Graduate Diploma in literacy and numeracy leadership, IBSA, Melbourne

Marr, B & Hagston, J 2007, Thinking beyond numbers: learning numeracy for the future workplace, NCVER, Adelaide

McHugh, M 2008, 'Adult literacy in Australia: results from the 2006 Adult Literacy and Life Skills Survey.' Literacy Link **28**(1)

National Quality Council 2009, VET Products for the 21st century. Final report of the Joint Steering Committee of the NQC and the COAG Skills and Workforce Development Subgroup, TVET Australia, Melbourne

Oggi Consulting 2013, Numeracy in focus, DIICCSRTE, Canberra

Oggi Consulting 2013, Numeracy in practice, DIICCSRTE, Canberra

Parsons, S & Bynner, J 2005, Does numeracy matter more?, NRDC, London

Tobias, S 1993, Overcoming Math Anxiety, W W Norton, New York

Tout, D 2008, Response to COAG National Numeracy Review. Submission No. NNR 42, Centre for Adult Education (CAE), Melbourne

Townsend, R & Waterhouse, P 2008, Whose responsibility?: employers' views on developing their workers' literacy, numeracy and employability skills, NCVER, Adelaide

VETASSESS 2006 TAALLN401A Address language, literacy and numeracy issues within learning and assessment practice. Learner Guide, VETASSESS, Melbourne

Vocational Graduate Certificate in Adult Language, Literacy and Numeracy Practice structure

The Vocational Graduate Certificate (VGC) provides development of knowledge and skills to address the language, literacy and numeracy (LLN) skills development of learners in a workplace, community or classroom setting.

There are four core units:

- TAELLN701A Analyse and apply adult literacy teaching practices
- TAELLN702A Analyse and apply adult numeracy teaching practices
- TAELLN703A Develop English language skills of adult learners
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills

There are five elective units:

- TAELLN705A Design and conduct pre-training assessment of adult language, literacy and numeracy skills
- TAELLN706A Lead the delivery of adult language, literacy and numeracy support services
- TAALLN501A Support the development of adult language, literacy and numeracy skills
- TAEASS501A Lead and coordinate assessment systems and services
- TAEDES502A Design and develop learning resources

Learners must select two electives. At least one of the elective units must be selected from the elective units listed above. The second elective unit may be selected from the elective unit list or from any other currently endorsed training package or accredited course at Diploma, Advanced Diploma, Vocational Graduate Certificate or Vocational Graduate Diploma level.

Elective units are selected as relevant to current or future work outcome and local requirements. For example, a VET practitioner delivering a WELL funded training project might select:

- TAELLN705A Design and conduct pre-training assessment of adult language, literacy and numeracy skills
- TAELLN803A Formulate workplace strategy for adult language, literacy and numeracy skill development

Professional Development Plan

This Professional Development Plan is for VET practitioners and their managers to use to address their skills and knowledge gaps following self assessment.

Instruction

Thinking about the results of your self assessment, identify three professional development goals relevant to your role as a VET practitioner and develop an action plan to achieve each goal.

Professional development goal	Strategies to achieve this goal
1.	
2.	
3.	

NUMERACY SELF ASSESSMENT TOOL

ACSF NUMERACY LEVEL 1 SELF ASSESSMENT

This tool is designed to support your self assessment against ACSF numeracy level 1.

The self assessment questions are based on indicators and performance features. Answer the questions and identify your current skills and knowledge. List the evidence that supports your judgement. An item of evidence may be used for more than one question.

Please note that completing this self assessment is not the same as undertaking an actual numeracy assessment.

Questions	Indicator	Yes/No	Evidence and examples from day-to-day activities
I can locate and recognise simple, everyday mathematical information in highly familiar short and simple oral and/or written materials where the mathematics is highly explicit	1.09		
I can locate and recognise whole numbers and money into the 100s, and halves	1.09		
I can locate and recognise digital time, including AM/PM, and familiar dates	1.09		
I can locate and recognise familiar 2 dimensional (2D) shapes and objects such as triangles, squares and circles	1.09		
I can locate and recognise basic and familiar metric measurements and quantities	1.09		
I can locate and recognise simple and familiar oral directions	1.09		
I can locate and recognise simple data in highly familiar, simple graphs and tables	1.09		

Questions	Indicator	Yes/No	Evidence and examples from day-to-day activities
I can rely heavily on hands-on (concrete) and real-life materials, personal experience and prior knowledge to use one or two pieces of information in performing a simple mathematical process	1.10		
I can rely heavily on hands-on (concrete) and real-life materials, personal experience and prior knowledge to roughly check the reasonableness of the outcome(s) with support via prompting or questioning	1.10		
I can use personal, informal 'in-the-head' methods to calculate or use a calculator to calculate	1.10		
I can identify and use appropriate tools at a basic level in a limited range of applications, e.g. use a ruler to decide whether an item is longer than 10 cm or use a simple calculator to subtract two numbers	1.10		
I can understand place value and recognise and compare whole number amounts (into the 100s), halves and quantities, including money, in personally relevant contexts	1.10		
I can add and subtract simple whole number amounts (into the 100s) and familiar monetary amounts in personally relevant contexts	1.10		
I can recognise and compare familiar shapes and objects in relation to size and shape	1.10		

Questions	Indicator	Yes/No	Evidence and examples from day-to-day activities
I can recognise and compare familiar basic metric measurements and quantities such as length, mass, capacity/volume, time, temperature, e.g. personal height and weight, litre of milk or vehicle height clearances	1.10		
I can give and follow simple and familiar oral directions, including using highly familiar maps/diagrams	1.10		
I can compare information and data within highly familiar simple texts, lists, charts, diagrams and tables	1.10		
I can write numbers and monetary amounts into the 100s	1.11		
I can use common, everyday, informal language and gestures to convey numeracy-based information and processing, e.g. language of position such as *up, down, behind, right, left, over, through*; comparative language such as *taller, heavier, hotter, smaller*; language of shape, size, colour, such as *straight, curved, square, circle, triangle*	1.11		
I can use the simple and informal symbolism, diagrams and conventions relevant to the mathematical knowledge of the level, e.g. 57, $5.98, ½, +, –, 21/5/12	1.11		

ACSF NUMERACY LEVEL 2 SELF ASSESSMENT

This tool is designed to support your self assessment against ACSF numeracy level 2.

The self assessment questions are based on indicators and performance features. Answer the questions and identify your current skills and knowledge. List the evidence that supports your judgement. An item of evidence may be used for more than one question.

Please note that completing this self assessment is not the same as undertaking an actual numeracy assessment.

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can identify and interpret simple mathematical information in familiar and simple oral instructions and written texts where the mathematics is partially embedded	2.09		
I can identify and interpret whole numbers, including numbers into the 1000s, money and simple, everyday fractions, decimals and percentages, e.g. ¼, 1/10, 50%, 25% or 0.25	2.09		
I can identify and interpret analogue and digital time and dates	2.09		
I can identify and interpret common 2D shapes and some common 3 dimensional (3D) shapes, e.g. spheres or cubes	2.09		
I can identify and interpret familiar and simple length, mass, volume/capacity and temperature measures	2.09		
I can identify and interpret familiar and simple maps/street directories/plans	2.09		
I can identify and interpret familiar data in simple graphs and tables	2.09		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can rely substantially on hands-on (concrete) and real life materials, personal experience and prior knowledge to decide on an appropriate method of processing, using one or two familiar mathematical steps to solve the problem	2.10		
I can rely substantially on hands-on (concrete) and real life materials, personal experience and prior knowledge to make estimations and check reasonableness of processes and outcomes in relation to the context	2.10		
I can use personal and informal 'in-the-head' methods and pen and paper methods to calculate or use calculator/technological processes and tools to calculate	2.10		
I can identify appropriate tools and use them in familiar applications, e.g. use a familiar measuring instrument, such as a tape measure, to measure length in cm or record workplace data on a simple hand-held device	2.10		
I can identify and use whole numbers, including numbers into the 1000s, money and simple everyday fractions, decimals and percentages, e.g. ¼, $^1/_{10}$, 50% or 0.25	2.10		
I can perform a limited range of familiar and predictable calculations with the four operations (+, –, x, ÷) with division and multiplication related to small whole number values	2.10		
I am beginning to understand the order of the four arithmetical operations	2.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can order and group shapes and measurements, explaining any simple relationships or patterns, e.g. four-sided shapes or quantities from smallest to largest	2.10		
I can identify, draw and describe common 2D shapes and some common 3D shapes, e.g. sphere, cube or cylinder	2.10		
I can measure and estimate length, mass, capacity/volume, time and temperature, using simple instruments graduated in familiar units, e.g. cm, m, ml, °C or hours/min/sec	2.10		
I can use knowledge of direction and location (e.g. N, S, E, W or clockwise), including simple coordinates to read familiar and simple maps, street directories or plans	2.10		
I can order, where appropriate, and use familiar data to construct simple charts and tables based on provided scales and axes with graduations of 1s, 5s or 10s	2.10		
I can use a combination of mainly informal and some formal written mathematical and general language to represent the mathematical and problem solving process	2.11		
I can use a combination of mainly informal and some formal oral mathematical and general language to report on and discuss the mathematical and problem solving process	2.11		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use a combination of mainly informal and some formal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level, e.g. ¼, 1/10, 50%, 0.25, +, –, x, ÷, ml, °C, 16 cm, map reference D5, N, E	2.11		

ACSF NUMERACY LEVEL 3 SELF ASSESSMENT

This tool is designed to support your self assessment against ACSF numeracy level 3.

The self assessment questions are based on indicators and performance features. Answer the questions and identify your current skills and knowledge. List the evidence that supports your judgement. An item of evidence may be used for more than one question.

Please note that completing this self assessment is not the same as undertaking an actual numeracy assessment.

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can interpret and comprehend a range of everyday mathematical information that is embedded in familiar and routine texts	3.09		
I can interpret and comprehend whole numbers and familiar or routine fractions, decimals and percentages	3.09		
I can interpret and comprehend dates and time, including 24 hour times	3.09		
I can interpret and comprehend familiar and routine 2D and 3D shapes, including pyramids and cylinders	3.09		
I can interpret and comprehend familiar and routine length, mass, volume/capacity, temperature and simple area measures	3.09		
I can interpret and comprehend familiar and routine maps and plans	3.09		
I can interpret and comprehend familiar and routine data, tables, graphs and charts, and common chance events	3.09		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can draw on a combination of hands-on, in-context materials, personal experience, mathematical and other prior knowledge to select appropriate methods of solution from a limited range of mathematical processes	3.10		
I can draw on a combination of hands-on, in-context materials, personal experience, mathematical and other prior knowledge to use developing estimation, and other assessment skills, to check and reflect on the outcome and its appropriateness to the context and task	3.10		
I can use a blend of personal 'in-the-head' methods and formal pen and paper methods to calculate and use calculator/technological processes and tools to undertake the problem solving process	3.10		
I can select and use appropriate tools, hand-held devices, computers and technological processes, e.g. use a tape measure to measure the dimensions of a window in mm or create a personal weekly budget in a spreadsheet	3.10		
I can calculate with whole numbers and everyday or routine fractions, decimals and percentages, and where appropriate convert between equivalent forms (including dividing by small whole numbers only, with division by decimal values and long division worked out on a calculator; calculations with simple fractions are multiplication of whole number values only, e.g. 20% or 1/5 of $250)	3.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use and apply order of arithmetical operations to solve multi-step calculations	3.10		
I can use and apply rates in familiar or routine situations, e.g. km/hr, $/kg or $/m	3.10		
I can apply knowledge of properties of 2D and 3D shapes to describe and draw everyday objects, including constructing common 3D shapes	3.10		
I can measure, estimate and calculate length, perimeter, mass, capacity/volume, time, temperature and simple area (for rectangular areas only, using A = L x W, or estimate area of a non-rectangular shape by counting squares)	3.10		
I can identify and estimate common angles, e.g. as a rotation with a full turn = 360° and recognition of right angles as 90°	3.10		
I can convert between routine metric units by applying understanding of common prefixes, e.g. milli, centi or kilo	3.10		
I can use distance, direction, coordinates, simple scales, labels, symbols and keys to read and use everyday maps and plans	3.10		
I can collect and organise familiar data and construct tables, graphs and charts, manually or with spreadsheets, using simple and familiar or routine scales and axes	3.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can describe, compare and interpret the likelihood of everyday chance events (e.g. rolling a six on a dice or the chance of rain) using qualitative terms such as certain, likely, impossible and relate this to everyday or routine fractions, decimals or percentages	3.10		
I can use a combination of both informal and formal written mathematical language and symbols and general language to document and report on the mathematical and problem solving process and results	3.11		
I can use a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and results	3.11		
I can use a combination of both formal and informal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level, e.g. $^1/_{100}$, 12.25%, km/hr, $/kg, 1.25 m = 1250 mm	3.11		

ACSF NUMERACY LEVEL 4 SELF ASSESSMENT

This tool is designed to support your self assessment against ACSF numeracy level 4.

The self assessment questions are based on indicators and performance features. Answer the questions and identify your current skills and knowledge. List the evidence that supports your judgement. An item of evidence may be used for more than one question.

Please note that completing this self assessment is not the same as undertaking an actual numeracy assessment.

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can extract, interpret and comprehend a range of mathematical information that is embedded in relevant but possibly unfamiliar or non-routine texts	4.09		
I can extract, interpret and comprehend fractions, decimals and percentages, including their equivalent values	4.09		
I can extract, interpret and comprehend ratio, rates and proportions	4.09		
I can extract, interpret and comprehend positive and negative numbers	4.09		
I can extract, interpret and comprehend numbers expressed as powers, e.g. 2^3 or 3.6×10^3	4.09		
I can extract, interpret and comprehend routine formulae and algebraic representations and conventions	4.09		
I can extract, interpret and comprehend 2D and 3D shapes, including compound shapes	4.09		
I can extract, interpret and comprehend detailed maps and plans	4.09		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can extract, interpret and comprehend statistical data in complex tables and spreadsheets, graphs, measures of central tendency, simple measures of spread and common chance events	4.09		
I can draw on prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to represent the mathematical information in a form that is personally useful as an aid to problem solving, e.g. table, summary or sketch	4.10		
I can draw on prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to select appropriate strategies from an expanding range of mathematical processes	4.10		
I can draw on prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to use estimation and other assessment skills to check the outcomes and decide on the appropriate accuracy for the outcome	4.10		
I can draw on prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to reflect on and evaluate the mathematics used and the outcomes obtained relative to personal, contextual and real-world implications	4.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can flexibly use both 'in-the-head' methods and formal pen and paper methods to calculate and use technological processes and tools, including using a range of calculator or spreadsheet functions, e.g. memory on a calculator, formulae in a spreadsheet or software to undertake a problem solving process	4.10		
I can select and flexibly use a range of tools, hand-held devices, computers and technological processes, e.g. enter a set of statistical data into a spreadsheet and use it to calculate the mean and to plot an appropriate graph	4.10		
I can use and apply relevant ratio, rates and proportions, e.g. scales on maps and plans, in the mixing of chemicals or ingredients, or calculating magnification factors	4.10		
I can calculate with fractions, decimals and percentages and flexibly use equivalent forms; calculate with relevant positive and negative numbers; and use numbers expressed as roots and powers, e.g. $2^3 = 8$, $\sqrt{4} = 2$, $3.6 \times 10^3 = 3{,}600$	4.10		
I can develop, interpret and use routine formulae and algebraic representations and conventions that describe relationships between variables in relevant contexts, e.g. in sport, when considering the cost of repairs, in calculating routine area and volume, using Pythagoras's theorem or in using workplace formulae	4.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use knowledge about space and shape, including angle properties, symmetry and similarity to describe, draw or construct relevant common 2D and 3D shapes, such as compound shapes	4.10		
I can estimate, accurately measure and calculate quantities, including areas and volumes, using relevant routine formulae	4.10		
I can convert within the metric system and between metric and other relevant non-metric units	4.10		
I can use, calculate and interpret information based on maps and plans, including scales, bearings, travel distances, speeds and times and time zones	4.10		
I can collect, represent, summarise and interpret a range of types of statistical data appropriately in a variety of ways, e.g. tables, spreadsheets, graphs, plots, measures of central tendency (mean, median, mode) and simple measures of spread	4.10		
I can use knowledge about chance and probability to estimate and interpret the outcomes of common chance events in both numerical and qualitative terms	4.10		
I can use a combination of informal, but mostly formal, written mathematical and general language, including some specialised mathematical symbolism, abbreviations, terminology and representation to document, interpret and communicate the processes, results and implications of the mathematical activities or tasks	4.11		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use a combination of informal and formal oral mathematical and general language, including some specialised mathematical language and terminology, to discuss and explain the processes, results and implications of a mathematical investigation	4.11		
I can use a combination of informal but mostly formal mathematical symbolism, diagrams, graphs, algebraic representation and conventions relevant to the mathematical knowledge of the level, e.g. $A = 2\pi r$, $\sqrt{2}$, -5°C, 2:3 = 4:?, 2^3, 3.6×10^3	4.11		

ACSF NUMERACY LEVEL 5 SELF ASSESSMENT

This tool is designed to support your self assessment against ACSF numeracy level 5.

The self assessment questions are based on indicators and performance features. Answer the questions and identify your current skills and knowledge. List the evidence that supports your judgement. An item of evidence may be used for more than one question.

Please note that completing this self assessment is not the same as undertaking an actual numeracy assessment.

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can extract, comprehend and analyse a broad range of relevant mathematical information that is highly embedded in complex texts and, where necessary, gather additional mathematical information from other sources	5.09		
I can extract, comprehend and analyse a wide range of mathematical information related to number and algebra, measurement and geometry, and statistics and probability, including rational and relevant irrational numbers	5.09		
I can extract, comprehend and analyse a wide range of mathematical information related to number and algebra, measurement and geometry, and statistics and probability, including selected appropriate concepts and information from specialist areas of mathematics relevant to personal, study or workplace needs, e.g. trigonometry, statistics, geometry, linear and non-linear relationships, including parabolas, hyperbolas, circles and exponential functions, introductory calculus, matrices or vectors	5.09		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to organise and represent the mathematical information in an alternative, useful form as an aid to problem solving, e.g. a table, summary, algebraic representation or graph	5.10		
I can use prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to select appropriate methods of solution from an expanded range of processes	5.10		
I can use prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to use developed estimating and assessment skills to check the outcomes and decide on the appropriate degree of accuracy required	5.10		
I can use prior mathematical knowledge and experience, diagrammatic, symbolic and other mathematical processes to critically review the mathematics used and the outcomes obtained to reflect on and question the outcomes and real-world implications	5.10		
I can use a range of mathematical processes flexibly and interchangeably selecting from formal pen and paper and mental and technologically assisted processes and tools, such as scientific, graphics or CAS calculators for calculations, including using trigonometrical, statistical or algebraic functions	5.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can select and flexibly use a range of specialised tools, hand-held devices, computers and technological processes, e.g. use a CAS calculator to solve a pair of simultaneous linear equations	5.10		
I can calculate with rational and relevant irrational numbers	5.10		
I can use and solve a range of equations using a variety of algebraic techniques	5.10		
I can apply graphical techniques to analyse and solve algebraic relationships and equations, including the connections between formulae, their graphical representations and the situations they represent, e.g. linear, quadratic, exponential or inverse relationships	5.10		
I can use and apply knowledge about space and shape, including angle properties, symmetry and similarity to describe, draw or construct accurate 2D and 3D shapes and scale plans and drawings	5.10		
I can estimate, accurately measure and calculate quantities including for complex areas and volumes using measurement formulae	5.10		
I can convert between a range of metric and non-metric units	5.10		
I can collect, organise and analyse data, including grouped data, using measures of central tendency, percentiles and measures of spread, and interpret and draw conclusions about trends and data reliability	5.10		

Questions	Indicator	Yes/No	Evidence and examples from your day-to-day activities
I can use and apply knowledge about probability to a range of relevant contexts (e.g. sporting events) calculate theoretical probabilities and use tree diagrams to investigate the probability of outcomes in simple multiple event trials	5.10		
I can use a combination of formal, written specialised mathematical and general language and representation to document, interpret and communicate the mathematical thinking, problem solving processes, outcomes and implications of the mathematical investigation	5.11		
I can use a combination of oral specialised mathematical and general language to discuss, explain and interpret the processes, results and implications of the mathematical investigation	5.11		
I can flexibly use a combination of specialised formal and general mathematical symbolism, diagrams, algebraic representation, graphs and conventions relevant to the mathematical knowledge of the level, e.g. Sin60° = √3/2, $V = \pi r^2 h$, $x = \frac{-b \pm \sqrt{b2-4ac}}{2a}$	5.11		