



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 91269

Apply systems of equations in solving problems

### **Resource title: Logo Design**

2 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 November 2011

Ministry of Education To support internal assessment from 2012

Quality assurance status These materials have been quality assured by NZQA.

NZQA Approved number: A-A-11-2011-91269-01-5197

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 91269:**  
Apply systems of equations in solving problems

**Resource reference:** Mathematics and Statistics 2.14B

**Resource title:** Logo Design

**Credits:** 2

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### Teacher guidelines

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The following guidelines are supplied to enable teachers to 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 91269. 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

The context for this activity is the analysis of a logo design. This activity requires students to use systems of equations involving two variables to locate key features of the design and to consider new features for the design.

### Conditions

This assessment activity may be conducted in one or more sessions. Confirm the time frame with your students.

Students work individually to complete the task.

Students may use technology such as graphic calculators or computers to complete the task.

### Resource requirements

Provide students with the Level 2 formulae sheet.

### Additional information

None.

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<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
Apply systems of equations in solving problems.	Apply systems of equations using relational thinking, in solving problems.	Apply systems of equations using extended abstract thinking, in solving problems.

### **Student instructions**

#### **Introduction**

An engineering company is developing a new logo using graphing software. This assessment activity requires you to use systems of equations to analyse the logo design and to consider new features for the design.

You have one period of in-class time to independently complete this task.

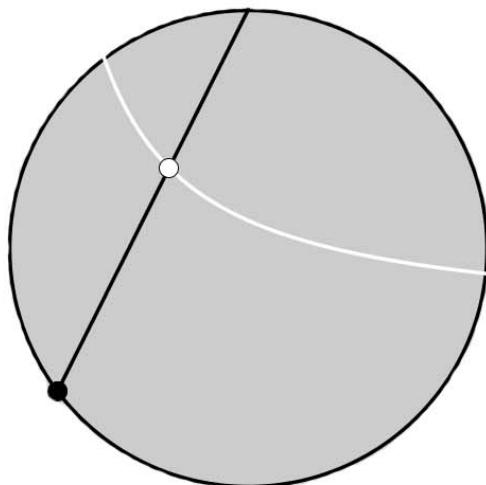
Your overall grade will be determined by the quality of your reasoning and how well you link this to the context.

#### **Task**

An engineering company is developing a new logo using graphing software. Their first design is based on a circle. Dots are placed at some of the points of intersection, as shown in the diagram.

They have asked you to analyse the logo design and to consider new features for the design.

Part of the design for the logo is shown on the next page:



Equations used for the logo design:

$$x^2 - 6x + y^2 = 0$$

$$y = 2x - 3$$

$$x(y + 1) = 4$$

Analyse the logo design following the steps below:

- Find the location of the white dot and the black dot.
- How could the constant term for the equation of the black line in the design be changed so that the black line becomes a tangent with the circle?
- A new dark grey line is being added to the design. It is to pass through the white dot and touch the white “line” in only one place. Find the equation of the new dark grey line.

Submit your analysis and related evidence used in considering new features of the design. This could include sketches for the final design of the logo, equations you have used, and any relevant calculations or graphs.

The quality of your reasoning and how well you link the context to generalisations of systems of equations will determine the overall grade. Clearly communicate your findings using appropriate mathematical statements.