

NZQA Approved

Internal Assessment Resource

Mathematics and Statistics Level 1

This resource supports assessment against Achievement Standard 91030 version 2

Standard title: Apply measurement in solving problems

**Credits:** 3

Resource title: Small bowls badge design

**Resource reference:** Mathematics and Statistics 1.5E

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| 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 |

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| Date version published by Ministry of Education | February 2015  To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA. NZQA Approved number A-A-02-2015-91030-01-9024 |
| 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. |

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Teacher guidelines

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 the achievement standard. 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 activity requires students to calculate the amount of embroidery and length of thread needed to make badges for a new sports club by applying measurement, using extended abstract thinking.

Conditions

Students need to work independently to complete this activity.

Resource requirements

Provide students with the formulae sheet.

Additional information

Teachers need to ensure students are familiar with any context specific vocabulary used in this resource.

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Student instructions

Introduction

This assessment activity requires you to apply measurement in solving problems involving a badge for a new sports club.

You are going to be assessed on how you apply measurement, using extended abstract thinking, in solving the problem, the quality of your understanding and application of measurement. You are required to communicate your solutions clearly and accurately.

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

Teacher note: It is expected that the teacher will read the student instructions and modify them if necessary to suit their students.

Task

A new sporting club wants a badge to go on their uniform.

This sport involves rolling small balls onto painted patches on a mat. The patches are in the shape of a triangle and a quadrilateral.

On the badge the triangle will have the same length for the height and base and the quadrilateral will have the same height as the triangle and a base twice the length of the triangle base. The badge needs to fit into a circle with diameter of 50 mm. Caitlyn thinks the design should be as shown below, with the triangle red, the quadrilateral black and the background yellow.

Diagram not to scale

The embroiderer needs to know the area for each colour and the length of special thread required for the outside edge for each shape.

Find the amount of embroidery needed for Caitlyn’s design for each of the colours and the total length of edging for the triangle quadrilateral and the circular edge of the badge for this design. You may use the attached formulae sheet to assist with this.

The black thread for embroidering the quadrilateral is the most expensive. Joel knows he can design a cheaper badge with the same specifications for the dimensions of the triangle and the quadrilateral. The club committee wants the triangle to be a reasonable size, with an area of at least 40 mm2. They also need a container to keep the badges in.

* Sketch a diagram to show Joel’s new design giving appropriate dimensions for each shape.
* Calculate the amount of embroidery needed for each colour for Joel’s badge.
* The sporting club requires a container to hold a minimum of 35 badges for competition purposes but would like to have a larger number than the minimum available. Describe the shape and give the dimensions of a suitable container for the minimum number of badges. Write a general rule for the volume of this type of container for any number, n, of badges.

In the solution of this problem you should:

* show calculations, as appropriate, that 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 the overall grade.

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 =

Assessment schedule: Mathematics and Statistics 91030 - Small bowls badge design

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The student applies measurement in solving problems by:   * selecting and using at least three different methods of applying measurement in solving problems * demonstrating knowledge of measurement concepts and terms * communicating solutions which usually require only one or two steps   For example, the student:   * calculates the perimeter for one badge * calculates the area of the embroidery for each of the colours * uses correct metric units throughout the task.   A clear identification as to what is being calculated is also required.  The examples above are indicative of the evidence that is required. | The student applies measurement, using relational thinking, in solving problems involving one or more of:   * selecting and carrying out a logical sequence of steps * connecting different concepts and representations   The student has also related findings to a context, or communicated thinking using appropriate mathematical statements.  For example, the student:   * selects appropriate dimensions for the new design for the quadrilateral * finds the total length of thread, areas of embroidery for each colour and volume of each badge for each design * identifies the most efficient layout for the badge e.g. which badge will use the least amount of cotton * investigates an appropriate shape for the badge container.   The examples above are indicative of the evidence that is required. | The student applies measurement, using extended abstract thinking, in solving problems 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   The student has used correct mathematical statements, or communicated mathematical insight.  For example, the student:   * identifies which is the best badge option using appropriate dimensions and shows how the materials used will be less * identifies an appropriate container such as a cylinder for the badges and finds a general rule for the volume, taking into account aspects such as: * selecting a diameter a little bigger than the badge diameter and giving an explanation for this * estimating a sensible thickness for each badge.   *The examples above are indicative of the evidence that is required.* |

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