REGISTERED
NATIONAL STANDARD

UNIT OF COMPETENCY

Title:	**Conduct routine workplace measurements and calculations** **Note**: A mapping exercise conducted by the developer(s) of this unit of competency has confirmed comparability to the units of competency *FSKNUM014 Calculate with whole numbers and familiar fractions, decimals and percentages for work* and *FSKNUM015 Estimate, measure and calculate with routine metric measurements for work* in the Australia Training Package.				
TQF Level:	2	**Credits:**	7	**Version:**	1
National standard code:	NS072-02				
Associated qualification (and code):	National Certificate in Work-Readiness and Employability Skills Level 2				
Approval date:	TBC	**Review date:**	TBC		
Purpose:	The ability to apply routine mathematical skills and knowledge in a key workplace requirement. All people seeking to enter the workplace in Tonga, in both the formal and informal sectors, must demonstrate a range of basic numeracy and mathematics skills and knowledge. At the completion of this unit, students will be able to: 1. interpret and calculate with whole numbers, routine fractions, decimals and percentages for workplace activities and tasks; *[Range of workplace activities and tasks include but not limited to: replenishment of supplies, simple quantity estimation, portioning, simple material costs, simple calculating of wastage, mixing quantities, work rosters and hours worked, worker attendance, advertising leaflets, catalogues and sale pricelists.]*				

	2. interpret and calculate routine time related tasks for the workplace; *[Range of workplace activities and tasks include but not limited to: start and finish times, break times, shift length, meeting times, event dates; workplace timetables, and time sheets.]* 3. use the metric scale, estimate measurements utilizating approximate values 4. perform accurate measurement using correct units and appropriate measuring instrument; 5. recognise, select, and interpret mathematical information embedded in workplace texts; *[Range workplace texts include but not limited to: notices, information texts, signs, workplace stock lists, salary statements, pay packets, pay slips, taxation forms, simple pricelists, sales tax.]* 6. identify and calculate routine metric measurement information in workplace texts which include the conversion of metric units; 7. undertake routine mathematical problem-solving processes, and communicate results to complete workplace activities; 8. confidently locate and recognise simple whole numbers in short, simple highly familiar personal and workplace texts; 9. perform simple one-and two step calculations when reading documents such as short and simple work instructions, costings, and also personal bills and purchases; 10. communicate mathematical ideas using spoken as well as written responses.
Learning Outcome 1 (LO1)	Interpret routine mathematical information and the required processes
Performance standards	1.1 Identify routine mathematical information embedded in common workplace tasks and texts; *[Range mathematic information include but not restricted to whole numbers, routine fractions, and decimals]* 1.2 Explain, in writing or orally, the meaning of the mathematical information identified in 1.1 above; 1.3 Identify percentages and common rates embedded in common workplace tasks and texts; 1.4 Explain, orally or in writing, the meaning of percentages and common rates embedded in common workplace tasks and texts identified in 1.3;

	1.5 Identify measures of time related tasks embedded in common workplace tasks and texts; 1.6 Explain, orally or in writing, measures of time related tasks embedded in common workplace tasks and texts identified in 1.5; 1.7 Ask questions to clarify needed workplace information.
Learning Outcome 2 (LO2)	Perform mathematical calculations to complete workplace tasks
Performance Standards	2.1 Select and use mathematical problem-solving processes, including the order of operations, when using whole numbers, routine fractions, decimals, percentages and measures of time to complete workplace tasks; *[Range tasks include but not limited to: costing and portioning in restaurant/food and beverage, calculation of working hours, tax deductions, superannuation, travelling times including departure/arrival, measuring the volume of water/box etc., measuring the heights using etc.* 2.2 Estimate outcome of calculations using pen-and-paper based methods and mental arithmetic; 2.3 Calculate results using pen and paper-based methods, calculators and data workbooks/spreadsheet as appropriate to the workplace and task; 2.4 Check for potentially rogue results and calculation errors.
Learning Outcome 3 (LO3)	Demonstrate accurate measurement using appropriate metric units
Performance standards	3.1 Estimate outcome of measurement using approximate values for measurements; 3.2 Select appropriate tools to measure accurately; 3.3 Perform accurate measurements, ensuring correct units and starting points and units; 3.4 Record the information using suitable mathematical language, symbols and abbreviations appropriate to discuss the task.
Learning Outcome 4 (LO4)	Perform mathematical calculations involving metric scale to complete workplace tasks
Performance standards	4.1 Identify and interpret measurement information embedded in common workplace tasks and texts; 4.2 Convert measures of length, mass, and capacity/volume to the metric system;

	4.3 Identify and use the relationship between metric units to convert between units of measure; 4.4 Calculate results using pen and paper-based methods, calculators and data workbooks/spreadsheet as appropriate to the workplace and task; 4.5 Use symbols and language related to metric measurement to communicate results of calculations; 4.6 Check reasonableness of results and interpret results in terms of original purpose and the context.
Learning Outcome 5 (LO5)	Communicate workplace mathematical information
Performance standards	5.1 Use written mathematical representations to document and report on basic workplace calculation processes and results; 5.2 Use mathematical language to orally present and discuss basic workplace problem-solving processes and results; 5.3 Demonstrate calculations on a calculator as needed to discuss basic workplace problem-solving processes and results; 5.4 Present workplace calculations, results, and data on paper (including the presentation of data workbook/spreadsheet in an accepted format).
Pre-requisites	N/A
Co-requisites	N/A
Underpinning skill and knowledge	1. Understand and use routine math for: ▪ the four mathematical operations, place value, and use of zero; ▪ whole numbers; ▪ common fractions and decimals; ▪ relationships and equivalence between familiar and routine fractions, decimals and percentages; ▪ the use and application of the order of operations; such as purchasing one item at one cost ($5) and three of another item at a different unit cost ($6) gives 5 + 3 × 6 which can give answers of 48 or 23; ▪ calculation of percentages and rates in routine tasks; ▪ reading days, dates, calendars and time, including digital, analogue and 24 hour time; ▪ estimating and checking the reasonableness of workplace tasks;

2. Meaning and purpose of familiar rates such as *kilometre per hour* (km/h), *dollar per kilogram* ($/kg) and *dollar per metre* ($/m);

3. High-frequency and common vocabulary to talk and read numerical information, including, but not limited, to:

   - plus, add, addition/minus, subtract, subtraction, equals
   - times, multiply, multiplication/share/divide/ division
   - fractions, proper and improper fractions
   - decimal, decimal point
   - percentage, percentage sign
   - round, estimate, rough guess
   - brackets, parentheses/ exponents, operations
   - first, second, third,
   - between
   - more, less /most, least
   - long, short/ longer, shorter
   - big, small / bigger, smaller
   - thick, thin / thicker, thinner
   - short, tall / shorter, taller
   - high, low / highest, lowest
   - the same as, equal to
   - more, less / the most,
   - cheaper, more expensive/dearer
   - double, half, quarter, third, tenth
   - maximum , minimum
   - first, last, in the middle
   - yesterday, today, tomorrow, the day before yesterday, the day after tomorrow
   - morning, am, afternoon, pm. evening

4. Routine units of metric measurement for:
   - Length: metres, kilometres, centimetres, millimetres,
   - Mass: grams, kilograms,
   - Capacity: litres, millilitres,
   - Temperature: degrees Celsius

5. Names, abbreviations and symbols of the units of measurement within the metric system, such as centimetre (cm), millimetre (mm), kilometre (km), millilitre (ml);

	6. Purpose and meaning of metric unit prefixes, *kilo, centi, milli*; 7. Conversions between metric units; conversions such as mm-cm-m-km, ml-l, g-kg and vice versa; 8. Read unit of measurement on equipment accurately. For example, distinguish between centimetre and millimetre. 9. Measurement made from starting point, especially where the instrument does not start at zero, to ensure the accuracy asked for is given. 10. Formula for perimeter and area of squares, rectangles, triangles and circles. 11. Applications and use of relevant technology such as calculators, and computer programmes such as spreadsheets and other relevant software to carry out workplace tasks.
Assessment requirements	**Assessment requirements**: 1. Verbally explain problem-solving processes used for a minimum of two (2) different routine workplace problems 2. Extract, use and record numerical information, including units, correctly and demonstrate the ability to determine and implement appropriate mathematical process for: a. a minimum of three (3) different workplace tasks which have embedded whole numbers and decimals; b. a minimum of two (2) different workplace tasks which contain common fractions; c. a minimum of two (2) different workplace tasks using percentages; d. a minimum of two (2) different time related work place tasks; e. a minimum of three (3) work place tasks which require two step calculations. f. a minimum of three (3) different measurement-related work place tasks that require conversion between units for: i. area of a square, rectangle, triangle or circle; ii. length of a side of square, rectangle or triangle; iii. perimeter of square, rectangle, triangle or circle iv. mass, volume, capacity or temperature

3. Demonstrate the ability to select and use measurement equipment to take accurate measurement in a minimum of three (3) different workplace tasks for;
    i. area of a square, rectangle, triangle or circle;
    ii. length of a side of square, rectangle or triangle;
    iii. perimeter of square, rectangle, triangle or circle
    iv. mass, volume, capacity or temperature
4. Candidates may have up to three (3) attempts at the assessment tasks. Should the candidate's 1st attempt be unsatisfactory, teachers are to provide feedback and re-teach when necessary, before arranging a date for the candidate's 2nd and 3rd attempts. Re-assessments must be completed within 14 days of their 1st assessment.

Assessment methods:

A diverse range of assessment methods is recommended, including the following:

1. Written assessment;
2. Direct observation of using a calculator or any other instrument and explaining processes;
3. Scenarios of simple workplace problem solving requiring use of data workbooks/spreadsheets;
4. Demonstration;
5. Role plays of participating in workplace conversations to discuss processes and results;
6. Third party feedback from teachers and/ or supervisors.

Suggested assessment conditions:

1. Access to own familiar resources including a calculator;
2. Access to measurement equipment relevant to the workplace required to complete the performance evidence within the learner context. Tools and equipment include but not limited to:
    a. tape measures, rulers, trundle wheels, folding rules
    b. weighing scales such as kitchen / bathroom scales (mechanical or digital)
    c. cooking thermometers
    d. medical/clinical thermometers
    e. medicine glasses and cups
    f. measuring cups / spoons

	3. Access to a computer to complete simple data workbooks/ spreadsheets as needed; 4. An expert or mentor to provide support to learner if requested; 5. Contextual support using workplace materials when appropriate.
Moderation arrangements	Training providers are required to: 1. Use their existing moderation processes which has been approved by TNQAB to moderate the assessment in this unit; 2. Plan their assessment and moderation and submit these plans to TNQAB for approval before they are implemented. Assessment and moderation plan forms are available on request from TNQAB.
Resource requirements	1. Measuring instruments **(metric)** required to complete the performance evidence (refer to "Point 1 and 2" in the *Assessment Conditions* in the *Assessment requirements* section): a. instruments for measuring lengths and distances (such as tape measure, rulers, trundle wheels, folding rules); b. kitchen weighing scales – mechanical or digital c. bathroom weighing scales – mechanical or digital d. medical thermometers e. cooking thermometers f. measuring cups; g. medicine glasses; h. measuring cups/spoons 2. Relevant printed resources – including dictionaries and/or glossaries; 3. Projector and audio speakers; 4. Relevant Power Point presentations; 5. Chalkboard, white board & markers; 6. Workplace documents to provide contextual support as appropriate; 7. Relevant video clips and audio recordings; 8. Student and staff calculators; 9. Student and staff computers with access to data workbooks / spreadsheets; 10. Student and staff work stations (tables and chairs); 11. Student and staff stationery (books, pens, charts, USB).
Requirements to complete this unit	1. Candidate of assessment must provide objective evidence of their attainment of all learning outcomes.

Important notes and definitions	**Notes**: 1. Training providers are encouraged to use their own assessment and moderation planning formats as long as they are clear and easy to follow. However, ready-made assessment and moderation plan templates are available on request from TNQAB; 2. Training providers are encouraged to invite guest speakers from the community to speak to students on relevant topics and concepts (e.g., *Mathematics in the real-world or workplace, importance of maths* etc.) 3. Re-assessments must be completed within 14 days of the first assessment attempt. **Definitions**: 1. *Approximate values for measurements*: refer to comparing what is known to make a reasonable guess about an unknown measurement. Using the size of known objects as a benchmark is a common method. For example, a centimetre is approximately the size of the finger nail on your little finger, compared to a millimetre, which is approximately the size of the tip of a pen. 2. *Embedded mathematical information*: refers to the math found within a text where some scanning and reading is required to be able to interpret, locate and extract the numerical information. 3. *Formulas for measurement*: refer to: • Perimeter: i. Square: P = 4 x S ii. Rectangle: P: (2 x L) + (2 x W) iii. Triangle: P = S1 + S2 + S3 iv. Circle: C = 2πr or C = πD • Area: i. Square: A = S^2 ii. Rectangle: A = LB iii. Triangle: A = ½ bh iv. Circle: A = πr^2 [S = Side; L = Length, W= Width; C = Circumference; R= Radius; D = Diameter; B=Base; H=height] 4. *Interpretation of numbers*: refers to understanding the relationship between numeral position and numerical value. This applies to whole numbers, fractions, decimals and percentages.

	5. *Mathematical operations*: refer to the procedures of calculating or determining something by mathematical or logical methods. The four basic mathematic operations include addition (+), subtraction (-), division (÷), and multiplication (x). 6. *Order of operations*: refer to the rules that state the sequence in which the multiple operations in an expression should be solved. The acronym PEMDAS (for Parenthesis, Exponent, Multiplication, Division, Addition, and Subtraction) is an easy way to remember the order of the operations, where in each letter stands for a mathematical operation. Some sources use the acronym BODMAS (B for Brackets, O for Operations. PEMDAS and BODMAS can be used interchangeably. 7. *Reasonableness*: refers to making a comparison of the final result to an initial estimate to provide a check of the value, and where referral to context is used to decide if the result is possible and relevant or needs revising or modification 8. *Rogue results and calculation errors*: refer to errors in calculation 9. *Routine decimals*: refer to decimals up to three decimal places. 10. *Routine fractions*: refer to common fractions including halves, thirds, quarters, fifths, tenths, hundredths. 11. *Routine percentages*: refer to common percentages such as 10%, 20%, 15%, 25%, 50%, 40%, 75%, 100%. 12. *Two step calculations*: refer to problems that require more than one step to find an answer. Often, the answer to the first step is needed to help work out the rest of the problem.
Public comments on unit	Please contact TNQAB National Qualifications Unit (email EnquireNQ@tnqab.to or Telephone 28136) if you like to discuss or suggest changes to the details of this unit.