**NZQA**

**Approved**

Achievement standard: 91032 Version 3

Standard title: Apply right-angled triangles in solving measurement problems

Level: 1

Credits: 3

Resource title: An angle on the roof

Resource reference: Mathematics and Statistics VP-1.7 v2

Vocational pathway: Construction and Infrastructure

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| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91032-02-7271 |
| 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

Achievement standard: 91032

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Learner instructions

# Introduction

This assessment activity requires you to apply right-angled triangles related to measuring a roof to calculate the quantity of sheet metal roofing needed to replace it.

You are going to be assessed on how you apply right-angled triangles, using extended abstract thinking, in solving measurement problems, by devising a strategy and developing a chain of logical reasoning to determine the length of sheet metal roofing required to re-roof a building.

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

A building needs re-roofing and the roofer asks you to take measurements and perform calculations to provide him with the information he needs to order the replacement metal roofing.

Your task is to take the appropriate measurements and use them to determine the total length of sheet metal roofing the builder needs to order (from the ridge to the gutter). You are required to take the measurements you need without physically climbing on the roof.

Working in groups of up to three, you will be given time to take any necessary measurements.

Working independently, you will need to then analyse the data, perform the appropriate calculations, and complete a sketch.

Note that when sheet materials are laid on roofs, an overlap is required so that rather than the sheets sitting alongside each other, they overlap by a specified amount. Sheet materials come in specified widths and it is important to take this overlap into account when determining the effective coverage of each sheet.

Builders have access to online calculators and applications to assist them in their job. One of these can be found at <http://www.steelformers.co.nz/resources/calculator>

With this roof calculator, you can work out:

* the quantity of sheets required
* the cut length of each sheet
* the total lineal metres of roofing material
* the number of fasteners needed to fix the roof
* the total area of the roof.

You simply enter the roof pitch (in degrees), the roof width (in metres) and the roof length (in metres), and select the roofing material type. The calculator performs calculations in the background to find answers for any measurements entered for the different roofing materials selected from the drop-down box.

The figures generated by the online calculator are intended for estimation purposes, as coverage may vary in certain situations. Compare your measurements and the results of any calculations you perform with the answers given by the online calculator.

Develop a spreadsheet that will calculate the roof area for any roof when the roof pitch (in degrees), the roof width (in metres) and the roof length are entered.

You need to:

* show the calculations you have used
* use mathematical statements
* explain what you are calculating at each stage of the solution.

The quality of your discussion and reasoning and how well you link this to the context will determine your overall grade.

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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

The context is a building that needs to have the roofing iron replaced. The assessor/educator could identify the building or the learner could choose a building they want to measure and perform calculations on.

It is recommended that the learner uses a standard gable roof for this assessment, but they could also use a gable roof with a hip end or a single plane (lean-to) roof.

# Conditions

The learner needs to work independently to complete this activity. Confirm the time frame with the learner.

# Resource requirements

The learner should have access to appropriate technology.

# Additional information

Ensure learners are familiar with any context specific vocabulary used in this resource.

# Assessment schedule: Mathematics and Statistics 91032 – Up on the roof

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement withMerit | Evidence/Judgements for Achievement with Excellence |
| The learner applies right-angled triangles in solving measurement problems by:* selecting and using a range of methods
* demonstrating knowledge of measurement and geometric concepts and terms
* communicating solutions which require only one or two steps

At least three different methods need to be selected and correctly used in solving measurement problemsFor example, the learner:* + uses trigonometry to find the height of the ridge
	+ uses trigonometry to find the angle of the roof pitch
	+ uses Pythagoras to calculate the length of the roofing iron from ridge to gutter
	+ takes measurements at an appropriate level of precision.

*The examples above are indicative of the evidence that is required.* | The learner applies right-angled triangles, using relational thinking, in solving measurement 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 relating findings to the context, or communicating thinking using appropriate mathematical statementsFor example, the learner:* + takes appropriate measurements to find the roof dimensions, then uses these to determine the roof area and length of roofing iron needed to replace the roof
	+ discusses and compares their calculated answers with those given by the online calculator.

The learner clearly shows a logical sequence of steps and communicates using appropriate mathematical statements.*The examples above are indicative of the evidence that is required.* | The learner applies right-angled triangles, using extended abstract thinking, in solving measurement 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 using correct mathematical statements, or communicating mathematical insight For example, the learner:* + uses their measurements to determine the length of roofing iron needed and compares their answers with those of the online calculator
	+ considers the overlap of sheets and how this might affect the final answers
	+ investigates how the online calculator generates answers for any given values, providing a general formula.

The learner clearly communicates their solution using correct mathematical statements.*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.