

Numeracy By Measure

Building the Workplace Measurement Skills
of VET Practitioners



Cabinet Fitting

KITCHEN MEASURES

Many jobs require workers to work with measurements. Measurement underpins the success and welfare of a modern workplace and touches almost every part of working life. To develop and sell products and services, to manage quality and safety, and to enhance productivity workplaces need to measure processes, products and performance.

The example used in this Snapshot is a job task performed by tradespeople as part of preparing a quote for a new kitchen. The job task involves preparing a hand-drawn sketch on-site, which is a crucial stage in quoting for a new kitchen. It includes understanding and working with a range of measures, including linear dimensions and space and shape.

The numeracy skills required for this task focus predominantly on the second and third ACSF numeracy indicators. They include the ability to use and apply a range

of mathematical skills to undertake the task, including using tools to measure, draw and then reflect on and review the results – the application of ACSF numeracy indicator .10, *using and applying mathematical knowledge and problem solving processes*.

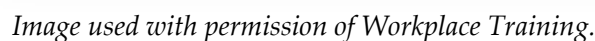
The numeracy skills also include the ability to record measurements, prepare hand sketches and communicate orally with the customer – the application of ACSF numeracy indicator .11, *communicating and representing mathematics*. These skills are also used back at the workshop to describe the job to supervisors and others to ensure fair quotes are given and quality products are manufactured and installed.

Workers responsible for undertaking such measurement tasks must also have a range of other complementary skills, such as the skills to work safely (follow safety procedures and identify and report hazards), and the skills to follow workplace

Numeracy by Measure: Cabinet fitting

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The ability to use and interpret measurements using a measuring tape to measure and check the linear dimensions or walls, cabinets, windows and appliances is needed to complete this task.



ACSF NUMERACY MAPPING

The process of mapping the numeracy skills demands of a job task to the ACSF is imprecise. That is, there is no absolute right or wrong. Professional judgement is needed. Consult the ACSF as you reflect on the numeracy skills mapping presented in this Snapshot. Do you follow and agree with the logic? What is your reasoning?

This task maps to **ACSF numeracy level 3**, with the mathematical content mainly related to the focus area *Mathematical knowledge and skills: measurement and geometry*. There is also the requirement to perform a number of calculations with the measurements, so there are aspects of the focus area *Mathematical knowledge and skills: number and algebra* too. A worker needs to be at **exit** numeracy level 3 to successfully and competently undertake a task such as this – that is, they need to be working at ACSF numeracy level 4.

At level 3, the second indicator describes the mathematical application aspects as using ‘a variety of developing mathematical and problem solving strategies’ while the third indicator describes the use of ‘a combination of both informal and formal oral and written mathematical language and representation’. The whole task of producing and reporting on the hand-drawn sketch from the on-site assessment covers the second and third numeracy indicators at level 3. However, if the tradesperson is then also involved in the development and drawing of 2D and 3D technical drawings, the numeracy skill demands are higher and the task aligns to ACSF numeracy level 4.

To undertake the whole task requires the understanding and application of a range of measures and measurement activities including the understanding and interpretation of familiar and routine 2D and 3D shapes alongside the understanding and application of linear dimensions. This not only requires the ability to take and understand measurements (indicator .10) but also the skills to record and discuss measurements in a hand sketch (indicator .11).

The following pages illustrate and explain the unpacking and mapping of two of the measurement skills required in this task (linear dimensions, and space and shape) to the relevant ACSF numeracy indicators, focus areas and performance features.

LINEAR DIMENSIONS

In this job task the understanding and use of linear dimensions underpins the process of drawing accurate sketches.

The hand sketch illustrates the range of accurate measurements the tradesperson needs to be able to take and write up, with accuracy to the nearest millimetre. The tradesperson must also be able to undertake relevant calculations to check total lengths versus the components. Errors when taking and recording linear dimension measurements could result in an inaccurate sketch and the production and installation of a poor quality product.



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

The information in the following table shows how the measurement of linear dimensions applies to this task and aligns to ACSF numeracy level 3.

ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<p>Problem solving processes including estimating and reflecting</p> <ul style="list-style-type: none"> • Uses developing estimation, and other assessment skills, to check and reflect on the outcome <p>Mathematical methods and use of tools</p> <ul style="list-style-type: none"> • Selects and uses appropriate tools, hand held devices, computers and technological processes, e.g. uses a tape measure to measure dimensions of a window in mm <p>Mathematical knowledge and skills: number and algebra</p> <ul style="list-style-type: none"> • Calculates with whole numbers and everyday routine fractions, decimals and percentages <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> • Measures, estimates and calculates length • Converts between routine metric units by applying understanding of common prefixes, e.g. milli, centi or kilo 	<p>The worker needs to be able to use a tape measure to measure all the relevant dimensions of the existing kitchen area using millimetres and check whether the linear dimensions measured and written down make sense, and are realistic and appropriate. The new construction being proposed does not exist, so the skills required to visualise and measure appropriately are significant. The measurements need to be reliable and not require another on-site visit.</p> <p>It is crucial to measure accurately to the nearest millimetre and to check and review the measurements. This is where the job task is clearly beyond level 2 and potentially even meets level 4 requirements where it states: ‘estimates, accurately measures ...’</p> <p>The worker needs to be able to undertake relevant calculations to check total dimensions compared to kitchen components.</p> <p>Discussions with supervisors and other workers back in the workshop may require further details to be provided about the measurements and how it all fits together, potentially involving the use of metres alongside the millimetres measured and recorded on the sketch, therefore, knowledge about metric conversions is assumed.</p>

ACSF numeracy indicator 3.11

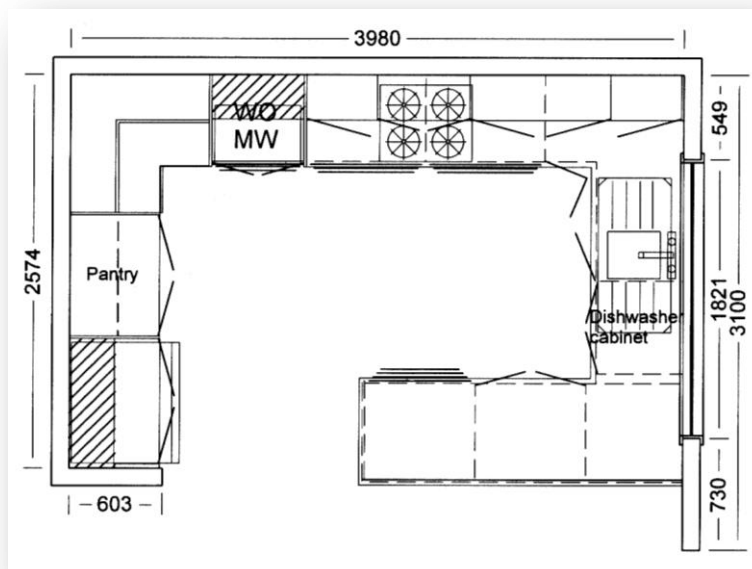
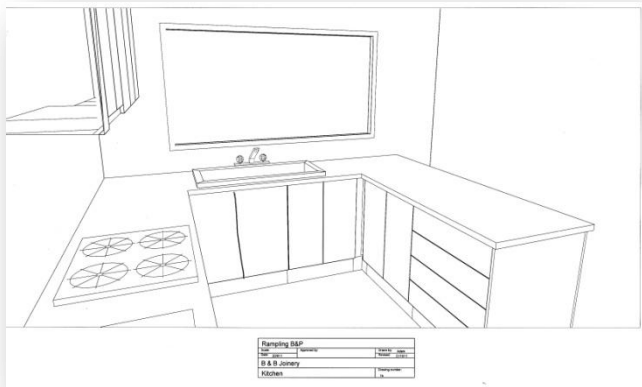
Focus areas and performance features	Comment
<p>Written mathematical language</p> <ul style="list-style-type: none"> Uses a combination of both informal and formal written mathematical language and symbols and general language to document and report on the mathematical and problem solving process and results <p>Oral mathematical language</p> <ul style="list-style-type: none"> Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical symbolism, representation and conventions</p> <ul style="list-style-type: none"> Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level Uses a combination of both formal and informal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level: e.g. $1.25\text{ m} = 1250\text{ mm}$ 	<p>The worker needs to be able to record a wide range of measurement information about different linear dimensions as shown on the sample sketch. This includes a range of formal written and more technical representations including 'both formal and informal symbolism and conventions'. Examples include the appropriate use of different marks and annotations to show the meanings of each dimension, and the use of terminology such as 'minimal overhang'. The measurements are recorded in millimetres (mm).</p> <p>The worker also needs to be able to discuss the results and how they were obtained and the hand sketch with supervisors and workers back in the workshop. This involves using a range of both informal and formal oral mathematical language in relation to linear dimensions.</p>



SPACE AND SHAPE

In this job task an important skill required of the worker in doing the on-site assessment is to be able to represent the real situation, seen and experienced in three dimensions, as a two dimensional sketch. The hand sketch sketches form the basis of 3D illustrations and accurate technical drawings, like the examples shown below. They show different views of the kitchen – including plan views showing what a structure looks like from above, elevations which show the different side-on views of the structure, and cross-sectional views.

Errors in relation to space and shape in the hand sketch could result in incorrect 2D and 3D technical drawings and the production and installation of a poor quality product.





ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<p>Problem solving processes including estimating and reflecting</p> <ul style="list-style-type: none"> Use developing estimation, and other assessment skills, to check and reflect on the outcome and its appropriateness to the context and task <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> Applies knowledge of properties of 2D and 3D shapes to describe and draw everyday objects, including constructing common 3D shapes 	<p>The worker needs to be able to draw, represent and record the proposed design of the kitchen including the measurement information as illustrated on the sample hand sketch. The new construction does not (necessarily) exist and therefore what the worker sees may bear little resemblance to the one being proposed. So the skills required to visualise and document appropriately what is being requested and proposed are quite sophisticated and require a range of skills described at level 3, if not at level 4.</p> <p>This task requires skills such as ‘knowledge of properties of 2D and 3D shapes’, ‘developing estimation, and other assessment skills, to check and reflect on the outcome and its appropriateness to the context and task’ and understanding of angles,</p>

ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<ul style="list-style-type: none"> Identifies and estimates common angles, e.g. as a rotation with a full turn = 360° and recognition of right angles as 90° 	especially of right angles.

ACSF numeracy indicator 3.11	
Focus areas and performance features	Comment
<p>Written mathematical language</p> <ul style="list-style-type: none"> Uses a combination of both informal and formal written mathematical language and symbols and general language to document and report on the mathematical and problem solving process and results <p>Oral mathematical language</p> <ul style="list-style-type: none"> Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical symbolism, representation and conventions</p> <ul style="list-style-type: none"> Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level Uses a combination of both formal and informal symbolism, diagrams, graphs and conventions relevant to the mathematical knowledge of the level: e.g. 1.25 m = 1250 mm 	<p>The worker needs to be able to record space and shape information using a range of formal written and more technical representations including 'both formal and informal symbolism and conventions'. Examples include the appropriate use of different marks and annotations to show the meanings of different shapes, constructions, and dimensions.</p> <p>The worker also has to talk to the customer about the construction and design, including different shape options and how the different options will fit in with each other. This requires a 'combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process'.</p> <p>The worker also needs to be able to discuss the hand sketch with the supervisor and other workers back in the workshop, which will involve further explanations and the use of more formal written and oral language in relation to space and shape.</p> <p>If the worker is also involved in the technical drawing and design process, then the level of formal skills required in relation to the complexity of mathematical symbolism, representation and conventions increases further.</p>

ABOUT THIS RESOURCE

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners is a professional development resource to support the development of VET practitioner numeracy proficiency skills and numeracy training skills. It has been developed in response to a National Centre for Vocational Education and Research (NCVER) report titled *Seeking the N in LLN*. This report found that there may be a need to increase the capacity of the vocational education and training (VET) workforce to meet the numeracy skills needs of existing workers in Australia. A copy of the full report is available for download at www.ncver.edu.au.

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners includes a [Guide](#) with professional development activities and six Snapshots exploring different workplace numeracy skills based on measurement. This is one of the Snapshots.

Measurement topics covered in the Snapshots include:

- [Bicycle Fitting](#)
- [Cabinet Fitting](#)
- [Health Monitoring](#)
- [Shoe Fitting](#)
- [Smallgoods Packing](#)
- [Tyre Wall Markings](#)

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

VET practitioners interested in increasing their awareness of numeracy skills in the workplace may also like to access the companion resources [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#) and [Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners](#).

[Numeracy by Measure](#), [Numeracy in Practice](#) and [Numeracy in Focus](#) are available for download from www.oggiconsulting.com/resources/.

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