**NZQA**

**Approved**

Achievement standard: 91030 Version 3

Standard title: Apply measurement in solving problems

Level: 1

Credits: 3

Resource title: Where have all the tanks gone?

Resource reference: Mathematics and Statistics VP-1.5 v2

Vocational pathway: Manufacturing and Technology

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| Date version published | February 2015 Version 2  To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-91030-02-7268 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.  Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

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Learner instructions

# Introduction

This assessment activity requires you to apply measurement in solving problems while designing a tank for a manufacturing company.

You are going to be assessed on how you apply measurement, using extended abstract thinking, when designing the tank. You are required to communicate your solutions clearly and accurately.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

The KG manufacturing company has asked you to design a tank that will be installed in a high-rise building. However, there are special conditions:

* the tank must have a capacity of exactly 235 L
* the tank cannot be a cuboid
* the tank must fit inside a cupboard which measures 1 m x 1 m x 2 m.

You need to do the following:

* Design the component parts that, when welded together, would form the tank.
* Fit the designs for the component parts onto a rectangular sheet of metal in such a way that the rectangle has minimal dimensions.
* Find the length of the edges that have to be welded to form the tank.
* Find the area of waste in the metal sheet.
* Prove that the assembled tank has the required capacity of 235 L and also fits inside the cupboard.

Show all calculations that you have used and clearly communicate your method using appropriate mathematical statements.

## Formulae sheet

Area of circle = 

Circumference of circle = 

Area of trapezium = 

Area of parallelogram = 

Area of triangle = 

Volume of prism = base area × *h*

Volume of pyramid =  × base area × *h*

Volume of cylinder = 

Volume of cone = 

Volume of sphere =

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to apply measurement, using extended abstract thinking, when designing a tank and investigate some aspects associated with it. Calculations include finding the dimensions of the tank so that it will have the specified volume when assembled, the area of the sheet metal wasted and the length of the welds that are needed to assemble the tank.

# Conditions

Learners need to work independently and may use any appropriate technology.

# Resource requirements

Provide learners with a sheet of formulae.

# Additional information

Taking measurements is not a requirement of the standard. It is acceptable for learners to complete this activity using provided measurements.

Assessors/educators need to ensure learners are familiar with any context specific vocabulary used in this task.

# Assessment schedule: Mathematics and Statistics 91030 – Where have all the tanks gone?

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner applies measurement in solving problems by:   * selecting and using a range of methods in solving problems * demonstrating knowledge of measurement concepts and terms * communicating solutions which would usually require only one or two steps   The learner selects and correctly uses at least three different methods for the tank construction  For example, the learner has completed at least three of the following:   * calculated the length of the tank edges that need to be welded * calculated areas that are required to form the tank * determined the dimensions of assembled tank so that it has the required volume * correctly used units in the measurements and calculations at a level of precision appropriate to the task.   The learner has clearly identified what is being calculated.  *The examples above are indicative of the evidence that is required.* | The learner applies measurement, using relational thinking, in solving problems by involving one or more of:   * selecting and carrying out a logical sequence of steps * connecting different concepts and representations * demonstrating understanding of concepts * forming and using a model   and also relating findings to a context, or communicating thinking using appropriate mathematical statements  For example:  The learner has designed component shapes which, when assembled, will form the tank. The component shapes have been fitted onto a rectangular sheet of metal and the area of waste metal has been calculated. The learner has calculated the lengths of edges that need to be welded and determined the dimensions of the assembled tank so that it has the required volume.  Working is shown and correct units used.  *The examples above are indicative of the evidence that is required.* | The learner applies measurement, using extended abstract thinking, in solving problems by involving one or more of:   * devising a strategy to investigate or solve a problem * identifying relevant concepts in context * developing a chain of logical reasoning, or proof * forming a generalisation   and also using correct mathematical statements, or communicating mathematical insight  For example:  The learner has accurately designed the components of the tank and fitted them onto a rectangular sheet of metal that is proven to be of minimal area. The length of edges to be welded has been calculated and the area of waste metal found. The learner has proved that the tank volume is the required 235 L and also fits inside the cupboard.  The strategy used is clear, working and units are shown and reasoning is clearly communicated.  *The examples above are indicative of the evidence that is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.