

Numeracy In Practice

BUILDING WORKPLACE NUMERACY
PROFICIENCY AND TRAINING SKILLS
OF VET PRACTITIONERS

A Professional Development Resource

GUIDE

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ABOUT THIS RESOURCE

WHAT IS IT?

This is a professional development resource. It builds vocational education and training (VET) workforce capacity building to better meet the numeracy skills needs of adults in the workplace.

The resource was developed in response to a National Centre for Vocational Education and Research (NCVER) report titled *Seeking the N in LLN* (Berghella and Molenaar 2013). This report is available for download at www.ncver.edu.au.

The resource is a companion resource to *Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace*. Both this resource and Numeracy in Focus are available for download from the WELL practitioners' website at www.wellpractitioners.com.au and the developer's website at www.oggiconsulting.com.au/resources.

The resource supports the competencies that VET practitioners need to:

- Assess and strengthen their own workplace numeracy proficiency skills
- Deliver workplace numeracy skills training
- Use the [Australian Core Skills Framework](#) (ACSF) in relation to the numeracy core skill

It assumes that the user has:

- Access to and a basic understanding of the purpose and structure of the [ACSF](#)
- Experience in workplace training delivery using adult learning principles

Working through this PD resource will position you to better support your learners.

The resource draws on research and resources available to view at www.oggiconsulting.com.au/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 to review and strengthen their own skills and help them to be more responsive to the numeracy skills needs of their learners in the workplace.

The roles and responsibilities of individuals involved in workplace numeracy assessment and delivery vary. Vocational specialists, language and literacy specialists, numeracy specialists and employers are all potential users of this resource and will need to adapt the resource to their own job role and work context.

WHY USE THIS RESOURCE?

VET practitioners need to be aware of their own workplace numeracy skills and need to implement strategies to address identified skill gaps. The 2013 NCVET report [Seeking the N in LLN](#) found that many VET practitioners may lack the numeracy proficiency skills and the adult numeracy training skills needed to effectively meet the numeracy skills needs of Australian workers. Engaging fully with this resource is one possible approach to addressing identified skill gaps.

The benefits of using this resource include:

- Raised awareness of the importance of numeracy skills in the workplace
- Increased VET practitioner confidence in using the [Australian Core Skills Framework](#) (ACSF) in relation to the numeracy core skill
- Strengthened VET practitioner workplace numeracy proficiency skills
- Increased understanding of specialist adult numeracy pedagogies
- Increased responsiveness to the numeracy skills needs of workers
- Reduced VET practitioner reluctance to assess and teach numeracy skills in the workplace
- Increased VET practitioner skills to complete formal training such as:
 - 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)
- Evidence of professional development for Registered Training Organisation (RTO) audits, Recognition of Prior Learning (RPL) and formal equivalence

Working through this PD resource will not make you a numeracy specialist but it will help you to better support your learners.

WHAT IS INCLUDED?

The resource comprises a Guide, a Numeracy Proficiency Assessment Tool – Process Manufacturing Industry, and six Snapshots.

Note: The information and activities in the resource are generically relevant to all VET practitioners working across all industries.

The [Guide](#) provides an overview of the importance of numeracy skills needs in the workplace, professional development guidance for developing the skills needed to effectively deliver workplace numeracy skills and an overview of the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry.

The [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) is a collection of 24 questions that VET practitioners can use to assess their numeracy proficiency skills in the context of the process manufacturing industry.

It is strongly recommended that VET practitioners undertake an upfront numeracy assessment using the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry or another assessment tool used to assess numeracy proficiency skills listed in the Guide. By this process they will learn something about themselves and be better prepared to prioritise their professional development needs.

The [Snapshots](#) provide detailed guidance to support the skills needed to effectively develop and deliver workplace numeracy skills relevant to six selected questions from the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry.

Topics covered in the Snapshots include:

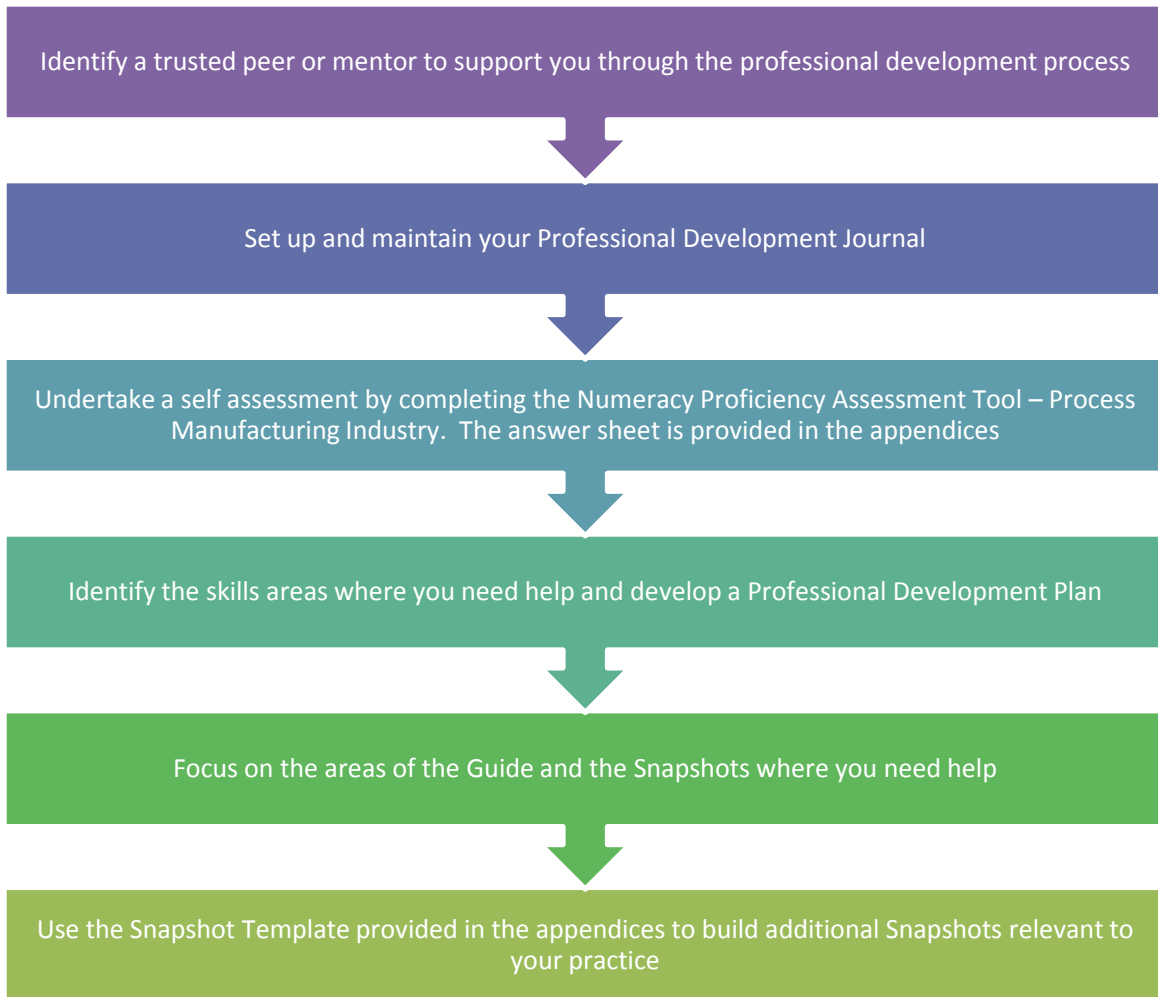
- Reading instruments
- Using ratios and metric conversions
- Using rates and performing time calculations
- Measuring length
- Calculating quantities
- Reading specifications

A Snapshot template is provided in the appendices of the Guide. VET practitioners are encouraged to use the template to build their own Snapshots for other questions found in the

[Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) and for numeracy problems encountered in their practice, contextualised to the industries they work in.

HOW CAN IT BE USED?

It is suggested that this resource is used in the following way:



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 the dashed line boxes like this one and the group activities provided in the appendices.

PROFESSIONAL DEVELOPMENT

This section is for raising awareness of the skills needed to effectively develop workplace numeracy skills. This section helps VET practitioners to identify their strengths and limitations and develop a plan to address skills gaps.

This section helps you as a VET practitioner to identify your strengths and limitations and develop a plan to address your numeracy related skills gaps – this is not only about your own numeracy capability, but also about supporting your learners.



Describe your own role in numeracy skills development in the workplace and where you want to be.

Discuss with a trusted peer or mentor how this relates to what you do.

ABOUT MATHS ANXIETY

Many people, including VET practitioners, suffer from maths anxiety. Maths anxiety is a common condition that makes it difficult for a person to access their working memory and think logically, affecting their performance as a learner and their attitude towards maths.

Working through this PD resource will give you insight into how a learner might feel about, and respond to, you supporting them in addressing maths anxiety.

Maths anxiety in practice ...

Many VET practitioners in the [Seeking the N in LLN](#) numeracy assessments reported experiencing feelings of maths anxiety. For example, one participant pulled out of the research upon seeing the assessment tool and without attempting any questions because they were experiencing heart palpitations.

Maths anxiety is reinforced by negative thinking patterns and behavioural avoidance.



Think about your own negative thinking patterns in relation to numeracy (for example, 'I can't do maths').

Think about your own behavioural avoidance strategies in relation to numeracy (for example, focusing on literacy at the expense of numeracy learner skills needs).

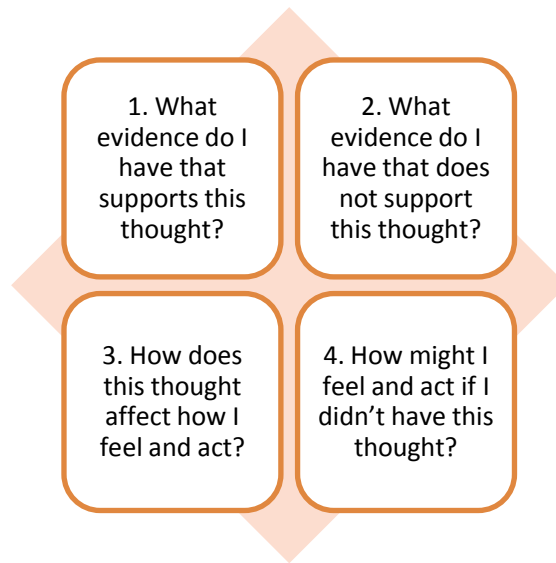
Discuss with a trusted peer or mentor how this relates to what you do.

STRATEGIES TO BREAK THE VICIOUS CYCLE

Self monitoring, where an individual keeps a journal of their thoughts and feelings in relation to maths, can be used as an effective strategy in reducing maths anxiety. For example, the thought 'I can't do maths' can lead to feelings of anxiety in anticipation of doing maths, which can lead to poor performance and avoidance. Capturing the thoughts and recognising that it is flawed thinking can help to break the vicious cycle of negative thinking patterns and behavioural avoidance.

A two person training team consisting of an LLN specialist and a vocational trainer toured a factory as part of their orientation. At the leading hand station they were shown the types of reports that leading hands and workers had to routinely complete. These included Statistical Control Charts and daily production sheets. On seeing the reports one of the VET practitioners observed anxiously, 'It's all numbers, I'm no good at maths, don't show me anymore.'

Socratic questioning can be used to evaluate negative thinking patterns. The questions are:



Socratic questioning is a powerful tool for critical thinking across a range of disciplines. Research how to make the best use of the technique to challenge your own assumptions, and how to use it as a teaching tool.


Discuss with a trusted peer or mentor how this relates to what you do.

The following is an example of a Professional Development Journal and Socratic questioning.

| Date | Record |
|--------|--|
| 1/2/13 | Attempted a ratio calculation. As soon as I sat down to do it my mind went blank – do I multiply or do I divide? There's no way I'm going to be able to do this. I'm hopeless at maths. This is a waste of time. Gave up. |
| 2/2/13 | Discussed with mentor and identified three thoughts that made me so anxious I gave up. These are: There's no way I'm going to be able to do this. I'm hopeless at maths. This is a waste of time. Action: Do Socratic questioning on all three thoughts. |

| Date | Record |
|--------|--|
| 3/2/13 | <p>Socratic questioning of 'I'm hopeless at maths'.</p> <p>What evidence do I have that supports this thought?</p> <p style="padding-left: 40px;">This is obvious, I couldn't do the problem and I've never been able to do it.</p> <p>What evidence do I have that does not support this thought?</p> <p style="padding-left: 40px;">Well, I do manage my day-to-day life and work, managing budgets and planning and organising events. When I think about it, I do maths every day. I just don't think of it as maths.</p> <p>How does this thought affect how I feel and act?</p> <p style="padding-left: 40px;">I feel really stupid and disappointed and I don't want to do it. Never have.</p> <p>How might I feel and act if I didn't have this thought?</p> <p style="padding-left: 40px;">I probably still wouldn't like maths but I might not feel so bad. Hey, I might even have a go.</p> |

A Professional Development Journal Template is provided in the appendices.

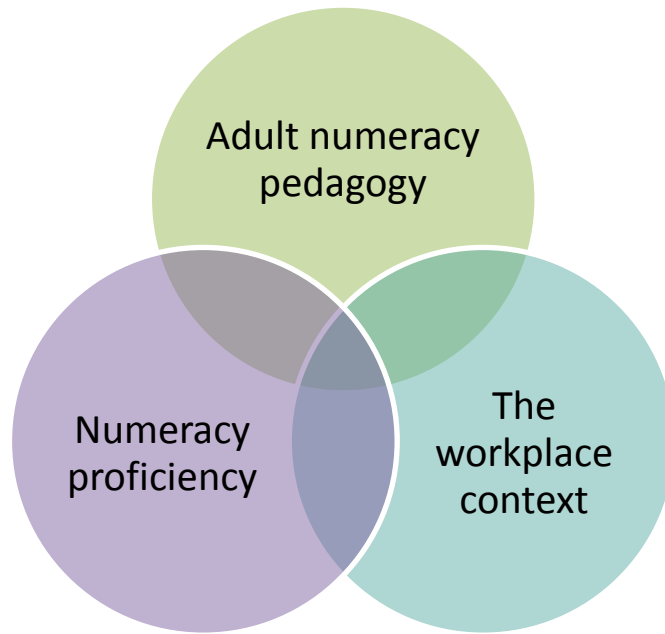


Use a Professional Development Journal to record your thoughts and feelings about maths. Use Socratic questioning to evaluate the thoughts.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

VET PRACTITIONER SKILLS REQUIREMENTS

To deliver effective workplace numeracy training, VET practitioners need to have strong numeracy proficiency and adult numeracy pedagogical training, and an in-depth understanding of the workplace context.



ADULT NUMERACY PEDAGOGY

VET practitioners need specialist teaching skills and knowledge to effectively support adults to develop numeracy skills. For example, maths anxiety is thought to originate from negative school experiences, which has implications for adult numeracy pedagogy.

THE WORKPLACE CONTEXT

VET practitioners need an in-depth understanding of the workplace context because workplace numeracy skill demands are highly context specific. For example, numeracy is used in the workplace for a specific purpose, the achievement of business goals.

NUMERACY PROFICIENCY

VET practitioners with a deep level of numeracy skills and knowledge can best challenge and engage learners while instilling a positive attitude towards mathematics.



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.

Read the NCVET report [Seeking the N in LLN](#) to gain a fuller understanding of the possible gaps in VET workforce capacity in relation to addressing existing worker numeracy skills needs.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

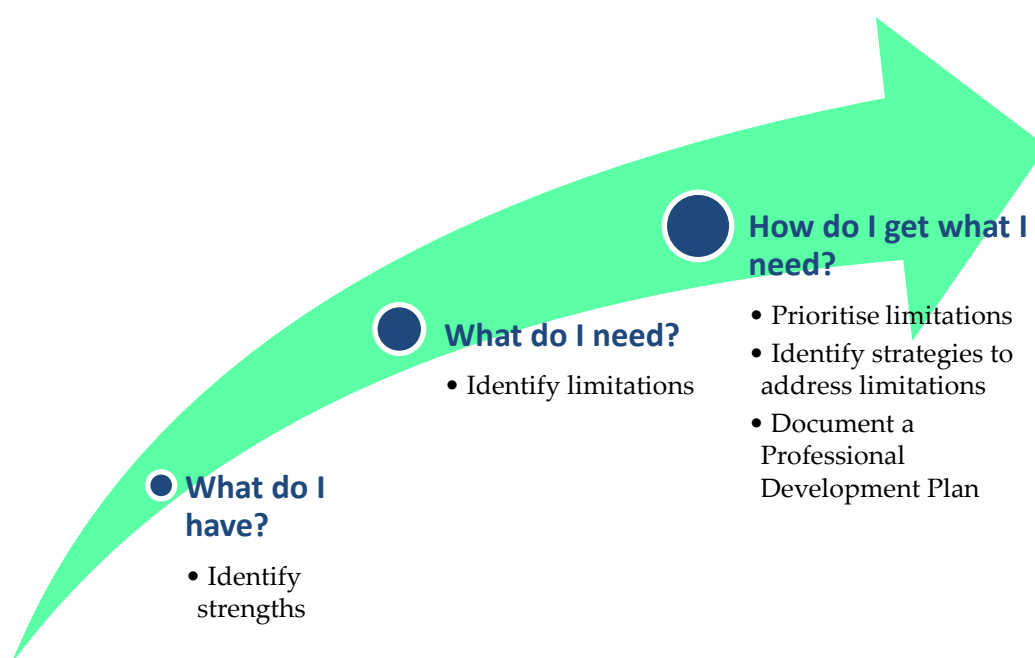
SELF ASSESSMENT

Undertaking a self assessment identifies strengths and limitations. Individuals can then work to their strengths and manage their limitations by undertaking professional development or seeking appropriate help.

Working through this PD resource will support you to confirm and strengthen your understanding of the workplace context.

Helpful self assessment questions include:

- What competencies do I have that support others to develop numeracy skills in the workplace?
- What limits my capacity to support others to develop numeracy skills in the workplace?
- What do I need to do to address my limitations?



PERFORMANCE STAGE EVALUATION

Core Skills for Work Developmental Framework (DIISRTE and DEEWR 2013) describes five generic descriptions of stages of performance, informed by Dreyfus and Dreyfus's Novice to Expert Model of Skill Acquisition, which can be used to evaluate the performance stage of VET practitioners across the three skills areas of numeracy proficiency, adult numeracy pedagogy and the workplace context.

The stages of performance are:

| Stage | Description |
|---|---|
| Stage 1 A novice performer | <p>Has little or no practical experience of the Skill Area on which to base actions</p> <p>Is highly reliant on explicit 'rules' (e.g. instructions, processes, procedures, models), guidance and support and priorities determined by others, to guide activities</p> |
| Stage 2 An advanced beginner | <p>Has some practical experience of the Skill Area and is beginning to recognise patterns (e.g. routines, regular responses, links and connections) that help understanding and influence action</p> <p>Is still reliant on explicit 'rules' and on assistance to identify priorities, but can apply these more autonomously in familiar, routine situations</p> |
| Stage 3 A capable performer | <p>Has sufficient practical experience of the Skill Area to identify patterns and organising principles and establish priorities for action</p> <p>Can comfortably apply the explicit and implicit 'rules' associated with familiar situations</p> <p>Adopts a systematic, analytical approach to tasks, especially in unfamiliar situations</p> |
| Stage 4 A proficient performer | <p>Has considerable practical experience of the Skill Area in a range of contexts and is moving from reliance on externally prescribed rules to recognition of principles that guide actions</p> <p>Organises knowledge and practical experience as patterns, concepts and principles, which makes it possible to assess, and respond to situations in an increasingly intuitive and flexible way</p> <p>Reverts to analysis and seeks guidance when making important decisions</p> |
| Stage 5 An expert performer | <p>Has extensive practical experience of the Skill Area, with both a big picture understanding and an eye for relevant fine detail</p> <p>Operates fluidly, intuitively and flexibly in highly complex situations, drawing on knowledge and practical experience organised into highly refined patterns, concepts and principles</p> <p>Uses a combination of informed intuition and analysis in different situations, recognising that 'it all depends'</p> <p>Will often reconceptualise approaches and practices to produce more effective outcomes, while also recognising which rules and principles are always applicable</p> |



Reflect on each of the scenarios below and using [Core Skills for Work Developmental Framework](#) identify the performance stages that you think you would need to effectively support the learners in relation to numeracy proficiency, numeracy pedagogy and workplace context.

- First year apprentice electricians needing support to read wiring diagrams
- Cleaning staff needing support to complete their time sheets
- Board members needing support to interpret and present financial information
- Nursing staff needing support to mentally calculate drug dosages on the ward
- Drivers needing support to comply with heavy vehicle driver fatigue laws
- Small business owners needing support to complete Business Activity Statements

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Think about a workplace training project that you are familiar with. What performance stages of numeracy proficiency, numeracy pedagogy and workplace context do you think you need to effectively support the learners?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

ASSESSING ADULT NUMERACY SKILLS

Adults are notoriously unreliable at judging their own numeracy skill levels because they tend to both underestimate and overestimate their numeracy skills.

On the one hand adults often have a low self-awareness of their own numeracy skills because they tend to use effective survival strategies and live a productive life. Adults often 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 homework.

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

Therefore it is always important to conduct an actual numeracy assessment to determine the numeracy skills level of an adult.



Have you ever tried to judge your own numeracy skills? Complete the self assessment tool provided in the appendices in [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

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](#)

Working through this PD resource will support you to confirm and strengthen your own numeracy skills.

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).



Are you aware of any other numeracy assessment tools that can be used by VET practitioners? Research what is available using the internet or by contacting an Industry Skills Council. What are the strengths and weaknesses of the assessment tools in the areas of numeracy proficiency, numeracy pedagogy and workplace context skills and knowledge?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

ABOUT THE NUMERACY PROFICIENCY ASSESSMENT TOOL – PROCESS MANUFACTURING INDUSTRY

The [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) is used to assess the numeracy proficiency skills of VET practitioners. It was developed for the 2013 NCVET report [Seeking the N in LLN](#).

The [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) is provided separately. The answers to the questions are provided in the appendices in this [Guide](#).



If you haven't already done so, complete the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#). Allow up to 45 minutes and make sure that you have all the necessary equipment before you start. Commit to completing what you can in one sitting, without looking at the answers.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Find out more about how the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry was developed by reading the [Seeking the N in LLN Support Document](#) (Berghella and Molenaar 2013). What are the strengths and weaknesses of the tool?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Compare your self assessment using [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#) against your assessment using the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#). How well did you judge your own numeracy skill levels?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

DEVELOPING A PLAN

Use the results of the self assessment to document a Professional Development Plan. A Professional Development Plan Template is provided in the appendices.

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 | Outcomes |
|---|--|----------|
| 1. Deal with my own numeracy anxieties | Maintain a PD Journal | |
| 2. Increase awareness of workplace numeracy needs | Work through Numeracy in Focus | |
| 3. Learn how to use percentages | Identify an example of using percentages in the workplace and build a Snapshot | |

REVIEW

This section focuses on the skills VET practitioners need 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 with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

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

- TAE10702A Analyse and apply adult numeracy teaching practices (TAE10 Training and Education Training Package)



If you think that you need to further develop your knowledge and skills in this area, add this unit of competency to your Professional Development Plan.

WORKPLACE NUMERACY SKILLS NEEDS

This section provides a brief overview of numeracy skills needed in the workplace highlighting its importance and the VET sector's response.

DEFINING NUMERACY

There is no accepted definition of numeracy. However, it is generally agreed that numeracy involves the use of mathematical skills in real life, the use of mathematical skills towards achieving a goal, and the ability to communicate about mathematical ideas ([Tout and Schmitt 2003](#)).

The [ACSF](#) describes numeracy as:

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 (Johnston 1995, Tout & Schmitt 2002, Gal et al 2009).

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 results. (DIICSRTE 2012)

IMPORTANCE OF CONTEXT

The context of numeracy is very important and the transfer of numeracy skills between different contexts cannot be assumed. For example, consider the following examples of using algebraic skills in a learning environment, the community and the workplace:

| Learning environment | Community | Workplace |
|--|--|--|
| Solve for x where $x^2 + 3x = 8x - 6$ | How long will it take to clear a debt of \$3000 if allocating \$80 per week? | How many bags of sand are needed to fill in a cylindrical hollow that is 1 metre deep and 2 metres wide? |

Numeracy considered 'basic' in a learning environment is not basic in a workplace where schedules must be adhered to, customers must be satisfied and specifications must be met. For example, consider a packer who is required to keep a tally of the number of items produced. In a learning environment this is a simple counting exercise. However, in the workplace a counting error can result in under- or overproduction, disrupted workflow and unmet customer orders.

Numeracy in the workplace is often hidden in job tasks and goes unnoticed until something goes wrong. Consider a spreadsheet used to tally up the end of day results. A computer failure or software error may mean that the results must be calculated manually or the formulas must be re-entered into the spreadsheet. Only when there is a problem is the extent of the numeracy embedded in the job task revealed.



Increase your awareness of numeracy in the workplace by reviewing the examples provided in [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

WORKPLACE NUMERACY SKILLS NEEDS

More than half (53%) of Australian adults and 40% of employed adults lack the numeracy skills needed to cope with everyday life and work ([Australian Bureau of Statistics 2008](#)).

Numeracy skills demands at work are increasing at all job levels, driven by globalisation, growing competition, changing technologies and increasing industry requirements. This has significant implications for VET practitioners in relation to their own job role and in relation to supporting employees to develop workplace numeracy skills.



For more detailed information about adult numeracy skills needs access Australian Bureau of Statistics 2008, [Adult Literacy and Life Skills Survey: summary results, cat.no. 4228.0](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Reflect on how the numeracy skills demands of your own job role have changed.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

WHY WORKPLACE NUMERACY IS IMPORTANT

Adult numeracy skills are a key economic driver influencing both labour force participation and wage levels.

Studies from around the world have shown:

- Adult numeracy levels are lower than adult literacy levels ([Australian Bureau of Statistics 2008](#))
- Numeracy matters more than literacy (Bynner and Parsons 1997)
- Numeracy matters more for women ([Parsons and Bynner 2005](#))
- Numeracy learners have more negative school experiences than literacy learners ([Dingwall 2000](#); [Marr and Hagston 2007](#))
- Workplace numeracy demands are increasing ([Dingwall 2000](#); [Australian Industry Group 2008](#))
- Workplace numeracy has significant complementary skills demands that are context specific ([Dingwall 2000](#); [Marr and Hagston 2007](#))
- Numeracy in the workplace is often invisible ([FitzSimons, Mlcek et al. 2005](#); [Marr and Hagston 2007](#))
- Numeracy in VET products¹ is often invisible ([National Quality Council 2009](#))
- Workplace numeracy is not the same as classroom numeracy ([Hoyles, Wolf et al. 2002](#); [FitzSimons, Mlcek et al. 2005](#))
- Workplace numeracy involves a range of numeracy and mathematics skills ([Marr and Hagston 2007](#))
- Fear and lack of numeracy confidence can be significant barriers to learning ([Coben 2003](#); [Marr and Hagston 2007](#))
- Numeracy and literacy skills are entwined ([Townsend and Waterhouse 2008](#))



Update your understanding of international research into the importance of numeracy skills by reading the summary of the latest research findings in [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

¹ VET products include both training packages and accredited courses.

Lack of numeracy confidence as a barrier ...

Training support to help key workers at a mental health service adopt a new service delivery model was progressing well with one sticking point. The staff were refusing to calculate and record goal attainment scores. The staff said that scoring was stressful for their clients and in some cases increased the risk of a dangerous relapse. Management took these concerns seriously and considered removing the scoring requirement.

The trainer knew that maths anxiety is a common condition and thought that staff might be feeling uncomfortable with the numeracy skills demands of the scoring. She scheduled a group training session and asked the staff to put aside their concerns about the clients and concentrate on learning how to do the scoring for one hour. After that, the trainer assured them, they would be given an opportunity to voice their concerns.

In the one hour session the trainer explained what the scores meant, demonstrated how to calculate the scores and then asked the staff to practise calculating the scores, first in small groups and then independently. At the end of the session all staff were confidently calculating the scores. When the trainer invited staff to express their concerns there were none. The staff agreed to use the scores in their day-to-day work with clients from that day on.

NATIONAL PRIORITIES AND SUPPORT

The Australian Government recognises the importance of numeracy for our economy, prosperity and social wellbeing. There are a number of Australian Government initiatives that prioritise the development of workplace numeracy in a systematic way.

These include the [National Foundation Skills Training Strategy for Adults](#), the [Australian Core Skills Framework](#), VET products and funded training programs. The following is a brief description of each.

NATIONAL FOUNDATION SKILLS STRATEGY FOR ADULTS

The [National Foundation Skills Strategy for Adults](#) was launched by the Australian Government in September 2012. It is a 10-year national framework, which aims that by 2022 two thirds of working age Australians will have literacy and numeracy skills at level 3² or above.

The Strategy targets adult learners and includes the following four key priority areas, with agreed actions for each:

- Raising awareness and commitment to action
- Adult learners have high quality learning opportunities and outcomes
- Strengthening foundation skills in the workplace
- Building the capacity of the education and training workforces to deliver foundation skills

Foundation skills include the five core language, literacy and numeracy skills (reading, writing, oral communication, learning, and numeracy), the eight employability skills (communication, teamwork, problem solving, initiative and enterprise, planning and organising, self management, learning and technology) and digital literacy.



Become more familiar with the four key priority areas by reading the [National Foundation Skills Strategy for Adults](#) (Council of Australian Governments Standing Council on Tertiary Education Skills and Employment 2012).

What are the implications for you and your job role?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

² Note that level 3 refers to ALLS level 3 not ACSF level 3. Recent NCVER research, [Does 1=1? Mapping measures of adult literacy and numeracy](#) suggests the levels may not be equivalent at the higher levels and that ALLS level 3 is higher than ACSF level 3 for numeracy.

AUSTRALIAN CORE SKILLS FRAMEWORK

The [Australian Core Skills Framework](#) (ACSF) provides:

- A consistent national approach to the identification of the core skills requirements in diverse personal, community, work and training contexts
- A common reference point for describing and discussing performance in the five core skill areas

The ACSF describes levels of performance across five core skills areas comprising learning, reading, writing, oral communication and numeracy. It describes each core skill across five levels of performance, four performance variables and three domains of communication. Levels of performance are described using indicators, focus areas, performance features and sample activities.



Become more familiar with the purpose and structure of the [Australian Core Skills Framework](#) (DIICCSRTE 2012) by reading the Introduction chapter of the ACSF.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

The ACSF numeracy core skill comprises three numeracy performance indicators across five Performance Levels.

NUMERACY INDICATOR .09

The first indicator, .09, relates to a person's ability to identify and extract the mathematics embedded in a contextualised task.

Indicator .09

Identifying mathematical information and meaning in activities and texts

- Identify mathematical information
- Interpret mathematical information

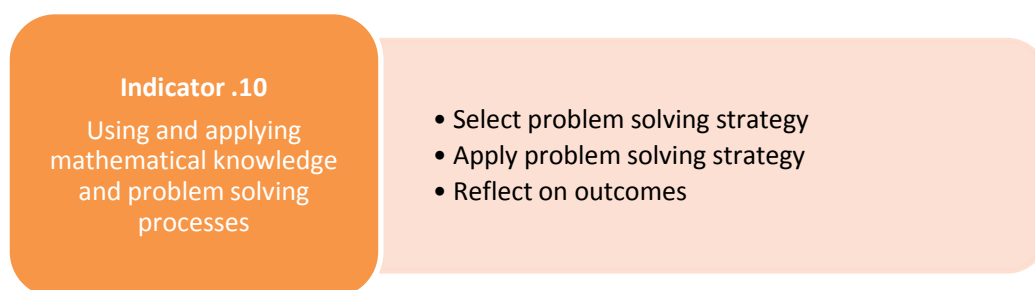
There are two focus areas:

- The explicitness of the mathematical information (how easy or difficult it is to find out what to do)
- The complexity of the mathematical information embedded in the text

Both these factors play an important role in determining the complexity of the task for the learner.

NUMERACY INDICATOR .10

The second indicator, .10, relates explicitly to doing the mathematics.



In the process of using and applying the mathematics there are a range of factors that need to be utilised. These include:

- The problem solving processes utilised, including estimating and reflecting the range of mathematical methods used and the tools utilised
- The mathematical knowledge and skills used in processing the problem, including three content areas – number and algebra, measurement and geometry, and statistics and probability

Coverage of content

Relevant mathematical knowledge and skills will be determined by the context, the needs of the learners, and the demands of a job or training. Therefore it may not be appropriate to cover all three mathematical knowledge areas. However, it would be expected that a learner can demonstrate evidence in two of the three mathematical knowledge and skill areas in order to achieve a particular level.

NUMERACY INDICATOR .11

The third indicator, .11, relates to the ability to represent and communicate the mathematics embedded in the situation.

Indicator .11
Communicating and
representing mathematics

- Represent the outcomes
- Communicate the results

The focus areas incorporated here include the use of both written and oral mathematical language. The third important focus area relates to the complexity of the mathematical symbolism, representation and conventions that are used and expected in solving and representing the results and outcomes of the mathematical process.

NUMERACY PERFORMANCE LEVELS

The five performance levels are:

NUMERACY INDICATORS BY LEVEL

| Level | Indicator | |
|-------|-----------|--|
| 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 |
| 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 |
| 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 |

NUMERACY INDICATORS BY LEVEL

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



Become more familiar with the numeracy core skill by reading the numeracy chapter of the [ACSF](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

VET PRODUCTS

VET products include training packages and accredited courses. They specify the skills and knowledge required to achieve an accredited training outcome.

VET product developers must make numeracy requirements explicit and recognisable. Sometimes numeracy skills are highly explicit. For example the unit, MEM30012A Apply mathematical techniques in a manufacturing engineering or related environment, contains explicit numeracy skills requirements. However, in other units numeracy skills have been so extensively integrated that they have been made invisible.



Enhance your ability to identify the numeracy skills embedded in units of competency by reviewing the trigger words provided in [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Industry Skills Councils have been mapping the ACSF against nominated units of competency within training packages. Access a mapped unit of competency and review the mapping of the numeracy core skill. Do you agree?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

FOUNDATION SKILLS TRAINING PACKAGE

The FSK Foundation Skills Training Package is designed to support individuals to:

- Acquire the foundation skills that will enable them to participate successfully in education and training
- Build the foundation skills that underpin vocational competence

FSK units of competency describe learning, reading, writing, oral communication, numeracy and digital technology foundation skills.

FSK includes 39 numeracy units across all ACSF levels, including Pre Level 1.³

These units are:

| ACSF level | Units of competency |
|------------|---|
| 5 | FSKNUM31 Apply a wide range of mathematical calculations for work |
| | FSKNUM32 Use and calculate with complex measurements for work |
| | FSKNUM33 Collect, organise and analyse statistical data for work |
| | FSKNUM34 Use and apply concepts of probability for work |
| | FSKNUM35 Use algebraic and graphical techniques to analyse mathematical problems for work |
| | FSKNUM36 Use trigonometry for work |
| | FSKNUM37 Use introductory matrices for work |
| | FSKNUM38 Use introductory vectors for work |
| | FSKNUM39 Use introductory calculus for work |
| 4 | FSKNUM21 Apply an expanding range of mathematical calculations for work |
| | FSKNUM22 Use and apply ratios, rates and proportions for work |
| | FSKNUM23 Estimate, measure and calculate measurements for work |
| | FSKNUM24 Use geometry to draw 2D shapes and construct 3D shapes for work |
| | FSKNUM25 Use detailed maps to plan travel routes for work |
| | FSKNUM26 Read, interpret and use detailed plans, drawings and diagrams for work |
| | FSKNUM27 Collect, organise and interpret statistical data for work |
| | FSKNUM28 Use routine formulas and algebraic expressions for work |
| | FSKNUM29 Use introductory graphical techniques for work |
| | FSKNUM30 Use common functions of a scientific calculator for work |

³ The ACSF includes a Pre Level 1 Supplement in the appendices. Pre Level 1 is relevant for people who are unable to demonstrate performance at level 1.

| ACSF level | Units of competency | |
|-------------|---------------------|--|
| 3 | FSKNUM14 | Calculate with whole numbers and familiar fractions, decimals and percentages for work |
| | FSKNUM15 | Estimate, measure and calculate with routine metric measurements for work |
| | FSKNUM16 | Interpret, draw and construct 2D and 3D shapes for work |
| | FSKNUM17 | Use routine maps and plans for work |
| | FSKNUM18 | Collect data and construct routine tables and graphs for work |
| | FSKNUM19 | Interpret routine tables, graphs and charts for work |
| | FSKNUM20 | Use basic functions of a calculator |
| 2 | FSKNUM08 | Identify and use whole numbers and simple fractions, decimals and percentages for work |
| | FSKNUM09 | Identify, measure and estimate familiar quantities for work |
| | FSKNUM10 | Identify and describe common 2D and some 3D shapes for work |
| | FSKNUM11 | Read and use familiar maps, plans and diagrams for work |
| | FSKNUM12 | Identify and interpret information in familiar tables, graphs and charts for work |
| | FSKNUM13 | Construct simple tables and graphs for work using familiar data |
| 1 | FSKNUM03 | Use whole numbers and money up to one thousand for work |
| | FSKNUM04 | Locate, compare and use highly familiar measurements for work |
| | FSKNUM05 | Identify and use some common 2D shapes for work |
| | FSKNUM06 | Use highly familiar maps and diagrams for work |
| | FSKNUM07 | Locate specific information in highly familiar tables, graphs and charts for work |
| Pre Level 1 | FSKNUM01 | Use beginning whole number skills and money up to one hundred for work |
| | FSKNUM02 | Use beginning skills related to time and 2D shapes for work |



Become more familiar with the **Foundation Skills Training Package** by reading the [Implementation Guide](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

FUNDED TRAINING SUPPORT

The Australia government recognises the importance of numeracy skills and funds workplace numeracy skills development. At the time this resource was developed funding is available through the Australian Apprenticeships Program and the Workplace English Language and Literacy (WELL) Program.

The Australian Apprenticeships Program is delivered by vocational specialists with a primary focus on vocational training while identifying and addressing LLN and employability skills needs.

Working through this PD resource will give you insight into your own numeracy skills and confidence, and your capacity to support your learners.

WELL Program training is delivered by LLN specialists with a primary focus on providing specialist LLN support integrated with vocational training.

Despite the availability of funded workplace numeracy support, in practice many VET practitioners report that numeracy training delivery is at best incidental to other training. Instead, LLN specialists largely focus on English language and literacy support and vocational specialists largely focus on meeting unit requirements within qualifications. This is a serious gap in VET capacity that is not consistent with the importance of numeracy or the identified numeracy skills needs of workers.



Reflect on training that you deliver. In theory, is numeracy skills development supported? In practice, are numeracy skills a focus in your training?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

REVIEW

This section provides a broad overview of workplace numeracy and the VET sector.



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 with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

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

- TAELLN702A Analyse and apply adult numeracy teaching practices (TAE10 Training and Education Training Package)
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills (TAE10 Training and Education Training Package)
- TAELLN401A Address adult language, literacy and numeracy skills (TAE10 Training and Education Training Package)



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

BUILD SKILLS FOR EFFECTIVE LEARNER OUTCOMES

This section provides an overview of the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#). It includes generically relevant information and activities that support VET practitioners to develop their numeracy proficiency and adult numeracy pedagogy skills in the workplace context using the [Snapshots](#).

The separate [Snapshots](#) provide specific guidance for selected questions from the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#).

Working through this PD resource places you in the role of the learner.

A Snapshot template is provided in the appendices of the [Guide](#). VET practitioners are encouraged to use the template to build their own Snapshots for other questions found in the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) and numeracy problems encountered in their practice.

THE QUESTIONS

[The Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) consists of 24 questions that cover a broad range of numeracy skills.

Each question is contextualised to the process manufacturing industry with a focus on typical job tasks requiring numeracy skills and performed by semi-skilled workers. Typical semi-skilled occupations include process workers and machine operators.

The answers to each question are provided in the appendices. In some questions there is one correct answer, in other questions there is a range of responses to allow for a reasonable margin of error.

[Snapshots](#) are available for the following questions:

- Question 1b Reading instruments
- Question 2a Using ratios and metric conversions
- Question 3c Using rates and performing time calculations
- Question 4a Measuring lengths
- Question 5 Calculating quantities
- Question 7a Reading specifications

While the questions are contextualised to one industry, the numeracy skills needed to ‘do the maths’ are generically relevant to many industries. Examples from other industries are provided in the [Snapshots](#).

| Question | ACSF Level | Numeracy topics |
|----------|------------|---|
| 1a | 3 | Reading instruments |
| 1b | 3 | Reading instruments |
| 2a | 4 | Using ratios and metric conversions |
| 2b | 2 | Adding and subtracting |
| 2c | 3 | Calculating percentages |
| 2d | 4 | Using ratios |
| 3a | 3 | Using rates and metric conversions |
| 3b | 3 | Using rates |
| 3c | 3 | Using rates and performing time calculations |
| 4a | 2 | Measuring lengths |
| 4b | 4 | Calculating averages |
| 4c | 4 | Calculating ranges |
| 4d | 4 | Converting metric and imperial units of measurement |
| 5 | 4 | Calculating quantities |
| 6a | 3 | Using rates |
| 6b (i) | 3 | Using rates and calculating percentages |
| 6b (ii) | 3 | Using rates and calculating percentages |
| 7a | 1 | Reading specifications |
| 7b | 2 | Reading specifications |
| 8A | 4 | Calculating length |
| 8B | 5 | Calculating length |
| 8C | 4 | Calculating length |
| 9a | 1 | Reading charts |
| 9b | 4 | Calculating percentages and constructing charts |

ACSF NUMERACY LEVEL

Each question is mapped to ACSF numeracy levels 1 to 5. The mapping was verified by a recognised numeracy assessment expert.

Working through this PD resource will alert you to the meaning of numeracy as much more than the ability to do mathematics.

The bulk of the questions are mapped to ACSF levels 3 and 4 which were the focus of the [Seeking the N in LLN](#) NCVET study. The [Snapshots](#) provide an explanation of the ACSF mapping for selected questions.

| ACSF numeracy level | Number of questions |
|---------------------|---------------------|
| 1 | 1 |
| 2 | 5 |
| 3 | 9 |
| 4 | 8 |
| 5 | 1 |
| Total | 24 |

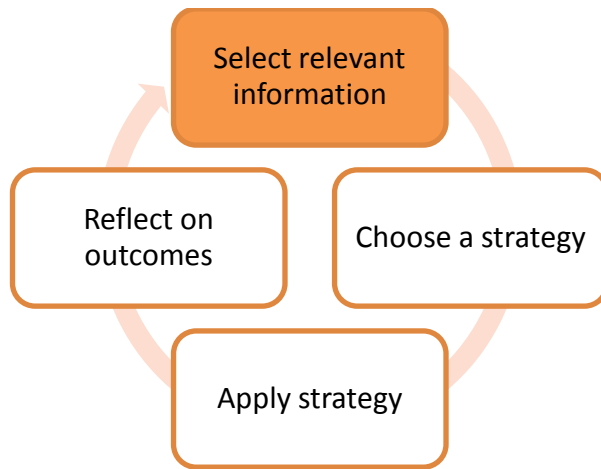
WHAT EACH QUESTION IS ASKING

Numeracy skills are needed to identify and interpret the mathematical information embedded in the questions. These skills are used to determine what the question is asking and whether mathematics should be used to find the answer.

These skills are described by ACSF numeracy indicator .09 which covers the identification of mathematical information and meaning in activities and texts. Indicator .09 skills demands increase with decreasing explicitness and increasing complexity of mathematical information.

These skills are related to the ACSF core skills of oral communication (listening) and reading but are not the same. Different listening and reading skills are needed to read and interpret mathematical information. Individuals with high level oral communication skills and reading skills may have low level indicator .09 skills. Individuals with low level oral communication skills and reading skills may have high level indicator .09 skills.

The Task Process Cycle ([Marr, Helme et al. 2003](#)) describes the four interrelated components needed to tackle a question. Selecting the relevant information is a critical step in the process.



The [Snapshots](#) offer advice on how to identify and interpret the mathematical information in selected questions.



Familiarise yourself with [ACSF](#) numeracy indicator .09 at each ACSF numeracy level. How does the level of complexity increase with each level?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

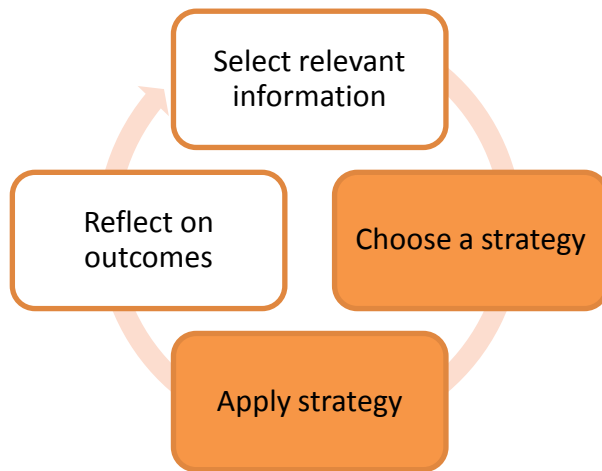
HOW TO SOLVE THE PROBLEM

To answer a question, numeracy skills are needed to ‘do the maths’.

These skills are described by ACSF numeracy indicator .10. This indicator covers the use and application of mathematical knowledge and problem solving processes. It includes:

- Problem solving processes, including estimating and reflecting
- Mathematical methods and use of tools
- Mathematical knowledge and skills: number and algebra
- Mathematical knowledge and skills: measurement and geometry
- Mathematical knowledge and skills: statistics and probability

Indicator .10 skills demands increase with increasing complexity of mathematical problem solving strategies and decreasing familiarity of context.



Note that while the skills needed to ‘do the maths’ are important, they are no more important than the skills described by indicator .09 and .11. For example, if an individual cannot read and interpret the question correctly, they are unlikely to be able to answer the question even though they may have the skills to ‘do the maths’.

The [Snapshots](#) offer one or more approaches to solving selected questions.



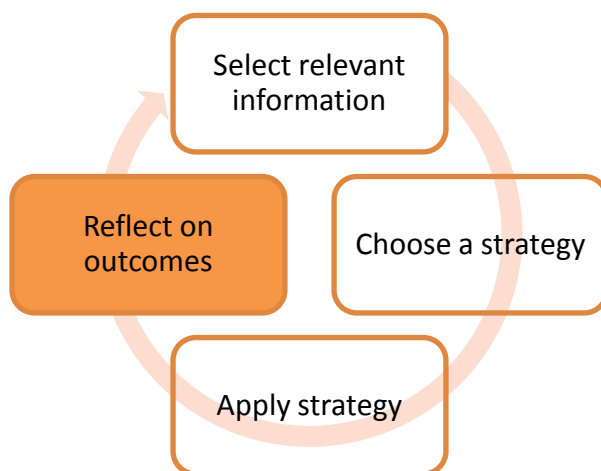
Familiarise yourself with [ACSF](#) numeracy indicator .10 at each ACSF numeracy level. How does the level of complexity increase with each level?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

HOW TO CHECK THE ANSWER

Achieving a correct answer requires not only the ability to 'do the maths' but also the ability to check whether the answer is correct or not.

These skills are covered by indicator .10 under the first focus area of problem solving processes, including estimating and reflecting. These skills are important because while anyone can make a mistake, individuals with higher level numeracy skills are able to question the reasonableness and real world implications of their results. At the lower levels it may be necessary for someone else, such as a supervisor or mentor, to prompt an individual to check and reflect on the result.



HOW TO COMMUNICATE THE ANSWER

Answering a question requires the skills to communicate the result. This involves using oral and written mathematical language and representation.

These skills are described by ACSF numeracy indicator .11. This indicator covers the communication and representation of mathematical information. Indicator .11 skills demands increase with increasing complexity of written and oral mathematical language and increasing complexity of mathematical symbolism, representation and conventions.

These skills are related to the ACSF core skills of oral communication (speaking) and writing but are not the same. Different speaking and writing skills are needed for mathematical information. Individuals with high level oral communication skills and writing skills may have low level indicator .11 skills. Individuals with low level oral communication skills and writing skills may have high level indicator .11 skills.

The [Snapshots](#) provide advice on how to best represent the results for selected questions.



Familiarise yourself with [ACSF numeracy indicator .11](#) at each ACSF numeracy level. How does the level of complexity increase with each level?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

ACSF ASSESSMENT DECISIONS

VET practitioners must use their professional judgement when making assessment decisions. Assessment tools like the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) are indicators of performance only. Further evidence is required over time and across a number of different assessment tasks for a comprehensive assessment decision.

In the NCVER report [Seeking the N in LLN](#) responses to questions were assigned one of three possible outcomes: Credit, Insufficient Evidence or Not Attempted.

CREDIT

A technically correct answer is not required to achieve a Credit in a learning and assessment environment.

For example:

- Answers are given the benefit of the doubt. For example, if the correct mathematical procedure is used but the incorrect answer calculated, a Credit is applied
- The highest ACSF numeracy level is given priority. For example, if within a calculation a ratio is used correctly but a metric conversion is not, a Credit is applied
- Incorrect data from previous questions is overlooked. For example, if an incorrect response from an earlier part of a question is carried through to arrive at an incorrect answer to a later question, a Credit is applied
- More right than wrong is credited. For example, if three out of four data points on a graph are plotted correctly, a Credit is applied

This approach may be confronting to VET practitioners focused on numeracy performance in the workplace where mistakes must be avoided. However, individuals often learn more from mistakes than from correct solutions. Therefore, in a learning and assessment environment correct procedures are acknowledged, human errors are allowed and striving is rewarded.

INSUFFICIENT EVIDENCE

The outcome Insufficient Evidence is applied where there is evidence that the question was attempted but there is insufficient evidence for Credit to be applied. An example is when the answer is incorrect and either there is insufficient evidence of the procedure used, or the procedure used is incorrect.

NOT ATTEMPTED

The outcome Not Attempted is assigned where there is no evidence of an attempt to answer the question.

The [Snapshots](#) give examples of responses that are not technically correct but can be assigned a Credit using this approach. An explanation is given of the reasons why.



Reflect on the method for making assessment decisions suggested. What are its strengths and weaknesses?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

MEETING WORKPLACE EXPECTATIONS

Expectations in a learning and assessment environment are very different to the workplace environment. Workers have to get the right answer and there are few second chances. Wrong answers can lead to lost productivity, dissatisfied customers and safety and environmental incidents. The standard to apply a Credit described previously is overly generous compared with what is required to meet workplace expectations.

The [Snapshots](#) explore the workplace implications for responses that are not technically correct but are assigned a Credit.

Workplace expectations ...

A laboratory operator prepares a pigment formulation that is colour checked and approved for production. Before it can be released it must be scaled from a 300 g laboratory batch size to a 900 kg production batch size. An incorrect calculation has significant cost and quality implications for production.



Reflect on the standard used for numeracy assessment decisions in a learning and assessment environment and performance expectations in the workplace. What are the implications for numeracy assessment decisions in the workplace?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

ANALYSING INCORRECT ANSWERS TO IDENTIFY SKILL GAPS

One way that a VET practitioner can identify learner skill gaps is recognising and analysing incorrect answers. Incorrect answers point to skill gaps and are a part of the learning process.

The reason for an error will relate to one or more of the ACSF numeracy indicators. For example:

- Maybe the question was not read and interpreted correctly
- Maybe the wrong problem solving process was applied
- Maybe a simple calculating error was made
- Maybe the right answer was represented in the wrong way

Solving the problem of what went wrong helps to identify where learner support is needed.

The [Snapshots](#) give examples of incorrect answers collected in the NCVET [Seeking the N in LLN](#) research. Included is an analysis of the likely cause of the error and the likely skill gaps.

IMPLICATIONS FOR TRAINING DELIVERY

To teach adult numeracy effectively, practitioners need to have specialist adult numeracy pedagogies as well as the necessary numeracy proficiency skills.

Adult numeracy pedagogies focus on meaning and context, promote a positive attitude towards numeracy and employ adult learning principles.

Working through this PD resource will support you to confirm and strengthen your numeracy teaching skills.

These are specialist skills. Unfortunately, without training in adult numeracy pedagogies VET practitioners tend to teach the way that they were taught mathematics at school: that is, using maths text books, rote-based rule learning, maths tests and minimal contextualisation.

Engaging adult learners ...

Workers at a manufacturing company were expected to use and understand percentages. One worker had struggled for years despite the support of work colleagues and supervisors. He said to the new trainer, 'I just don't get it and I don't see why it's important.' The trainer explained that it was important for completing production reports and checking his pay. He replied that his mate helped him at work and his wife helped him at home. Together they tried to find a way to spark some interest and motivation. The trainer talked about reading percentages in the paper but he said he wasn't interested. She suggested percentages used in footy tipping results but the worker said he didn't follow football, he preferred cycling. His cycling was a serious hobby and he was interested in maintaining peak physical fitness. He then asked the trainer if she thought she could help him to learn to calculate and interpret maximum heart rate measurements. They had found the spark.

EFFECTIVE ADULT NUMERACY TEACHING

The following is a list of research based principles for good practice adult numeracy teaching reproduced with the permission from the National Centre for Excellence in the Teaching of Mathematics ([NCETM 2008](#)).

Teaching is more effective when it:

1. Builds on the knowledge learners already have This means developing formative assessment techniques and adapting our teaching to accommodate individual learning needs

2. Exposes and discusses common misconceptions and other surprising phenomena Learning activities should expose current thinking, create 'tensions' by confronting learners with inconsistencies and surprises, and allow opportunities for resolution through discussion

3. Uses higher-order questions Questioning is more effective when it promotes explanation, application and synthesis rather than mere recall

4. Makes appropriate use of whole class interactive teaching, individual work and cooperative small group work Collaborative group work is more effective after learners have been given an opportunity for individual reflection. Activities are more effective when they encourage critical, constructive discussion, rather than argumentation or uncritical acceptance. Shared goals and group accountability are important

5. Encourages reasoning rather than 'answer getting' Often, learners are more concerned with what they have 'done' than with what they have learned. It is better to aim for depth than for superficial 'coverage'

Teaching is more effective when it:

6. Uses rich, collaborative tasks The tasks used should be accessible, extendable, encourage decision-making, promote discussion, encourage creativity, encourage 'what if' and 'what if not' questions

7. Creates connections between topics both within and beyond mathematics and with the real world Learners often find it difficult to generalise and transfer their learning to other topics and contexts. Related concepts (such as division, fraction and ratio) remain unconnected. Effective teachers build bridges between ideas

8. Uses resources, including technology, in creative and appropriate ways Information and Communication technology (ICT) offers new ways to engage with mathematics. At its best it is dynamic and visual: relationships become more tangible. ICT can provide feedback on actions and enhance interactivity and learner autonomy. Through its connectivity, ICT offers the means to access and share resources and – even more powerfully – the means by which learners can share their ideas within and across classrooms

9. Confronts difficulties rather than seeks to avoid or pre-empt them Effective teaching challenges learners and has high expectations of them. It does not seek to 'smooth the path' but creates realistic obstacles to be overcome. Confidence, persistence and learning are not attained through repeating successes, but by struggling with difficulties

10. Develops mathematical language through communicative activities Mathematics is a language that enables us to describe and model situations, think logically, frame and sustain arguments and communicate ideas with precision. Learners do not know mathematics until they can 'speak' it. Effective teaching therefore focuses on the communicative aspects of mathematics by developing oral and written mathematical language

Teaching is more effective when it:

11. Recognises both what has been learned and also how it has been learned

What is to be learned cannot always be stated prior to the learning experience. After a learning event, however, it is important to reflect on the learning that has taken place, making this as explicit and memorable as possible. Effective teachers will also reflect on the ways in which learning has taken place, so that learners develop their own capacity to learn

The [Snapshots](#) provide advice on ways to support learners to develop their numeracy skills relevant to selected questions.

Rich, collaborative tasks ...

A trainer was delivering continuous improvement training to a group of workers at an automotive parts manufacturer. The group included representatives from the foundry, the processing plant, maintenance and one cleaner. The trainer observed that the cleaner was isolated from the other group members. Group members often made derogatory remarks about the cleaner's role. In a session focusing on developing flowcharts the trainer gave the group the task of flowcharting the cleaner's job. Despite some initial resistance the group completed the activity and the product was a long and complicated flowchart that covered all areas of the plant. The group gained flowcharting skills whilst discovering how important the cleaner's job was to maintaining smooth and safe operations.



Find out more about these principles and how they were developed by reading the full [NCETM report](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Select and reflect on at least two of the effective teaching principles. Ask yourself: How does it benefit the learner? What does it mean for your practice?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

PROFESSIONAL DEVELOPMENT LEARNING STRATEGIES

Many VET practitioners need to develop their own numeracy proficiency skills. There is no quick fix. VET practitioners need to invest time and effort to develop numeracy skills and confidence. For VET practitioners who suffer from maths anxiety, getting started can be particularly confronting. They must battle with negative thinking patterns and undo behavioural avoidance strategies that may be so entrenched they have become invisible.

The [Snapshots](#) include suggestions for how VET practitioners can develop their own workplace numeracy proficiency skills for selected questions.



Read the United Kingdom [research by Cara and de Coulon](#) that analysed practitioner qualifications and adult numeracy learner progress.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Reflect on your performance using the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#). What impact might this have on your capacity to support workers to develop their numeracy skills? What action can you take to improve your skills?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

WORKPLACE CONTEXT

In the workplace, numeracy proficiency and adult numeracy pedagogy are not enough because the context is critical.

All workers require some level of numeracy skills, for example reading the time, completing a leave form and reading a pay packet. These are numeracy skills that are not industry specific. Different occupations within different industries have different numeracy demands, all context specific.

Working through this PD resource will alert you to the importance of the workplace context.

Consider the following comparison of the characteristics of numeracy in a workplace context compared with a learning context and the implications for workplace training.

| Characteristic | Learning context | Workplace context | Implications for workplace numeracy training |
|----------------|---|---|---|
| Purpose | To develop numeracy skills | To employ numeracy skills as one of many means to support the achievement of business goals within the constraints and demands of the workplace | Importance of business goals How numeracy supports business goals |
| | For example, practising taking blood pressure readings to learn the skill | For example, delivering a primary health service that includes monitoring a patient's health by taking a blood pressure reading | Importance of numeracy in supporting business goals Risks to business goals of poor numeracy performance |

| Characteristic | Learning context | Workplace context | Implications for workplace numeracy training |
|------------------------------|---|--|--|
| Importance of context | Context is not critical | Context is critical as numeracy is highly embedded in job tasks | Importance of job tasks |
| | For example, practising solving algebraic equations | For example, using algebra to calculate the volume of material needed for a job | How numeracy is used in the job task Importance of numeracy to the job task Risks to job task if poor numeracy performance |
| Overtness | Numeracy is overt For example, practising to write spreadsheet formulas | Numeracy is often hidden in work tasks For example, formulas in a spreadsheet that are only noticed if something goes wrong | Numeracy requirements of work tasks need to be uncovered Consideration of all three numeracy indicators |
| Complexity | Context has minimal impact on complexity For example, doing calculation worksheets | Numeracy is more complex because it is embedded in job tasks For example, counting stock | Importance of context complexities Impact of context complexities on numeracy performance |

| Characteristic | Learning context | Workplace context | Implications for workplace numeracy training |
|---------------------------|--|---|--|
| Degree of accuracy | <p>High degree of accuracy with a focus on calculations rather than estimations</p> <p>For example, calculating a completion time in a numeracy assessment</p> | <p>Degree of accuracy can be high or low depending on the job task</p> <p>For example, often calculations are done in the head and measurements are estimated</p> | <p>Different accuracies for different job tasks</p> <p>Degree of accuracy required cannot be assumed</p> <p>Impact of accuracy on productivity</p> <p>Different problem solving strategies for different levels of accuracy (e.g. in the head calculations, estimations)</p> |
| Mistakes | <p>Mistakes are not critical and are considered important for learning</p> <p>For example, practising taking measurements and learning from mistakes</p> | <p>Mistakes must be avoided</p> <p>For example, measuring a sample to check that it is within specification before sending it to a customer</p> | <p>Importance of recognising correct and incorrect answers</p> <p>Importance of checking own work</p> <p>Risks of mistakes in the workplace</p> <p>Need to assess against the workplace standards</p> |

| Characteristic | Learning context | Workplace context | Implications for workplace numeracy training |
|-------------------------------------|---|--|---|
| Complementary skills demands | <p>Complementary skills demands are optional</p> <p>For example, practising reading thermometers may or may not include decision making</p> | <p>Complementary skills demands are significant and important because numeracy is integrated with job tasks</p> <p>For example, monitoring the temperature of food storage with an understanding of the food safety requirements, implications for the business and reporting and recording requirements</p> | <p>Identification of complementary skill demands</p> <p>Integration of numeracy and complementary skill demands</p> <p>Importance of complementary skill demands</p> <p>Risks if complementary skills demands not met</p> |

| Characteristic | Learning context | Workplace context | Implications for workplace numeracy training |
|--|---|---|---|
| Skills and knowledge transfer demands | Skills and knowledge transfer demands are optional For example, breakdowns are planned learning events | Skills and knowledge transfer demands are significant due to new information and unexpected problems For example, knowing what to do if there is an unforeseen breakdown | Identification of skills and knowledge transfer demands Integration of numeracy and skills and knowledge transfer demands Importance of skills and knowledge transfer demands Risks if skills and knowledge transfer demands not met |

The [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) is contextualised to a single industry, the process manufacturing industry, but the numeracy skills covered are in demand across many other industries.

Examples of how the numeracy skills covered can apply to other industries are provided in the [Snapshots](#) for selected questions.

Numeracy in the workplace ...

At a blow moulding operation producing plastic bottles, process workers use digital callipers to measure the internal diameters of bottle necks. The supervisor identified a process worker who was having difficulty taking these measurements. She was suffering so badly from maths anxiety that not only could she not use the calliper, she could not effectively participate in training in how to use a calliper. The supervisor told the trainer to take as much time as was needed because the job task was critical to production. The trainer spent time with the worker, getting to know her and building trust. However, every time she tried to introduce the calliper, the worker was unable to concentrate or function due to anxiety. The trainer decided to use two strategies. Firstly she discovered that the worker was highly skilled at sewing her own clothes using her own patterns. This provided an opportunity to reflect on and acknowledge the numeracy and technical skills that the worker already possessed. The trainer then asked the worker to sit at the far end of the training room and spend as much time as she needed exploring the calliper and practising unobserved. In the days that followed the worker gained the confidence to use the calliper with coaching from the trainer. To help transfer her skills and confidence from the learning environment to the workplace, she was then given the opportunity to practise on the line without the pressure of being observed or recording the results. Over time the activity was expanded until she was able to comfortably perform the task under normal workplace conditions.



Increase your awareness of numeracy in the workplace context by reading the research:

- [Council of Australian Governments 2008](#)
- [Hoyles, Wolf et al. 2002](#)
- [FitzSimons, Mlcek et al. 2005](#)
- [Marr and Hagston 2007](#)

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Increase your awareness of job tasks involving numeracy skills by reading [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#). Identify which tasks are relevant to the industries in which you work. Can you think of other examples relevant to your learners?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Think about a job task that you do that requires numeracy skills. Do you agree with the distinctions made in the table above? Why/why not? What are the implications for training delivery in the workplace context?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Find out more about the occupations targeted in the development of the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry by reading [Seeking the N in LLN Support Document](#).

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



The transferability of numeracy skills between different contexts is not a given. Read the example provided in the box on page 6 of [No More Excuses](#) (Industry Skills Councils 2011). Can you think of other examples?

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Select a question from the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) that does not have a Snapshot. Use the Snapshot Template provided in the appendices to build your own Snapshot.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.



Select a numeracy problem in a workplace. Use the Snapshot Template provided in the appendices to build your own Snapshot.

Discuss with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

REVIEW

This section covers the skills needed to develop the workplace numeracy skills of learners and the workplace numeracy training skills of VET practitioners.



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 with a trusted peer or mentor how this relates to what you do. Record this in your Professional Development Journal.

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

- TAELLN702A Analyse and apply adult numeracy teaching practices (TAE10 Training and Education Training Package)
- TAELLN704A Implement and evaluate delivery of adult language, literacy and numeracy skills



If you think that you need to further develop your knowledge and skills in this area, 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 |
| CALD | Culturally and linguistically diverse |
| DIICCSRTE | Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education |
| ICT | Information and Communication Technology |
| NCVER | National Centre for Vocational Education and Research |
| PD | Professional development |
| RTO | Registered Training Organisation |
| VET | Vocational Education and Training |
| 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 | http://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.au/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](#), cat.no. 4228.0, ABS, Canberra
- Australian Industry Group 2008, [Skilling the existing workforce: final project report](#), Ai Group, Sydney
- Berghella, T. and J. Molenaar 2013, [Seeking the N in LLN](#), NCVER, Adelaide
- Berghella, T. and J. Molenaar 2013, [Seeking the N in LLN support document](#), 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
- Cara, O. and A. de Coulon 2009, [Skills for Life teachers' qualifications and their learners' progress in adult numeracy](#), NRDC, London
- Circelli, M., S. Gillis, et al. 2013, [Does 1 = 1? Mapping measures of adult literacy and numeracy](#), NCVER, Adelaide
- Coben, D 2003, [Adult numeracy: review of research and related literature](#), NRDC, London
- Council of Australian Governments 2008, [National Numeracy Review report](#), COAG, Canberra
- Council of Australian Governments Standing Council on Tertiary Education Skills and Employment 2012, [National Foundation Skills Strategy for Adults](#), SCOTese, Brisbane
- DIICCSRTE 2012, [Australian Core Skills Framework: 5 Core Skills, 5 Levels of Performance, 3 Domains of Communication](#), DIICCSRTE, Canberra
- DIICCSRTE and DEEWR 2013, [Core Skills for Work Developmental Framework](#), DIICCSRTE and DEEWR, 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
- 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
- Industry Skills Councils 2011, ['No more excuses: an industry response to the language, literacy and numeracy challenge'](#), viewed 12 December 2012, <http://www.isc.org.au/pdf/NoMoreExcuses_FINAL%20FINAL%20single%20page.pdf>
- Innovation and Business Skills Australia 2013, [Foundation Skills Training Package Implementation Guide](#), DIISRTE, Canberra

- Innovation and Business Skills Australia 2010, [User guide for TAE70110 and TAE80110](#), IBSA, Melbourne
- Marr, B & Hagston, J 2007, [Thinking beyond numbers: learning numeracy for the future workplace](#), NCVER, Adelaide
- Marr, B., S. Helme, et al. 2003, [Rethinking assessment: strategies for holistic adult numeracy assessment. A resource book for practitioners, policy-makers, researchers and teachers](#), Language Australia, Melbourne
- 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
- NCETM 2008, [Mathematics Matters: Final Report](#), The National Centre for Excellence in the Teaching of Mathematics, London
- 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
- Tout, D & Schmitt, M J 2003, [‘The inclusion of numeracy in adult basic education’](#), in Annual Review Of Adult Learning And Literacy: Volume 3, eds J. Comings, B. Garner & C. Smith, Jossey-Bass, San Francisco, pp. 152-202
- Townsend, R & Waterhouse, P 2008, [Whose responsibility?: employers’ views on developing their workers’ literacy, numeracy and employability skills](#), NCVER, Adelaide

PROFESSIONAL DEVELOPMENT JOURNAL

Use this Professional Development Journal to record your thoughts and feelings about maths, discussions with your trusted peer or mentor and your professional development progress.

| Date | Record |
|------|--------|
| | |

PROFESSIONAL DEVELOPMENT PLAN

Use this planning tool to address numeracy related skills and knowledge gaps.

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

| Professional development goal | Actions to achieve goals |
|-------------------------------|--------------------------|
| 1. | |
| 2. | |
| 3. | |

SNAPSHOT TEMPLATE

Use this template to develop your own Snapshot. Identify a question from the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) or a numeracy problem in the workplace and work through the questions using this [Guide](#) and the [Snapshots](#) to help you.

What is the question?

(Describe the numeracy problem to be solved)

What is the ACSF level?

(Identify the numeracy skills required to map the problem to the ACSF explaining your reasoning)

What is the question asking?

(Identify and interpret the mathematical information provided)

How can the problem be solved?

(Describe at least one way to 'do the maths' to solve the problem. Challenge yourself and describe an alternative method)

How can the answer be checked?

(Describe how to verify whether the answer is correct or not and explain why your selected method is effective)

How should the answer be communicated?

(Describe how the mathematical information should be communicated and represented and explain your reasoning)

How can Credits be assigned?

(Give examples of the types of incorrect answers that would attract a Credit in a learning environment)

What are the workplace expectations?

(Describe the standard expected in the workplace for this problem. Review each example provided in the previous question, determine whether the workplace standard has been met, and identify possible risks)

What are the skill gaps?

(Analyse examples of incorrect answers to describe the source of the error in relation to the ACSF numeracy level, indicator and focus area)

What are the implications for training delivery?

(Describe how you would use good practice numeracy teaching to develop this skill in your learners)

What can you do to improve your skills?

(Describe the learning strategies that you can use to address your own skill gaps in relation to solving this problem)

How is the workplace context important?

(Describe the characteristics of numeracy in the workplace context in relation to this question including the purpose, overtness, complexity, level of accuracy, tolerance of mistakes, criticality of context, complementary skill demands and skills and knowledge transfer demands)

GROUP PROFESSIONAL DEVELOPMENT ACTIVITY: MATHS ANXIETY

Purpose

To explore personal feelings of maths anxiety and implications for practice.

Instructions to the facilitator

Pre-workshop activity

Where practical, use this pre-workshop activity of reading and reflecting to engage participants prior to the workshop. Ask the participants to read the section titled 'About maths anxiety' in the [Guide](#) and complete the activities on pages 8 and 9.

Workshop activity

Prior to introducing the topic hand out copies of the *Numeracy in Practice* [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) to each individual for them to browse through. After a couple of minutes explain the purpose of the activity and ask the participants to respond to the following questions. When they have completed the questions facilitate a group discussion reflecting on the activity, what they have learnt and actions they will take. Allow up to 2 hours for the activity.

Post-workshop activity

Where practical, use this post-workshop activity of reflection and action to strengthen the transfer of learning. Ask the participants to create a Professional Development Journal using the template in the [Guide](#) and use it to record their thoughts and feelings about maths. Invite them to use Socratic questioning to evaluate their thoughts as per the example on pages 10 and 11 of the [Guide](#).

Workshop activity

1. Answer the following two questions. It is important to do this individually and quickly without censoring, analysing or judging.

How did you feel while you were looking at the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry?

What thoughts or images automatically crossed your mind while you were looking at the Numeracy Proficiency Assessment Tool – Process Manufacturing Industry?

2. Read the following information about maths anxiety.

Many people, including VET practitioners, suffer from maths anxiety. Maths anxiety is a common condition that makes it difficult for a person to access their working memory and think logically, affecting their performance as a learner and their attitude towards maths.

Maths anxiety is thought to originate from negative school experiences and is reinforced by negative thinking patterns (for example, 'I can't do maths') and behavioural avoidance.

Self monitoring, where an individual keeps a journal of their thoughts and feelings in relation to maths, can be used as an effective strategy in reducing maths anxiety. For example, the thought 'I can't do maths' can lead to feelings of anxiety in anticipation of doing maths which can lead to poor performance and avoidance. Capturing the thoughts and recognising that it is flawed thinking and not maths causing anxiety can help the individual to break the vicious cycle of anxiety and avoidance.

Socratic questioning can be used to evaluate the thought. For example:

1. What evidence do I have that supports this thought?
2. What evidence do I have that does not support this thought?
3. How does this thought affect how I feel and act?
4. How might I feel and act if I didn't have this thought?

Here is an example:

| | |
|--|--|
| Automatic thought | I'm hopeless at maths |
| What evidence do I have that supports this thought? | This is obvious, I couldn't do the problem and I've never been able to do it |
| What evidence do I have that does not support this thought? | Well, I do manage my day-to-day life and work, managing budgets and planning and organising events. When I think about it, I do maths every day. I just don't think of it as maths |
| How does this thought affect how I feel and act? | I feel really stupid and disappointed and I don't want to do it. Never have |
| How might I feel and act if I didn't have this thought? | I probably still wouldn't like maths but I might not feel so bad. Hey, I might even have a go |

3. Select an automatic thought from Part 1 and complete this table using Socratic questioning. Group members can help coach each other with this activity.

| | |
|--|--|
| Automatic thought | |
| What evidence do I have that supports this thought? | |
| What evidence do I have that does not support this thought? | |
| How does this thought affect how I feel and act? | |
| How might I feel and act if I didn't have this thought? | |

4. Reflect on the activity.

What have you learnt from this activity?

In what ways did it challenge you?

How will you use this learning?

What are the implications for your practice?

GROUP PROFESSIONAL DEVELOPMENT ACTIVITY: ACSF ASSESSMENT DECISIONS

Purpose

To reflect on assessment decision making practices for numeracy assessments.

Instructions to the facilitator

Pre-workshop activity

Where practical, use this pre-workshop activity of reading and reflecting to engage participants prior to the workshop. Ask the participants to complete the [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) following the instructions included in the tool and mark the assessment themselves using the answer sheet provided in the [Guide](#). Ask them to be prepared to discuss their approach to making assessment decisions.

Workshop activity

Introduce the topic and ask the participants to respond to the following questions. When they have completed the questions facilitate a group discussion reflecting on the activity, what they have learnt and actions they will take. Allow up to 2 hours for the activity.

Note: The [Snapshots](#) provide examples of how ACSF assessment decisions were made that can be incorporated in this activity.

Post-workshop activity

Where practical, use this post-workshop activity of reflection and action to strengthen the transfer of learning. Ask the participants to create a Professional Development Plan to record and follow up the actions they commit to take based on the workshop activity.

Workshop activity

The following approach to making ACSF assessment decisions was used in the NCVET [Seeking the N in LLN](#) research.

Answers to questions were assigned one of three possible outcomes: Credit, Insufficient Evidence or Not Attempted.

Note that consistent with good practice numeracy assessment a technically correct answer was not necessarily required to achieve a Credit.

For example:

- Answers are given the benefit of the doubt. For example, if the correct mathematical procedure is used but the incorrect answer calculated, a Credit is applied
- The highest ACSF numeracy level is given priority. For example, if within a calculation a ratio is used correctly but a metric conversion is not, a Credit is applied
- Incorrect data from previous questions is overlooked. For example, if an incorrect response from an earlier part of a question is carried through to arrive at an incorrect answer to a later question, a Credit is applied
- More right than wrong is credited. For example, if three out of four data points on a graph are plotted correctly, a Credit is applied

The outcome Insufficient Evidence is applied where there is evidence that the question was attempted but there is insufficient evidence for Credit to be applied. For example, if the answer is incorrect and either there is no evidence of the procedure used, or the procedure used is incorrect.

The outcome Not Attempted is assigned where there is no evidence of an attempt to answer the question.

1. Reflecting specifically on how Credits were applied answer the following questions.

What are the strengths of this approach?

What are the limitations of this approach?

What would you do differently?

2. Reflect on the activity.

What have you learnt from this activity?

In what ways did it challenge you?

How will you use this learning?

What are the implications for your practice?

GROUP PROFESSIONAL DEVELOPMENT ACTIVITY: PERFORMANCE EXPECTATIONS

Purpose

To explore the purpose and performance expectations of numeracy in different contexts and the implications for practice.

Instructions to the facilitator

Pre-workshop activity

Where practical, use this pre-workshop activity of reading and reflecting to engage participants prior to the workshop. Ask the participants to read the section titled 'Importance of context' in the [Guide](#) and familiarise themselves with examples of numeracy in the workplace using [*Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace*](#).

Workshop activity

Introduce the topic and ask the participants to respond to the following questions. When they have completed the questions facilitate a group discussion reflecting on the activity, what they have learnt and actions they will take. Allow up to 2 hours for the activity.

Note: The [Snapshots](#) provide examples of how a Credit achieved in a learning environment may be overly generous in a workplace context, which can be incorporated in the activity.

Post-workshop activity

Where practical, use this post-workshop activity of reflection and action to strengthen the transfer of learning. Ask the participants to create a Professional Development Plan to record and follow up the actions they commit to take based on the workshop activity.

Workshop activity

Expectations in a learning environment are very different from expectations in the workplace where workers have to get the right answer and there are few second chances.

In the scoring of the numeracy assessments in the [Seeking the N in LLN](#) research a correct answer was not required to achieve a Credit.

For example:

- Answers are given the benefit of the doubt. For example, if the correct mathematical procedure is used but the incorrect answer calculated, a Credit is applied
- The highest ACSF numeracy level is given priority. For example, if within a calculation a ratio is used correctly but a metric conversion is not, a Credit is applied
- Incorrect data from previous questions is overlooked. For example, if an incorrect response from an earlier part of a question is carried through to arrive at an incorrect answer to a later question, a Credit is applied
- More right than wrong is credited. For example, if three out of four data points on a graph are plotted correctly, a Credit is applied

The outcome Insufficient Evidence is applied where there is evidence that the question was attempted but there is insufficient evidence for Credit to be applied. For example, if the answer is incorrect and either there is no evidence of the procedure used, or the procedure used is incorrect.

The outcome Not Attempted is assigned where there is no evidence of an attempt to answer the question.

The standard to achieve a Credit may be overly generous compared to what is required to meet workplace expectations where the risk of a wrong answer can include lost productivity, dissatisfied customers, and safety and environmental incidents.

1. Reflecting on the scoring standard used and workplace expectations answer these questions.

What is the purpose of numeracy practice in a learning environment?

What are the numeracy performance expectations in a learning environment?

What is the purpose of numeracy practice on the job?

What are the numeracy performance expectations on the job?

How do the purposes and performance expectations of the two contexts align?

What are the implications for numeracy training in the workplace?

2. Reflect on the activity.

What have you learnt from this activity?

In what ways did it challenge you?

How will you use this learning?

What are the implications for your practice?

GROUP PROFESSIONAL DEVELOPMENT ACTIVITY: COMPARING CONTEXTS

Purpose

To explore the different characteristics of numeracy in a workplace context compared with a learning environment.

Instructions for the facilitator

Pre-workshop activity

Where practical, use this pre-workshop activity of reading and reflecting to engage participants prior to the workshop. Ask the participants to complete the *Numeracy in Practice* [Numeracy Proficiency Assessment Tool – Process Manufacturing Industry](#) following the instructions included in the tool. Ask them to mark the assessments themselves using the answer sheet provided in the [Guide](#) and the approach described in the section on ACSF assessment decisions.

Workshop activity

Introduce the topic and ask the participants to respond to the following questions. When they have completed the questions facilitate a group discussion reflecting on the activity, what they have learnt and actions they will take. Allow up to 2 hours for the activity.

Note: The [Snapshots](#) provide examples of numeracy in the workplace context, which can be incorporated in the activity.

Post-workshop activity

Where practical, use this post-workshop activity of reflection and action to strengthen the transfer of learning. Ask the participants to create a Professional Development Plan to record and follow up the actions they commit to take based on the workshop activity.

Workshop activity

In the workplace, numeracy proficiency and adult numeracy pedagogy practitioner skills and knowledge are not enough because the context is so important.

Consider the following comparison of the characteristics of numeracy in a workplace context compared with a learning environment.

| Characteristic | Learning environment | Workplace | Implications for workplace training |
|-----------------------|--|---|--|
| Purpose | <p>To develop numeracy skills</p> <p>For example, practising taking blood pressure readings to learn the skill</p> | <p>To employ numeracy skills as one of many means to support the achievement of business goals within the constraints and demands of the workplace</p> <p>For example, monitoring a patient's health by taking a blood pressure reading</p> | <p>Importance of business goals</p> <p>How numeracy supports business goals</p> <p>Importance of numeracy in supporting business goals</p> <p>Risks to business goals of poor numeracy performance</p> |
| Importance of context | <p>Context is not critical</p> <p>For example, practising solving algebraic equations</p> | <p>Context is critical as numeracy is highly embedded in job tasks</p> <p>For example, using algebra to calculate the volume of material needed for a job</p> | <p>Importance of job tasks</p> <p>How numeracy is used in the job task</p> <p>Importance of numeracy to the job task</p> <p>Risks to job task if poor numeracy performance</p> |

| Characteristic | Learning environment | Workplace | Implications for workplace training |
|----------------|--|---|---|
| Overtness | <p>Numeracy is overt</p> <p>For example, practising to write spreadsheet formulas</p> | <p>Numeracy is often hidden in work tasks</p> <p>For example, formulas in a spreadsheet that are only noticed if something goes wrong</p> | <p>Numeracy requirements of work tasks need to be uncovered</p> <p>Consideration of all three numeracy indicators</p> |
| Complexity | <p>Context has minimal impact on complexity</p> <p>For example, doing calculation worksheets</p> | <p>Numeracy is more complex because it is embedded in job tasks</p> <p>For example, counting stock</p> | <p>Importance of context complexities</p> <p>Impact of context complexities on numeracy performance</p> |

| Characteristic | Learning environment | Workplace | Implications for workplace training |
|--------------------|--|---|--|
| Degree of accuracy | <p>High degree of accuracy with a focus on calculations rather than estimations</p> <p>For example, calculating a completion time in a numeracy assessment</p> | <p>Degree of accuracy can be high or low depending on the job task</p> <p>For example, often calculations are done in the head and measurements are estimated</p> | <p>Different accuracies for different job tasks</p> <p>Degree of accuracy required cannot be assumed</p> <p>Impact of accuracy on productivity</p> <p>Different problem solving strategies for different levels of accuracy (e.g. in the head calculations, estimations)</p> |
| Mistakes | <p>Mistakes are not critical and are considered important for learning</p> <p>For example, practising taking measurements and learning from mistakes</p> | <p>Mistakes must be avoided</p> <p>For example, measuring a sample to check that it is within specification before sending it to a customer</p> | <p>Importance of recognising correct and incorrect answers</p> <p>Importance of checking own work</p> <p>Risks of mistakes in the workplace</p> <p>Need to assess against the workplace standards</p> |

| Characteristic | Learning environment | Workplace | Implications for workplace training |
|---------------------------------------|---|--|--|
| Complementary skills demands | <p>Complementary skills demands are optional</p> <p>For example, practising reading thermometers may or may not include decision making</p> | <p>Complementary skills demands are significant and important because numeracy is integrated with job tasks</p> <p>For example, monitoring the temperature of food storage with an understanding of the food safety requirements, implications for the business and reporting and recording requirements</p> | <p>Identification of complementary skills demands</p> <p>Integration of numeracy and complementary skills demands</p> <p>Importance of complementary skills demands</p> <p>Risks if complementary skills demands not met</p> |
| Skills and knowledge transfer demands | <p>Skills and knowledge transfer demands are optional</p> <p>For example, breakdowns are planned learning events</p> | <p>Skills and knowledge transfer demands are significant due to new information and unexpected problems</p> <p>For example, knowing what to do if there is an unforeseen breakdown</p> | <p>Identification of skills and knowledge transfer demands</p> <p>Integration of numeracy and skills and knowledge transfer demands</p> <p>Importance of skills and knowledge transfer demands</p> <p>Risks if skills and knowledge transfer demands not met</p> |

1. Identify a job task that you do that requires numeracy skills and answer the questions below.

What is the job task and what numeracy skills are needed?

To what extent is numeracy hidden or overt in the job task (for example, numeracy may be hidden in spreadsheet formulas and only noticed when there is a problem)?

What level of accuracy is expected in the workplace (for example, must an answer be spot on or is an estimate OK)?

What other skills and knowledge, besides numeracy, do you need to do the job task?

Are you expected to have the numeracy skills and knowledge to respond to new information and unexpected problems (for example, generate a new report)? Give examples.

Do you agree with the distinctions made in the table? Why/why not?

What are the implications for numeracy training delivery in the workplace context?

2. Reflect on the activity.

What have you learnt from this activity?

In what ways did it challenge you?

How will you use this learning?

What are the implications for your practice?

NUMERACY PROFICIENCY ASSESSMENT TOOL – PROCESS MANUFACTURING INDUSTRY ANSWERS

| Question | ACSF Level | Answer |
|----------|------------|--|
| 1a | 3 | 15 °C |
| 1b | 3 | 30 °F or 31 °F or 32 °F |
| 2a | 4 | Part A: 16 000 ml Part B: 4000 ml |
| 2b | 2 | 10:30 am (the next day) |
| 2c | 3 | 1000 ml |
| 2d | 4 | 3775 ml |
| 3a | 3 | 5760 preforms/hour |
| 3b | 3 | 62.5 seconds |
| 3c | 3 | 53280 bottles |
| 4a | 2 | Actual measurement (+/- 1 mm error allowed) |
| 4b | 4 | Calculate |
| 4c | 4 | Calculate |
| 4d | 4 | Yes /No |
| 5 | 4 | 18050 g |
| 6a | 3 | 44 units/hour |
| 6b (i) | 3 | Actual scrap rate: 6% |
| 6b (ii) | 3 | Target met: No |
| 7a | 1 | 15 MPa minimum |
| 7b | 2 | Yes |
| 8A | 4 | 11.973 mm |
| 8B | 5 | 13.010 mm |
| 8C | 4 | 44.546 mm |
| 9a | 1 | 20% |
| 9b | 4 | Draw on graph 11.5%, 61.5%, 19.2%, 7.7% |