Carry out measurements and calculations

CPCCCCM1015A

Lecturer’s guide
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Carry out measurements and calculations
Lecturer’s guide
Introduction

This lecturer’s guide is an accompaniment to the learner’s guide for the unit CPCCCM1015A Carry out measurements and calculations, and will support you in the delivery and assessment of that unit.

Areas of explanation include:

- taking measurements from plans
- taking physical measurements
- performing calculations
- calculating and estimating material quantities.

Delivery and assessment overview

It is intended that this unit will be delivered face-to-face in a classroom environment, utilising the content and activities provided in the learner’s guide. It is recommended that you integrate workshop activities into your delivery to provide learners with hands-on experience and the opportunity to develop and demonstrate their competency in the required skills and knowledge for the unit. There will also be hands-on learning opportunities provided within the work placement component of the course, and we encourage you to leverage these as part of your delivery and assessment strategy.

Three assessments are provided for this unit; however, please note that these are suggested assessment activities only and you are welcome to replace them with your preferred assessment tools. You will need to ensure that your assessment methodology meets the requirements of the unit – specifically that it must include direct observation of tasks in real or simulated work conditions.

Note: Because this unit is part of other building and construction qualifications, these resources may be used outside of the Certificate II in Building and Construction (Pathway – Trades) course.
Qualification overview

This unit of competency, CPCCCM1015A *Carry out measurements and calculations*, forms part of Certificate II in Building and Construction (Pathway – Trades), a pre-vocational course for learners seeking to gain an apprenticeship in the building and construction industry. The focus of this course is on developing relevant technical, vocational and interpersonal competencies as well as skills, knowledge and experiences that may be transferable to other industry areas. Learners will also gain employability skills relevant to an entry level employee of the industry.

The first component of the course consists of seven core units of competency (common to 11 construction trades) and a period of work placement. This component, which would typically be delivered over a one-year period, is designed to provide learners with a tradesperson’s introduction to the building and construction industry.

In the second component of the course, typically undertaken in the second year of study, learners will choose from 10 trade-specific streams of units of competency that enable them to focus their learning on a particular trade such as bricklaying, painting or carpentry.

To progress further in the industry, beyond this introductory level, learners will then need to gain an apprenticeship in their chosen trades area, or pursue further training within the building and construction field.
Introduction

Unit overview

This unit of competency describes the performance outcomes, skills and knowledge required to carry out measurements and calculations.

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement.

The full unit of competency details are provided for you at Annex A to this guide.

Competence in this unit will be demonstrated by successful completion of three assessments:

- Assessment 1 – Calculations and units
- Assessment 2 – Calculating perimeter, area and volume
- Assessment 3 – Calculating and estimating material quantities.

Resources and preparation

You will need to provide access to the following resources:

- at least one set of construction drawings, in addition to those provided at Annex C to the learner’s guide
- measuring tapes of varying lengths and types
- scale rules and calculators for in-class use.

You will also need to check all websites noted in the learner’s guide before each delivery session, as addresses can change without notice.

Learners should provide:

- a USB thumb drive
- an A4 notepad
- an A4 file for notes, handouts and other printed documents
- a scale rule
- a basic calculator
- pens, pencils, eraser and highlighters.

It is recommended that the unit CPCCCM2001A Read and interpret plans and specifications be delivered before this unit, as being able to read and interpret plans and drawings is a key requirement.
Some of these resources may be useful or of interest. If you want learners to use them, you will need to provide them with access.

<table>
<thead>
<tr>
<th>Information area</th>
<th>Resource</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Standards®</td>
<td>Varies with topic</td>
<td>SAI Global</td>
</tr>
</tbody>
</table>

### Legislation

The following is a list of legislation relevant to the residential construction industry in your state or territory. These documents may be referred to during the course.

- Building Act
- Building Regulations
- Health Regulations
- Occupational Health and Safety Act and Regulations
- Safe Design of Buildings and Structures (Code of Practice)
- Residential Design Codes

### Useful websites

The following is a list of websites that contain further information relevant to the construction and residential building industries.

- Australian Building Codes Board (ABCB) <www.abcb.gov.au>
- Building Designers Association of Australia (BDAA) <www.bdaa.com.au>
- Housing Industry Association (HIA) <www.hia.com.au>
- Master Builders Australia (MBA) <www.masterbuilders.com.au>
- SAI Global <www.saiglobal.com>

**Note:** Resources, legislation and websites noted in the guides may vary across regions, especially where state/territory legislation is referred to. Please review these within the context of your own local requirements.
The learner’s guide

Format and intent

General

In the learner’s guide, you’ll find a variety of material to help you deliver this unit. This includes:

- text, images, diagrams and worked examples
- activities including interpreting plans, taking measurements, carrying out calculations and working out quantities, all related to the content most recently covered.

All written activities are designed to be written directly into the learner’s guide. When learners have finished the unit, their guide should be complete and able to be used as a reliable reference in the future. For this to be the case, the activities need to be checked and/or discussed to give learners the opportunity to correct any incorrect answers and finish off any incomplete activities.

The learner’s guide also contains the three suggested assessments for this unit.

Note: The learner’s guide is not intended to be content-heavy, and it is not a textbook. It is designed to complement your classroom delivery and provide learners with a summary of the unit content.

For this unit

Throughout the learner’s guide, learners will complete activities to help them engage with the content being covered and to enhance their learning through reflection and research. Most of the topics have in-class activities to be completed while the content is fresh in learners’ minds.

You should try to complete these activities yourself before class, so that you’re able to prompt learners with likely answers should they get stuck or be unable to find a suitable response.

You may choose to supplement the content of the learner’s guide with additional activities and examples. Ending sessions with a group discussion designed to encourage further questions will also enhance learners’ knowledge.
Content

Section 1 provides an overview of the types of plans and drawings used in the residential building industry, who uses them, what for and what information they contain. Ideally, learners should already have completed, or be currently enrolled in, the unit CPCCCM2001A Read and interpret plans and specifications, so plans are not explored in detail in this unit. You will need to determine what extra support and practice your learner group may benefit from to successfully complete this unit. Extra support could include working through a range of example plans in groups.

In this section, learners are introduced to the Australian Height Datum (AHD) and asked to think of examples of projects that might need to use it.

The AHD, and levels in general, can be difficult to understand, so it is advisable to prepare some examples and various ways to explain the concept in advance. Examples could include a pipeline across Australia and aircraft control towers.

This section also looks at the units of measurement used in plans, and converting between these units. In talking about measurement units with learners, include a discussion about when the units are not written (for example, on plans), what assumptions learners can make about the unit(s) used and how they can check their assumptions.

Activity 1.3 requires learners to convert metres to millimetres and vice versa. An explanation precedes the activity, but you may need to also work through some examples before learners attempt the activity.

Section 2 provides an overview of working safely within the context of an employee on a building site. You will need to devise some examples or scenarios of WHS practices relevant to your learners’ work placements and/or your local area to provide context for learners. You should show examples of policies and products relating to safety on a building site. This may include induction forms, white cards, evacuation plans and safety flip charts. You should discuss manual handling, ergonomics, PPE and codes of conduct in relation to both the office and on-site environments.

Ideally, learners would already have completed the unit CPCCCOHS2001A Apply OHS requirements, policies and procedures in the construction industry.

In Section 3 learners look at the main pieces of equipment used to measure and calculate in the building industry. They are required to use a calculator for basic mathematical calculations. Although learners are expected to have basic maths skills, again you may need to work through some examples before they attempt the activities as some learners find the concept of scale difficult.

Scale is explained, then how to use a scale rule, before learners practise using a scale rule in Activities 3.3 and 3.4.
Section 4 is all about obtaining measurements, both physically and from plans, including checking whether they’re correct and recording them accurately. It also introduces measuring mass, volume and area. Learners may require additional support with these key concepts.

You may also wish to do an in-class activity to demonstrate and practise using the various pieces of measuring equipment before learners complete Activity 4.2. There is also an opportunity before Activity 4.2 to look at the condition of the equipment, how to handle it and how to use it safely.

Activity 4.4 requires learners to measure a variety of items around the campus. Check the items listed to be measured in this activity in advance, and substitute others if some aren’t suitable for measurement on your campus. Be aware of WHS issues.

Section 5 introduces the various types of calculations used in the building industry, including the most commonly used formulas. The content explores what the formulas are, why they are used, and when and how to use them. Perimeter, area, volume and mass are explained through worked solutions, which are immediately followed by practice examples for learners to try. You should work through these yourself in advance, to ensure that you can explain them clearly to learners. Some may need to be demonstrated in the classroom or workshop.

This section also introduces other units and quantities specific to the construction industry, which learners also need to understand and be able to use. This section involves the use of formulas, and requires a good basic knowledge of maths. You may need to provide additional support for some learners.

Section 6 pulls together the learning from the previous five sections and leads learners through the skills and knowledge needed to calculate quantities for a range of typical construction-related tasks. Worked solutions are presented using a set of house plans. Learners then carry out calculations using another set of plans. They are required to apply formulas, perform multi-step calculations and use the appropriate units to determine required quantities for a range of construction materials.

Section 7 asks learners to reflect on what they’ve learned and evaluate their understanding.
Carry out measurements and calculations
Lecturer's guide CPCCM1015A
Delivery strategy

As you prepare to deliver this unit, you should decide whether there is a particular type of construction that is most commonly used in your region and that it would be beneficial for your learners to know most about. If there is, try to source examples, stories and ideas that will enable you to provide learning experiences with an emphasis on that type of construction. Although the learner’s guide refers to specific types of construction and materials, these can be modified to suit the area in which the unit is being delivered and the preferred construction type(s) in that area.

Annex B to this guide contains a ‘Delivery guide’ showing alignment of activities to the unit of competency.

A full set of plans from ‘Hopscotch Homes’ is provided at Annex F to this guide (Annex C to the learner’s guide) – these are required for the assessment. An additional set of plans is also provided at Annex F, should you wish to use these in class. A full drawing for the ‘Sanderson St’ home used in some activities is also provided at Annex F to this guide.

It is recommended that the unit CPCCCM2001A Read and interpret plans and specifications be delivered before this unit, as being able to read and interpret plans and drawings is a key requirement.

The learner’s guide

The learner’s guide is a required resource for all sessions. In addition, each session may require specific resources, while some will share resources over a number of weeks’ delivery.

Given that learners in this unit are likely to lack experience in any of this content, you will have to guide them through the content for the most part. However, learners should also be encouraged to find their own answers to questions so as to develop their knowledge of where information can be sourced, even if they don’t have any background in the residential building industry at all.

If you haven’t already done so, get a copy of the learner’s guide and familiarise yourself with it.
Carry out measurements and calculations
Lecturer's guide CPCCCM1015A
Assessment summary

The three assessments provided for this unit are designed to assess competency in the four elements of the unit.

Please note that these are suggested assessment activities only and you are welcome to replace them with your preferred assessment tools. You will need to ensure that your assessment methodology meets the requirements of the unit.

Assessment 1 is an open-book assessment giving learners the opportunity to demonstrate their competency in performing basic mathematical operations using a calculator, applying and converting units, and using formulas.

Assessment 2 is an open-book assessment. Learners choose and apply formulas to calculate the dimensions of a range of common shapes. They may also use a calculator.

Assessment 3 is the final open-book assessment. Learners are required to interpret simple plans to calculate quantities of materials needed for some common construction tasks. Again, learners may use a calculator and consult their learner’s guide if they wish.

An assessment plan and the assessments are provided at Annex C to this guide.

A matrix is provided at Annex D showing how the assessment tasks map to the unit of competency, and there is an assessment marking key at Annex E.

A full set of plans from ‘Hopscotch Homes’ is provided at Annex F to this guide (Annex C to the learner’s guide) to go with Assessment 3.

Results and appeals

Please refer to your training institution, association website or your supervisor for information about the assessment process.
Annex A – Unit details

<table>
<thead>
<tr>
<th>Unit title</th>
<th>Carry out measurements and calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptor</td>
<td>This unit of competency specifies the outcomes required to carry out measurements and perform simple calculations to determine task and material requirements for a job in a construction work environment.</td>
</tr>
<tr>
<td>Employability skills</td>
<td>This unit contains employability skills.</td>
</tr>
<tr>
<td>Prerequisite units</td>
<td>Nil</td>
</tr>
<tr>
<td>Application</td>
<td>This unit of competency supports achievement of skills to take measurements and use these to calculate material qualities and calculations for related tasks commonly used and applied in construction work.</td>
</tr>
</tbody>
</table>

Element 1 Plan and prepare

1.1 Work instructions are confirmed and applied using relevant information.

1.2 Safety (OHS) requirements are obtained from site safety plan, other regulatory specifications or legal obligations, and are applied.

1.3 Measuring and calculating equipment selected to carry out tasks is consistent with job requirements, is checked for serviceability, and any faults are rectified or reported.

Element 2 Obtain measurements

2.1 Method of obtaining the measurement is selected and applied.

2.2 Measurements are obtained using a rule or tape accurate to 1 mm.

2.3 Measurements, including areas and volumes, are confirmed and recorded.

Element 3 Perform calculations

3.1 Appropriate calculation factors are determined and correct method is selected for achieving required result.

3.2 Material quantities for the project are correctly calculated using appropriate factors.

3.3 Results are confirmed and recorded.
Element 4 Estimate approximate quantities

4.1. Calculations for determining material requirements are taken.

4.2. Appropriate formulas for calculating quantities are selected.

4.3. Quantities are estimated from the calculations taken.

4.4. Material quantities for the project are calculated, confirmed and recorded within enterprise tolerances.

Required skills and knowledge

Required skills

Required skills for this unit are:

- communication skills to:
  - determine requirements
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - follow instructions
  - read and interpret:
    - documentation from a variety of sources
    - drawings and specifications
  - report faults
  - use language and concepts appropriate to cultural differences
  - use and interpret non-verbal communication, such as hand signals
  - written skills to record measurements, calculations and quantities

- identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials

- numeracy skills to apply measurements, calculations and geometry

- organisational skills, including the ability to plan and set out work

- teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities

- technological skills to:
  - use a range of mobile technology, such as two-way radio and mobile phones
  - voice and hand signals to access and understand site-specific instructions.
Required knowledge

Required knowledge for this unit is:

- basic calculators
- communication devices
- company procedures
- construction terminology
- job safety analysis (JSA) and safe work method statements
- measuring, calculating, geometry and determination of quantities
- processes for care of measuring equipment
- project quality requirements
- site and equipment safety (OHS) requirements
- tolerances.
## Evidence guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

<table>
<thead>
<tr>
<th>Overview of assessment</th>
<th>This unit of competency could be assessed in the workplace or a close simulation of the workplace environment, provided that simulated or project-based assessment techniques fully replicate construction workplace conditions, materials, activities, responsibilities and procedures.</th>
</tr>
</thead>
</table>
| Critical aspects for assessment and evidence required to demonstrate competency in this unit | A person who demonstrates competency in this unit must be able to provide evidence of the ability to:  
• locate, interpret and apply relevant information  
• comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations  
• comply with organisational policies and procedures, including quality requirements  
• safely and effectively use tools and equipment  
• communicate and work effectively and safely with others  
• complete measurements, calculations and determination of quantities for different projects of varying complexity in a range of contexts or occasions over time  
• calculate each of the following using a realistic construction task or example:  
  ◦ length  
  ◦ perimeter  
  ◦ circumference  
  ◦ area  
  ◦ volume  
  ◦ number  
  ◦ ratio  
  ◦ percentage  
  ◦ conversion of metres to millimetres and millimetres to metres  
  ◦ measure using a rule or tape measure five separate tasks within 1 mm accuracy. |
## Context of and specific resources for assessment

| Context of and specific resources for assessment | This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints. Assessment of essential underpinning knowledge will usually be conducted in an off-site context. Assessment is to comply with relevant regulatory or Australian standards' requirements. Resource implications for assessment include:  

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>an induction procedure and requirement</td>
</tr>
<tr>
<td></td>
<td>realistic tasks or simulated tasks covering the mandatory task requirements</td>
</tr>
<tr>
<td></td>
<td>relevant specifications and work instructions</td>
</tr>
<tr>
<td></td>
<td>tools and equipment appropriate to applying safe work practices</td>
</tr>
<tr>
<td></td>
<td>support materials appropriate to activity</td>
</tr>
<tr>
<td></td>
<td>workplace instructions relating to safe work practices and addressing hazards and emergencies</td>
</tr>
<tr>
<td></td>
<td>material safety data sheets</td>
</tr>
<tr>
<td></td>
<td>research resources, including industry-related systems information.</td>
</tr>
</tbody>
</table>

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support. |
### Method of assessment

<table>
<thead>
<tr>
<th>Assessment methods must:</th>
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</thead>
<tbody>
<tr>
<td>• satisfy the endorsed Assessment Guidelines of the</td>
</tr>
<tr>
<td>Construction, Plumbing and Services Training Package</td>
</tr>
<tr>
<td>• include direct observation of tasks in real or</td>
</tr>
<tr>
<td>simulated work conditions, with questioning to confirm</td>
</tr>
<tr>
<td>the ability to consistently identify and correctly</td>
</tr>
<tr>
<td>interpret the essential underpinning knowledge required</td>
</tr>
<tr>
<td>for practical application</td>
</tr>
<tr>
<td>• reinforce the integration of employability skills</td>
</tr>
<tr>
<td>with workplace tasks and job roles</td>
</tr>
<tr>
<td>• confirm that competency is verified and able to be</td>
</tr>
<tr>
<td>transferred to other circumstances and environments.</td>
</tr>
</tbody>
</table>

Validity and sufficiency of evidence requires that:

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>• competency will need to be demonstrated</td>
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<tr>
<td>over a period of time reflecting the scope</td>
</tr>
<tr>
<td>of the role and the practical requirements</td>
</tr>
<tr>
<td>of the workplace</td>
</tr>
<tr>
<td>• where the assessment is part of a</td>
</tr>
<tr>
<td>structured learning experience the</td>
</tr>
<tr>
<td>evidence collected must relate to a number</td>
</tr>
<tr>
<td>of performances assessed at different</td>
</tr>
<tr>
<td>points in time and separated by further</td>
</tr>
<tr>
<td>learning and practice, with a decision on</td>
</tr>
<tr>
<td>competency only taken at the point when</td>
</tr>
<tr>
<td>the assessor has complete confidence in</td>
</tr>
<tr>
<td>the person's demonstrated ability and</td>
</tr>
<tr>
<td>applied knowledge</td>
</tr>
<tr>
<td>• all assessment that is part of a</td>
</tr>
<tr>
<td>structured learning experience must</td>
</tr>
<tr>
<td>include a combination of direct, indirect</td>
</tr>
<tr>
<td>and supplementary evidence.</td>
</tr>
</tbody>
</table>

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.
## Range statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

| **Information** includes: | • diagrams or sketches  
|                          | • instructions issued by authorised organisational or external personnel  
|                          | • manufacturer specifications and instructions  
|                          | • maps  
|                          | • material safety data sheets (MSDS)  
|                          | • memos  
|                          | • organisation's work specifications and requirements  
|                          | • plans and specifications  
|                          | • regulatory and legislative requirements  
|                          | • relevant Australian standards  
|                          | • safe work procedures or equivalent  
|                          | • signage  
|                          | • verbal or written and graphical instructions  
|                          | • work bulletins  
|                          | • work schedules.  
| **Safety (OHS)** is to be in accordance with state or territory legislation and regulations, organisational safety policies and procedures, and project safety plan and may include: | • clothing and equipment  
|                          | • handling of materials  
|                          | • hazard control  
|                          | • hazardous materials and substances  
|                          | • organisational first aid  
|                          | • use of firefighting equipment  
|                          | • use of tools and equipment  
|                          | • workplace environment and safety.  
| **Equipment** includes: | • calculators and laser equipment  
|                          | • rulers  
|                          | • tape measures  
|                          | • trundle wheels.  

### Carry out measurements and calculations

#### Lecturer’s guide

**Measurements**

- be in metric scale
- cover all necessary calculations.

**Areas and volumes**

- calculating regular and irregular shapes, such as rectangles, squares, circles, triangles, trapeziums, cubes, cones, pyramids and cylinders that represent calculations taken in a construction environment.

**Calculation factors:**

- include length, area, weight, height, width, depth, volume, mass, scales, ratios, perimeters, quantities, numbers, grade, percentages, addition, subtraction, multiplication and division
- are to be performed manually and with the aid of a calculator.

**Material quantities**

- calculated in either packed, bulk, loose or compacted states
- converted to volumes in the other states.
Annex B – Delivery guide

The following table shows how activities within the learner’s guide map to the unit of competency. Please note that this mapping is aligned as closely as possible to the unit. Actual learning outcomes may differ as many activities are open-ended and therefore learners’ answers may vary.

<table>
<thead>
<tr>
<th>Unit name</th>
<th>National ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carry out measurements and calculations</td>
<td>CPCCCM1015A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element 1 Plan and prepare</strong></td>
</tr>
<tr>
<td>1.1 Work instructions are confirmed and applied using relevant <em>information</em>.</td>
</tr>
<tr>
<td>1.2 <em>Safety (OHS)</em> requirements are obtained from site safety plan, other regulatory specifications or legal obligations, and are applied.</td>
</tr>
<tr>
<td>1.3 Measuring and calculating <em>equipment</em> selected to carry out tasks is consistent with job requirements, is checked for serviceability, and any faults are rectified or reported.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Element 2 Obtain measurements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Method of obtaining the measurement is selected and applied.</td>
</tr>
<tr>
<td>2.2 <em>Measurements</em> are obtained using a rule or tape accurate to 1 mm.</td>
</tr>
<tr>
<td>2.3 Measurements, including <em>areas and volumes</em>, are confirmed and recorded.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Element 3 Perform calculations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Appropriate <em>calculation factors</em> are determined and correct method is selected for achieving required result.</td>
</tr>
<tr>
<td>3.2 <em>Material quantities</em> for the project are correctly calculated using appropriate factors.</td>
</tr>
<tr>
<td>3.3 Results are confirmed and recorded.</td>
</tr>
</tbody>
</table>
### Element 4 Estimate approximate quantities

<table>
<thead>
<tr>
<th>Activity</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1. Calculations for determining material requirements are taken.</td>
<td>3.2–3.5, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>4.2. Appropriate formulas for calculating quantities are selected.</td>
<td>5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>4.3. Quantities are estimated from the calculations taken.</td>
<td>5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>4.4. Material quantities for the project are calculated, confirmed and recorded within enterprise tolerances.</td>
<td>5.1–5.18, 6.1–6.4</td>
</tr>
</tbody>
</table>
## Required skills

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication skills to:</strong></td>
<td></td>
</tr>
<tr>
<td>• determine requirements</td>
<td>1.1, 1.2, 1.4, 5.1–5.3</td>
</tr>
<tr>
<td>• enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand</td>
<td>4.4</td>
</tr>
<tr>
<td>• follow instructions</td>
<td>All</td>
</tr>
<tr>
<td>• read and interpret:</td>
<td></td>
</tr>
<tr>
<td>◦ documentation from a variety of sources</td>
<td>1.2, 1.2, 1.4, 4.2</td>
</tr>
<tr>
<td>◦ drawings and specifications</td>
<td>1.2, 1.2, 1.4, 4.2, 5.5–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>• report faults</td>
<td>3.2</td>
</tr>
<tr>
<td>• use language and concepts appropriate to cultural differences</td>
<td>–</td>
</tr>
<tr>
<td>• use and interpret non-verbal communication, such as hand signals</td>
<td>–</td>
</tr>
<tr>
<td>• written skills to record measurements, calculations and quantities</td>
<td>All</td>
</tr>
<tr>
<td>identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials</td>
<td>2.1, 2.2, 3.2</td>
</tr>
<tr>
<td>Numeracy skills to apply measurements, calculations and geometry</td>
<td>1.3, 3.1–3.5, 4.2, 4.4, 5.5–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>Organisational skills, including the ability to plan and set out work</td>
<td>1.1, 1.2, 1.4</td>
</tr>
<tr>
<td>Teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities</td>
<td>4.4</td>
</tr>
<tr>
<td>Technological skills to:</td>
<td></td>
</tr>
<tr>
<td>• use a range of mobile technology, such as two-way radio and mobile phones</td>
<td>–</td>
</tr>
<tr>
<td>• voice and hand signals to access and understand site-specific instructions.</td>
<td>–</td>
</tr>
</tbody>
</table>
## Carry out measurements and calculations

### Lecturer’s guide

**Activity**

<table>
<thead>
<tr>
<th>Required knowledge</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic calculators</td>
<td>All calculation activities</td>
</tr>
<tr>
<td>communication devices</td>
<td>–</td>
</tr>
<tr>
<td>company procedures</td>
<td>–</td>
</tr>
<tr>
<td>construction terminology</td>
<td>1.1, 1.2, 1.4, 2.2, 4.2, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>job safety analysis (JSA) and safe work method statements</td>
<td>2.1, 2.2</td>
</tr>
<tr>
<td>measuring, calculating, geometry and determination of quantities</td>
<td>1.3, 3.1–3.5, 4.2, 4.6, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>processes for care of measuring equipment</td>
<td>3.1</td>
</tr>
<tr>
<td>project quality requirements</td>
<td>–</td>
</tr>
<tr>
<td>site and equipment safety (OHS) requirements</td>
<td>2.1, 2.2, 2.4</td>
</tr>
<tr>
<td>tolerances.</td>
<td>–</td>
</tr>
</tbody>
</table>
### Critical aspects of evidence
A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>locate, interpret and apply relevant information</td>
<td>1.1, 1.2, 1.4, 4.2, 4.4, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations</td>
<td>2.1, 2.2, 4.4</td>
</tr>
<tr>
<td>comply with organisational policies and procedures, including quality requirements</td>
<td>2.2</td>
</tr>
<tr>
<td>safely and effectively use tools and equipment</td>
<td>2.1, 2.2, 3.2, 4.4</td>
</tr>
<tr>
<td>communicate and work effectively and safely with others</td>
<td>2.1, 2.2, 4.4</td>
</tr>
<tr>
<td>complete measurements, calculations and determination of quantities for different projects of varying complexity in a range of contexts or occasions over time</td>
<td>1.3, 3.1–3.5, 4.2, 4.4, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>calculate each of the following using a realistic construction task or example:</td>
<td>1.3, 3.1–3.5, 4.2, 4.4, 5.1–5.18, 6.1–6.4</td>
</tr>
<tr>
<td>- length</td>
<td></td>
</tr>
<tr>
<td>- perimeter</td>
<td></td>
</tr>
<tr>
<td>- circumference</td>
<td></td>
</tr>
<tr>
<td>- area</td>
<td></td>
</tr>
<tr>
<td>- volume</td>
<td></td>
</tr>
<tr>
<td>- number</td>
<td></td>
</tr>
<tr>
<td>- ratio</td>
<td></td>
</tr>
<tr>
<td>- percentage</td>
<td></td>
</tr>
<tr>
<td>- conversion of metres to millimetres and millimetres to metres</td>
<td></td>
</tr>
<tr>
<td>- measure using a rule or tape measure five separate tasks within 1 mm accuracy.</td>
<td></td>
</tr>
</tbody>
</table>
Carry out measurements and calculations
Lecturer's guide
Annex C – Assessments

The assessments suggested here for this unit are designed to assess your competency in the elements as listed in the unit details at Annex A to this guide. There are three components to the assessment.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment 1 – Calculations and units</strong></td>
<td>1, 2</td>
</tr>
<tr>
<td>This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment 2 – Calculating perimeter, area and volume</strong></td>
<td>2, 3, 4</td>
</tr>
<tr>
<td>This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment 3 – Calculating and estimating material quantities</strong></td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Your lecturer may provide you with alternative assessments.

Individual learning and assessment needs

Learners have different learning styles and needs. Please let your lecturer know if there is anything that may have an effect on your learning.

Results and appeals

There is a process to be followed should you wish to appeal the result of your assessment. Please ask your lecturer for more information about this.
Assessment 1 – Calculations and units

This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.

Read each question carefully.

Materials and equipment

To attempt this assessment you will need:

• the assessment paper
• this guide
• a calculator
• a pen or pencil and an eraser.
CPCCCM1015A

Carry out measurements and calculations

Assessment 1 – Calculations and units

Name ___________________________ Date __________

I have received feedback on this assessment.

Signature ________________________ Date __________

Assessor’s initials
Carry out measurements and calculations
Lecturer’s guide
Assessment 1 – Calculations and units

Use a calculator to find the answers to questions 1–4. Show your working out if you wish.

1. Carry out the following additions.
   a) 20 + 316 + 4300 = 
   b) 5.592 + 12.476 + 0.500 = 
   c) 0.750 + 8.7744 + 2.345 = 

2. Carry out the following subtractions.
   a) 653 – 179 = 
   b) 6.76 – 1.610 = 
   c) 2969.445 – 845.708 = 

3. Carry out the following multiplications.
   a) 27.76 × 35 = 
   b) 18.017 × 3.58 = 
   c) 0.976 × 0.675 = 

4. Carry out the following divisions.
   a) 1565 ÷ 25 = 
   b) 85.325 ÷ 27.5 = 
   c) 750 ÷ 0.75 = 

Write the answers to the following questions in the spaces provided.

5. a) The two metric units of length used in the building industry are: 
   ______________________ and ______________________.
   b) The metric unit of area used in the building industry is ____________________.
   c) The metric unit of volume used in the building industry is ____________________.

6. Convert the following from metres to millimetres.

<table>
<thead>
<tr>
<th>Metres</th>
<th>Millimetres</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 15.662</td>
<td>= ____________________</td>
</tr>
<tr>
<td>b) 0.195</td>
<td>= ____________________</td>
</tr>
</tbody>
</table>
7. Convert the following from millimetres to metres

<table>
<thead>
<tr>
<th>Millimetres</th>
<th>Metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 830</td>
<td></td>
</tr>
<tr>
<td>b) 5150</td>
<td></td>
</tr>
</tbody>
</table>

8. When dimensions in millimetres are to be used for either area or volume calculations, what should be done to the dimensions before making the calculation?

9. Write the formula for each of the following.

   Perimeter of a rectangle  \( P = \) ________________

   Area of a rectangle  \( A = \) ________________

   Area of a circle  \( A = \) ________________

   Volume of a rectangular prism  \( V = \) ________________

   Area of a triangle  \( A = \) ________________
Assessment 2 – Calculating perimeter, area and volume

This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.

Read each question carefully.

Materials and equipment

To attempt this assessment you will need:

• the assessment paper
• this guide
• a calculator
• a pen or pencil and an eraser.
CPCCCM1015A

Carry out measurements and calculations

Assessment 2 – Calculating perimeter, area and volume

Name _______________________________ Date _____________

I have received feedback on this assessment.

Signature _____________________________ Date _____________

Assessor’s initials

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Carry out measurements and calculations
Lecturer’s guide

CPCCC1015A
Assessment 2 – Calculating perimeter, area and volume

1. Calculate the perimeters of the following two shapes.
   a)  
      ![Image of a shape with dimensions 4.950, 9.450, 8.150, and 2.470]
      Formula = ________________
      Answer = ________________
   b)  
      ![Image of a circle with diameter 7.800]
      Formula = ________________
      Answer = ________________
2. Calculate the area of this shape.

Formula = ________________

Answer = ________________

3. Calculate the area of this triangle.

Formula = ________________

Answer = ________________
4. The measurements of this concrete cube are 2.4 H × 2.4 W × 2.4 L. Calculate the volume in cubic metres.

Formula = ______________

Answer = ______________

5. Calculate the net surface area of brick paving (the shaded area) in this sketch of a courtyard.

Formula = __________________________________________________________

Answer = __________________________________________________________

End of Assessment 2
Carry out measurements and calculations
Lecturer’s guide

CPCCM1015A
Assessment 3 – Calculating and estimating material quantities

This is an open-book assessment. You may seek guidance from your lecturer, and you may refer to this guide if you wish. You may use a calculator.

Read each question carefully.

Materials and equipment

To attempt this assessment you will need:

• the assessment paper
• this guide
• the Hopscotch Homes plans (provided at Annex C to this guide)
• a calculator
• a pen or pencil and an eraser
• a scale rule.
Carry out measurements and calculations
Lecturer’s guide CPCCCM1015A
CPCCCM1015A

Carry out measurements and calculations

Assessment 3 – Calculating and estimating material quantities

Name ___________________________ Date _____________

I have received feedback on this assessment.

Signature _________________________ Date _____________

Assessor’s initials
Carry out measurements and calculations
Lecturer’s guide
Assessment 3 – Calculating and estimating material quantities

1. Calculate the net surface area of the walls of Bed 2 in this part plan. The ceiling height is 2450, the door is 2060 high and the window is 1810 high.

Formula = 

Answer = 
2. Calculate the volume of concrete required for the porch slab in this part plan.

Formula = 

Answer = 
3. This sketch shows part of a block of land. A fence is to be erected on the two sides shown.

Calculate how many fence posts will be required for the job if they are to be placed at a maximum of 2.4 m centres.

Formula = 

Answer = 
4. View the Hopscotch Homes floor plan. Use your scale rule to measure the following. Give your answers in metres (m).
   
   a) Internal perimeter of Bed 2, excluding the walk-in robe (WIR).
      
      __________________________________________________________
      __________________________________________________________
   
   b) External perimeter of the building including the garage.
      
      __________________________________________________________
      __________________________________________________________
   
   c) Length of the kitchen benchtops.
      
      __________________________________________________________
      __________________________________________________________
   
   d) Perimeter of the alfresco cover.
      
      __________________________________________________________
      __________________________________________________________
   
   e) Length of the steel beam (200 UB) that spans the family and meal rooms.
      
      __________________________________________________________
      __________________________________________________________
5. Point A has a height of 3 m above natural ground level, and point B has a height of 1 m above ground level. These two points are 10 m distance apart.
   a) What is the height difference between the two points?

   b) With the aid of a sketch, describe how the ground slopes upwards or downwards from point A to point B.

   c) What is the gradient from A to B, stated as a ratio?
6. Consider the safety policies for a building site. List four safety requirements that should be considered when doing measurements.


7. Consider the safety policies for workers on a building site. List four safety requirements on a typical building site.


8. Using the floor plan provided here, drawn at a scale of 1:100, carry out calculations and estimates detailed in a), b), c) and d) on the next page for the living room only.

Reproduced or adapted with the permission of WA Country Builders.
a) How many bricks will be needed for the largest external wall? The face size of the bricks for this home is 76 × 230.

b) What total length of timber skirting will it take to do the perimeter of the room?

c) If the client goes with the 300 × 300 tiles they've been looking at, how many tiles will it take to do the floor?

d) How much concrete will it take to pour the slab to a thickness of 160 mm?

e) What equipment would you use to measure up then calculate quantities for each of the following?
   Bricks
   Skirting
   Tiles
   Slab
9. What would be the best way to look after your measuring equipment? Circle the correct answer.
   a) Keep it all together in a bag in the back of the ute.
   b) Keep each piece of equipment in its own bag or box.
   c) Wear it all in a tool belt.
   d) Throw it in the back of the ute and keep the lid closed.

10. What would be your top three tips to make sure you can work effectively and communicate with other tradespeople when you’re carrying out measurements and calculations?
    
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________

11. When doing estimates, what document(s) tell you the specific materials that are going to be used (eg tiles, bricks) and any quality requirements?
    
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________

12. What communication technology could you use if you had to send another tradesperson information about quantities of materials required for a job?
    
    ______________________________________________________
    ______________________________________________________

End of Assessment 3
Annex D – Assessment guide

Please note that this mapping is aligned as closely as possible to the unit. Actual mapping of assessment outcomes may vary slightly, as the answers learners give to some questions may relate to elements of the unit other than those intended.

<table>
<thead>
<tr>
<th>Unit name</th>
<th>National ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carry out measurements and calculations</td>
<td>CPCCCM1015A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element 1 Plan and prepare</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Work instructions are confirmed and applied using relevant information.</td>
<td>Q1–4</td>
<td>All</td>
</tr>
<tr>
<td>1.2 Safety (OHS) requirements are obtained from site safety plan, other regulatory specifications or legal obligations, and are applied.</td>
<td></td>
<td>Q6, 7</td>
</tr>
<tr>
<td>1.3 Measuring and calculating equipment selected to carry out tasks is consistent with job requirements, is checked for serviceability, and any faults are rectified or reported.</td>
<td></td>
<td>Q4, 8, 9</td>
</tr>
</tbody>
</table>

| **Element 2 Obtain measurements** | | |
| 2.1 Method of obtaining the measurement is selected and applied. | Q5–7, 9 | Q1–4 | Q1–4, 8 |
| 2.2 Measurements are obtained using a rule or tape accurate to 1 mm. | Q9 | Q1–4 | Q1–4, 8 |
| 2.3 Measurements, including areas and volumes, are confirmed and recorded. | Q8 | Q1–4 | All |
### Element 3 Perform calculations

<table>
<thead>
<tr>
<th></th>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Appropriate <em>calculation factors</em> are determined and correct method is selected for achieving required result.</td>
<td>Q9</td>
<td>Q5</td>
</tr>
<tr>
<td>3.2</td>
<td><em>Material quantities</em> for the project are correctly calculated using appropriate factors.</td>
<td>Q5</td>
<td>Q1–3</td>
</tr>
<tr>
<td>3.3</td>
<td>Results are confirmed and recorded.</td>
<td>Q5</td>
<td>All</td>
</tr>
</tbody>
</table>

### Element 4 Estimate approximate quantities

<table>
<thead>
<tr>
<th></th>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Calculations for determining material requirements are taken.</td>
<td>Q2, 3, 8</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td>Appropriate formulas for calculating quantities are selected.</td>
<td>Q9</td>
<td>Q1–5</td>
</tr>
<tr>
<td>4.3</td>
<td>Quantities are estimated from the calculations taken.</td>
<td>Q2, 3, 8</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>Material quantities for the project are calculated, confirmed and recorded within enterprise tolerances.</td>
<td>Q2, 3, 8</td>
<td></td>
</tr>
<tr>
<td>Required skills</td>
<td>Assessment 1</td>
<td>Assessment 2</td>
<td>Assessment 3</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>communication skills to:</td>
<td>Q6–9</td>
<td>Q4, 5</td>
<td>Q6, 7, 10</td>
</tr>
<tr>
<td>• determine requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>• follow instructions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• read and interpret:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>◦ documentation from a variety of sources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>◦ drawings and specifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• report faults</td>
<td></td>
<td></td>
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<td>• use language and concepts appropriate to cultural differences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• use and interpret non-verbal communication, such as hand signals</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• written skills to record measurements, calculations and quantities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>identifying and accurately reporting to appropriate personnel any faults in tools, equipment or materials</td>
<td>Q6, 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>numeracy skills to apply measurements, calculations and geometry</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>organisational skills, including the ability to plan and set out work</td>
<td>Q1–4, 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>teamwork skills to work with others to action tasks and relate to people from a range of cultural and ethnic backgrounds and with varying physical and mental abilities</td>
<td>Q1–4, 8, 10, 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>technological skills to:</td>
<td>To be observed in class and on work placement.</td>
<td>To be observed on work placement.</td>
<td></td>
</tr>
</tbody>
</table>
## Required knowledge

<table>
<thead>
<tr>
<th>Required knowledge</th>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic calculators</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>communication devices</td>
<td></td>
<td></td>
<td>Q12</td>
</tr>
<tr>
<td>company procedures</td>
<td>All</td>
<td>All</td>
<td>Q11, 12</td>
</tr>
<tr>
<td>construction terminology</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>job safety analysis (JSA) and safe work method statements</td>
<td></td>
<td></td>
<td>Q6, 7</td>
</tr>
<tr>
<td>measuring, calculating, geometry and determination of quantities</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>process for care of measuring equipment</td>
<td></td>
<td></td>
<td>Q9</td>
</tr>
<tr>
<td>project quality requirements</td>
<td></td>
<td></td>
<td>Q10</td>
</tr>
<tr>
<td>site and equipment safety (OHS) requirements</td>
<td></td>
<td></td>
<td>Q6, 7</td>
</tr>
<tr>
<td>tolerances</td>
<td></td>
<td></td>
<td>Q10</td>
</tr>
</tbody>
</table>

## Critical aspects of evidence

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

<table>
<thead>
<tr>
<th>Critical aspects of evidence</th>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>locate, interpret and apply relevant information</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>comply with site safety plan, OHS regulations and state and territory legislation applicable to workplace operations</td>
<td></td>
<td></td>
<td>Q6, 7</td>
</tr>
<tr>
<td>comply with organisational policies and procedures, including quality requirements</td>
<td></td>
<td></td>
<td>Q10</td>
</tr>
<tr>
<td>safely and effectively use tools and equipment</td>
<td></td>
<td></td>
<td>Q6, 7, 9</td>
</tr>
<tr>
<td>communicate and work effectively and safely with others</td>
<td>Q6–9</td>
<td>Q4, 5</td>
<td>Q6, 7, 10, 12,</td>
</tr>
<tr>
<td>complete measurements, calculations and determination of quantities for different projects of varying complexity in a range of contexts or occasions over time</td>
<td>All</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>
calculate each of the following using a realistic construction task or example:
• length
• perimeter
• circumference
• area
• volume
• number
• ratio
• percentage
• conversion of metres to millimetres and millimetres to metres
• measure using a rule or tape measure five separate tasks within 1 mm accuracy.

<table>
<thead>
<tr>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Q1–4</td>
<td>Q1–4, 8</td>
</tr>
</tbody>
</table>
Carry out measurements and calculations
Lecturer’s guide

CPCCM1015A
Annex E – Assessment marking keys

Assessment 1 – Calculations and units

The following answers are provided to you as a guide only. You should review them all to ensure that they meet your requirements.

1. Carry out the following additions.
   a) \(20 + 316 + 4300 = 4636\)
   b) \(5.592 + 12.476 + 0.500 = 18.568\)
   c) \(0.750 + 8.7744 + 2.345 = 11.869\)

2. Carry out the following subtractions.
   a) \(653 – 179 = 474\)
   b) \(6.76 – 1.610 = 5.15\)
   c) \(2969.445 – 845.708 = 2123.737\)

3. Carry out the following multiplications.
   a) \(27.76 \times 35 = 971.6\)
   b) \(18.017 \times 3.58 = 64.501\)
   c) \(0.976 \times 0.675 = 0.659\)

4. Carry out the following divisions.
   a) \(1565 ÷ 25 = 62.6\)
   b) \(85.325 ÷ 27.5 = 3.103\)
   c) \(750 ÷ 0.75 = 1000\)

Write the answers to the following questions in the spaces provided.

5. a) The two metric units of length used in the building industry are: millimetres (mm) and metres (m).
   b) The metric unit of area used in the building industry is square metres (m²).
   c) The metric unit of volume used in the building industry is cubic metres (m³).

6. Convert the following from metres to millimetres.
<table>
<thead>
<tr>
<th>Metres</th>
<th>Millimetres</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 15.662</td>
<td>15 662</td>
</tr>
<tr>
<td>b) 0.195</td>
<td>195</td>
</tr>
</tbody>
</table>
### 7. Convert the following from millimetres to metres

<table>
<thead>
<tr>
<th>Millimetres</th>
<th>Metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>830</td>
<td>0.830</td>
</tr>
<tr>
<td>5150</td>
<td>5.150</td>
</tr>
</tbody>
</table>

### 8. When dimensions in millimetres are to be used for either area or volume calculations, what should be done to the dimensions *before* making the calculation?

*They should be converted from millimetres to metres.*

### 9. Write the formula for each of the following.

- **Perimeter of a rectangle**
  \[ P = (\text{length} + \text{width}) \times 2 \]

- **Area of a rectangle**
  \[ A = \text{length} \times \text{width} \]

- **Area of a circle**
  \[ A = \pi \times \text{radius}^2 \]

- **Volume of a rectangular prism**
  \[ V = \text{length} \times \text{width} \times \text{height} \]

- **Area of a triangle**
  \[ A = \frac{1}{2} \times \text{base} \times \text{perpendicular height} \]

---

**End of Assessment 1**
Assessment 2 – Calculating perimeter, area and volume

The following answers are provided to you as a guide only. You should review them all to ensure that they meet your requirements.

1. Calculate the perimeters of the following two shapes.
   a) 
   
   ![Diagram of a shape with sides 4.950, 2.470, 8.150, and 9.450]
   
   Formula = \( 9.45 + 8.15 = 17.6 \)
   
   \( 17.6 \times 2 = 35.2 \)
   
   or
   
   \( 9.45 + 8.15 + 2.47 + 4.95 + (8.15 - 4.95) + (9.45 - 2.47) = \)
   
   \( 9.45 + 8.15 + 2.47 + 4.95 + 3.2 + 6.98 = \)
   
   Answer = \( 35.2 \)
   
   b) 
   
   ![Diagram of a circle with diameter 7.800]
   
   Formula = \( \pi \times d \)
   
   \( 3.14 \times 7.8 \)
   
   Answer = \( 24.49 \)
2. Calculate the area of this shape.

Formula = **Treat as a compound shape.**

\[
9.45 \times 3.95 = 37.3275 \\
3.47 \times (7.15 - 3.95) = 11.104 \\
37.3275 + 11.104 = 48.4315
\]

Round off the answer to three decimal places.

Answer = **48.432 m\(^2\)**

3. Calculate the area of this triangle.

Formula = \( \text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \)

\[
= \left(\frac{6.78}{2}\right) \times 3.65 \\
= 12.3735
\]

Round off the answer to three decimal places.

Answer = **12.374 m\(^2\)**
4. The measurements of this concrete cube are 2.4 H × 2.4 W × 2.4 L.
   Calculate the volume in cubic metres.

   \[
   \text{Formula} = L \times W \times H
   \]
   \[
   2.4 \times 2.4 \times 2.4 = \]
   
   Answer = \text{13.824 m}^3

5. Calculate the net surface area of brick paving (the shaded area) in this sketch of a courtyard.

   \[
   \text{Formula} = A = L \times W \text{ of paving, then deduct area of garden beds and pond}
   \]
   \[
   L \times W = 12.50 \times 6.50 = 81.25
   \]
   
   Two garden beds = \[2 \times (4.00 \times 1.20) = 2 \times (4.80) = 9.60\]
   
   Pond = \[3.14 \times (1.6 \times 1.6) = 8.04\]
   
   \[
   A = 81.25 - (9.60 + 8.04)
   \]
   
   \[
   = 63.61
   \]
   
   Answer = \text{63.61 m}^2

End of Assessment 2
Carry out measurements and calculations
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Assessment 3 – Calculating and estimating material quantities

The following answers are provided to you as a guide only. You should review them all to ensure that they meet your requirements.

1. Calculate the net surface area of the walls of Bed 2 in this part plan. The ceiling height is 2450, the door is 2060 high and the window is 1810 high.

Formula = \[ A = \text{length} \times \text{width}, \quad P = (\text{length} + \text{width}) \times 2 \]

\[
P = (4.020 + 2.500) \times 2 = 13.040
\]

Gross A = 13.040 \times 2.450 = 31.948

Deductions
\[
1.210 \times 1.810 = 2.190 \text{ (window)}
\]

\[
0.82 \times 2.060 = 1.689 \text{ (door)}
\]

\[
2.190 + 1.689 = 3.879
\]

\[
31.948 – 3.879 = 28.069 \text{ m}^2
\]

Answer = \[ 28.069 \text{ m}^2 \]
2. Calculate the volume of concrete required for the porch slab in this part plan. Allow approximately 5% wastage.

Formula = \( V = L \times W \times H \) (thickness)

\[
= 5.820 \times 4.620 \times 0.100 \\
= 2.689
\]

To allow for wastage, round up to nearest 0.2.

Answer = 2.8 m\(^3\)
3. This sketch shows part of a block of land. A fence is to be erected on the two sides shown. Calculate how many fence posts will be required for the job if they are to be placed at a maximum of 2.4 m centres.

Formula = \[ \frac{54.5}{2.4} = 22.7 \]

Round up to 23 and include corner post + 1 = 24.

Formula = \[ \frac{30.8}{2.4} = 12.8 \]

Round up to 13.

24 + 13 = 37

Answer = 37 posts
4. View the Hopscotch Homes floor plan. Use your scale rule to measure the following. Give your answers in metres (m).
   a) Internal perimeter of Bed 2, excluding the walk-in robe (WIR).
      13.28 m
   b) External perimeter of the building including the garage.
      33.94 m
   c) Length of the kitchen benchtops.
      7.88 m
   d) Perimeter of the alfresco cover.
      8.40 m
   e) Length of the steel beam (200 UB) that spans the family and meal rooms.
      6.83 m

5. Point A has a height of 3 m above natural ground level, and point B has a height of 1 m above ground level. These two points are 10 m distance apart.
   a) What is the height difference between the two points?
      2 m
   b) With the aid of a sketch, describe how the ground slopes upwards or downwards from point A to point B.
      The ground slopes downwards from A to B.
   c) What is the gradient from A to B, stated as a ratio?
      1:5
6. Consider the safety policies for a building site. List four safety requirements that should be considered when doing measurements.

- Inductions completed
- Evacuation plan
- Fire wardens
- Code of ethics/conduct
- Safety information flip charts available
- Proper use of equipment
- Location of fire-fighting equipment known

7. Consider the safety policies for workers on a building site. List four safety requirements on a typical building site.

- Inductions completed
- Scaffolds in place
- Hazard signage
- Code of ethics/conduct
- PPE provided

8. Using the floor plan provided here, drawn at a scale of 1:100, carry out calculations and estimates detailed in a), b), c) and d) on the next page for the living room only.

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a) How many bricks will be needed for the largest external wall? The face size of the bricks for this home is 76 × 230.

Answer will vary, depending on which room is chosen (and if you use a different plan). Ensure that the answer is in the correct unit, and rounded off correctly.

b) What total length of timber skirting will it take to do the perimeter of the room?

Answer will vary, depending on which room is chosen (and if you use a different plan). Ensure that the answer is in the correct unit, and rounded off correctly.

c) If the client goes with the 300 × 300 tiles they’ve been looking at, how many tiles will it take to do the floor?

Answer will vary, depending on which room is chosen (and if you use a different plan). Ensure that the answer is in the correct unit, and rounded off correctly.

d) How much concrete will it take to pour the slab to a thickness of 160 mm?

Answer will vary, depending on which room is chosen (and if you use a different plan). Ensure that the answer is in the correct unit, and rounded off correctly.

e) What equipment would you use to measure up then calculate quantities for each of the following?

- Bricks: Measuring tape on site, scale rule on plan.
- Skirting: Measuring tape on site, scale rule on plan.
- Tiles: Measuring tape on site, scale rule on plan.
- Slab: Measuring tape on site, scale rule on plan.
9. What would be the best way to look after your measuring equipment? Circle the correct answer.
   a) Keep it all together in a bag in the back of the ute.
   b) Keep each piece of equipment in its own bag or box.
   c) Wear it all in a tool belt.
   d) Throw it in the back of the ute and keep the lid closed.

10. What would be your top three tips to make sure you can work effectively and communicate with other tradespeople when you’re on the job carrying out measurements and calculations?

   Answers may include the following.

   • Listen to instructions.
   • Ask questions where necessary.
   • Check that you’re not getting in anyone’s way.
   • Find out who is the supervisor on site.
   • Take notes of your measurements and calculations.

11. When doing estimates, what document(s) tell you the specific materials that are going to be used (e.g., tiles, bricks) and any quality requirements?

   • The specifications document
   • Any design brief documents from the builder
   • Manufacturer’s instructions

12. What communication technology could you use if you had to send another tradesperson information about quantities of materials required for a job?

   • SMS
   • Email
   • Fax
   • Telephone

End of Assessment 3
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Floor Areas

<table>
<thead>
<tr>
<th>Area Type</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GARAGE</td>
<td>23.88</td>
</tr>
<tr>
<td>HOUSE</td>
<td>150.04</td>
</tr>
<tr>
<td>PORCH</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Total Area: 178.42 m²

Setback: 150m

Setout: 1,500m

GARAGE

GRANO @ -1c

DRIVEWAY 900 wide

PATH CROSSOVER BY OWNER TO COUNCIL REQUIREMENTS.

NOMINATED WATER METER POSITION TO BE CONFIRMED BY WAWA.

EASEMENT 1.65m HIGH TIMBER PALING FENCE

EXTENT OF 1500 SAND PAD SETBACK

STREET 29c HIGH WALL ON BOUNDARY WITH FLASHING AND SQUARE LINE GUTTER ON TOP AND PHYSICAL TERMITE BARRIER (REFER TO DETAIL)

SCALE: 1:200

PAGE 5 OF 5

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Lecturer's guide CPCCCM1015A
CARRY OUT MEASUREMENTS AND CALCULATIONS
CERTIFICATE II IN BUILDING AND CONSTRUCTION
(PATHWAY – TRADES)
CPCCCM1015A

LECTURER’S GUIDE

DESCRIPTION
This lecturer’s guide has been written to support the delivery and assessment of the unit CPCCCM1015A Carry out measurements and calculations from the Certificate II in Building and Construction (Pathway – Trades). The course, and the learner’s guide, focus on the skills and knowledge required as a tradesperson in the building and construction industry.

The guide provides you with the following resources and tools:
• unit delivery strategy
• suggested assessment plan
• suggested assessment instruments and marking key
• assessment matrix.

Support is also provided through highlighting of any pre-delivery preparation required, and of any specific requirements for each delivery session and assessment.

EDITION
Edition 1, 2014

TRAINING PACKAGE
CPC08 Construction, Plumbing and Services Training Package

COURSE / QUALIFICATION
Certificate II in Building and Construction (Pathway – Trades)

UNIT OF COMPETENCY
CPCCCM1015A Carry out measurements and calculations

RELATED PRODUCTS
BC2120 Carry out measurements and calculations – Learner’s guide
This resource is one in a series that covers all six core units for the Certificate II in Building and Construction (Pathway – Trades) qualification. Please refer to the WestOne product catalogue for more information.