National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Internal Assessment Resource

Mathematics and Statistics Level 2

This resource supports assessment against:

Achievement Standard 91259 version 2

Apply trigonometric relationships in solving problems

Resource title: School Spare Land Subdivision

3 credits

This resource:

- Clarifies the requirements of the standard

- Supports good assessment practice

- Should be subjected to the school's usual assessment quality assurance process

- Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic

Date version published by Ministry of Education	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-02-2015-91259-02-5580
Authenticity of evidence	Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.
	Using this assessment resource without modification may mean that students' work is not authentic. The teacher 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.

Internal Assessment Resource

Achievement Standard Mathematics and Statistics 91259:
Apply trigonometric relationships in solving problems

Resource reference: Mathematics and Statistics 2.4A v2

Resource title: School Spare Land Subdivision

Credits: 3

Teacher guidelines

The following guidelines are designed to ensure that teachers can carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by Achievement Standard Mathematics and Statistics 91259. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

Context/setting

This assessment activity requires students to use trigonometric relationships to find missing dimensions and angles in two adjoining triangles, and to subdivide the triangles into four polygons of a minimum area.

Conditions

This assessment activity should be conducted over sufficient time to allow students time to complete all aspects. Students need to work independently.

Students may use any appropriate technology.

Resource requirements

Provide students with copies of **Resource 1** and the Level 2 Mathematics formulae sheet.

Additional information

None.

Internal Assessment Resource

Achievement Standard Mathematics and Statistics 91259:
Apply trigonometric relationships in solving problems

Resource reference: Mathematics and Statistics 2.4A v2

Resource title: School Spare Land Subdivision

Credits: 3

Achievement	Achievement with Merit	Achievement with Excellence
Apply trigonometric relationships in solving problems.	Apply trigonometric relationships, using relational thinking, in solving problems.	Apply trigonometric relationships, using extended abstract thinking, in solving problems.

Student instructions

Introduction

Your school is selling some unused land to raise money for a new gymnasium. The buyer will only purchase the land if the school can demonstrate that the land can be subdivided into four sections of at least 400m^2 each. The buyer will not purchase the land if all of the sections are triangular. This assessment activity requires you to determine the dimensions of appropriate subdivisions so that the sale can proceed.

> Teacher note: This activity can be adapted by providing different figures or dimensions.

Task

Working independently, use the land diagram in **Resource 1** to produce a report justifying the sale by:

- calculating the length of the pipeline running through the land

- demonstrating that the land can be divided into four sections each of more than 400m^2

- showing one possible way of dividing the land into four sections each of more than 400m^2.

The quality of your reasoning, using a range of methods, and how well you link this context to your solutions will determine the overall grade.

Clearly communicate your method using appropriate mathematical statements so that the new owner can easily verify the dimensions of the sections.

Resources

Resource 1: Land Diagram
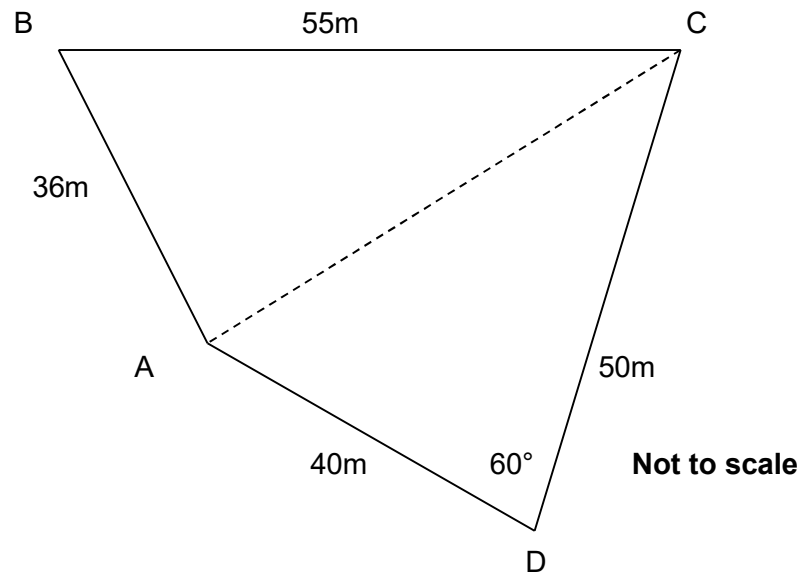
The unused land bounded by ABCD needs to be split into four sections.
The pipeline running through the land is between points A and C.

Assessment schedule: Mathematics and Statistics 91259 School Spare Land Subdivision

Teacher note: Customise this schedule with examples of the types of responses that can be expected.

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
The student has applied trigonometric relationships in solving problems. The student correctly selects and uses trigonometric relationships. They have demonstrated knowledge of trigonometric concepts and terms and communicated 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. The student correctly uses the cosine rule to find the length of the pipeline and at least one other trigonometric relationship in a calculation that is needed to find the area of ABCD. For example, the student might: • *find the length of AC and an angle in triangle ACB.* • *find the length of AC and the area of triangle ACD*	The student has applied trigonometric relationships, demonstrating relational thinking in solving problems. The student has related their findings to the context or communicated their 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. *The student has connected the area of ABCD to the area of four sections more than 400 m². They have found the areas of triangle ACD and ACB, the total area of the quadrilateral, and demonstrated that ABCD can be divided into four sections of more than 400 m².*	The student has applied trigonometric relationships, demonstrating extended abstract thinking in solving problems. The student has used correct mathematical statements or communicated mathematical insight. Any appropriate and correct rounding is acceptable (including truncation) and does not need to be stated. Correct units are required. *The student has devised a strategy to subdivide the land area into four sections of more than 400 m². They have subdivided ABCD into four sections, at least one of the sections is not a triangle, and the dimensions of the sections have been clearly communicated.*

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.