**NZQA**

**Approved**

Achievement standard: 91259 Version 2

Standard title: Apply trigonometric relationships in solving problems

Level: 2

Credits: 3

Resource title: If it’s broken, fix it

Resource reference: Mathematics and Statistics VP-2.4 v2

Vocational pathway: Construction and Infrastructure

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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-02-2015-91259-02-8193 |
| 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 trigonometric relationships to find information needed for the repair of a stained glass window.

You are going to be assessed on how you apply trigonometric relationships, using extended abstract thinking, to devise a strategy and develop a chain of logical reasoning to make a recommendation to the glazier regarding the repair of a stained glass window.

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

Stained glass windows are made by joining small pieces of glass together with lead. Simple windows are made with patterns of squares and diamonds. However there are no limits on the shapes in modern windows.

A diagram of part of the stained glass window in the local church is shown in the Resource section below. There is a vertical crack in the window from the top to the bottom. The local glazier has been asked to repair it.

To prevent further cracking, the church has requested that the window be cut into four sections of more than 0.1 m2, with at least one of the sections not a triangle.

You need to write a report describing how the window can be divided. To do this you will:

* find the length of the came required to repair the vertical crack
* demonstrate that the window can be divided into four sections of more than 0.1 m2 and show one possible way of doing this.

You need to clearly communicate your method using appropriate mathematical statements so that the glazier can easily verify the dimensions of the sections.

# Resource

## Diagram of part of the stained glass window

0.51 m

0.56 m

0.84 m

0.78 m

crack

84.8°

**Diagram not to scale**

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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 use extended abstract thinking when applying trigonometric relationships, by investigating how a stained glass window can be divided into four sections of more than 0.1 m2.

# Conditions

Learners will work independently to complete this activity.

# Resource requirements

Learners need access to appropriate technology.

# Additional information

Make sure learners are familiar with any context-specific vocabulary used in this resource.

# Assessment schedule: Mathematics and Statistics 91259 – If it’s broken, fix it

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner applies trigonometric relationships in solving problems by:   * selecting and using methods * demonstrating knowledge of trigonometric concepts and terms * communicating using appropriate representations   Any appropriate and correct rounding is acceptable (including truncation) and does not need to be stated. Some evidence of correct units is required.  For example:  The learner correctly uses the cosine rule to find the length of the crack and at least one other trigonometric relationship in a calculation that is needed to find the area of the window. They might find the length of the crack and an angle in a triangle, or the length of the crack and an area of a triangle.  *The examples above are indicative of the evidence that is required.* | The learner applies trigonometric relationships, using relational thinking, in solving problems by involving one or more of:   * selecting and carrying out a logical sequence of steps * connecting different concepts or representations * demonstrating understanding of concepts * forming and using a model   and also relating findings to the context, or communicating thinking using appropriate mathematical statements  Any appropriate and correct rounding is acceptable (including truncation) and does not need to be stated. Correct units are required.  For example:  The learner connects the area of the window to the area of four sections of more than 0.1 m2. They find the areas of triangles representing the two sides of the window, and the total area of the window, and demonstrate that it can be divided into four sections of more than 0.1 m2.  *The examples above are indicative of the evidence that is required.* | The learner applies trigonometric relationships, 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   and also using correct mathematical statements, or communicating mathematical insight  Any appropriate and correct rounding is acceptable (including truncation) and does not need to be stated. Correct units are required.  For example:  The learner devises a strategy to divide the window into four sections of more than 0.1 m2. At least one of the sections is not a triangle, and the dimensions of the sections are 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.