# **Mathematics and Statistics Level 1 Course Outline 2**

# Guide to aid teacher planning only - designed to be printed or viewed in A3, Landscape.

## Purpose

This example Course Outline has been produced to help teachers and schools understand the new NCEA Learning and Assessment matrices, and could be used to create a year-long programme of learning. It will give teachers ideas of how the new standards might work to assess the curriculum at a particular level.

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| **Significant Learning** | **Learning activities and assessment opportunities**Throughout the year assessment for learning happens often. Evidence may also be collected for summative assessment. | **Duration** Total of 32 weeks |
| **Measurement** |
| * solve problems which involve finding volume(s)
* understand the effect of the accuracy of measurement on subsequent calculations.

***Overlaid learning:**** convert between metric units
* work with numbers in standard form, and move flexibly between standard form and ordinary form
* understand the effect of the accuracy of measurement on subsequent calculations
* use number knowledge and technology when solving problems.
 | Solve problems involving:* metric unit conversion
* perimeter, circumference, area (including surface area)
* volume – cuboids, prisms, cylinders, cones, pyramids, spheres
* limits of accuracy.

*This topic may contribute to assessment of:**AS1.2 (91945) Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific (Internal – 5 credits)**And build knowledge for:**AS1.4 (91947) Demonstrate mathematical reasoning (External – 5 credits)* | 4 weeks |
| **Geometry** |
| * use angle properties to find unknown angles in circles, building on knowledge of both the angle properties of polygons, and intersecting and parallel lines
* use properties of similar shapes in solving problems
* use trigonometric ratios and Pythagoras’ theorem to find lengths and angles in 2- and 3- dimensions
* identify, describe, or use key features of transformations, including centres and angles of rotation, centres of enlargement, scale factors, lines of symmetry, and vectors.

***Overlaid learning:**** use number knowledge and technology when solving problems
* model objects using 3D shapes
* find areas of non-uniform shapes using knowledge of coordinates or maps.
 | Solve problems involving:* Pythagoras’ theorem
* trigonometric ratios
* lines and angles in 3d
* vectors
* bearings, coordinate, grid references
* practical problems involving trigonometry
* angle properties, parallel lines, polygons, circle geometry
* similar triangles
* reflection, rotation, translation, enlargement, symmetry.

*This topic may contribute to assessment of:**AS1.2 (91945) Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific (Internal – 5 credits)**And build knowledge for:**AS1.4 (91947) Demonstrate mathematical reasoning (External – 5 credits)* | 5 weeks |
| **Number** |
| * use rates, ratios, and percentages in both directions, including finding an original value
* work with numbers in standard form, and move flexibly between standard form and ordinary form.

***Overlaid learning:**** use number knowledge and technology when solving problems.
 | Solve problems involving: * decimals and percentages
* increasing and decreasing quantities by given percentages, including mark up, discount, and gst
* sharing quantities in given ratios
* converting numbers expressed in standard form to ordinary form, and vice versa.

*This topic may contribute to assessment of:**AS1.2 (91945) Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific (Internal – 5 credits)**And build knowledge for:**AS1.4 (91947) Demonstrate mathematical reasoning (External – 5 credits)* | 3 weeks |
| **Algebra** |
| * make connections between representations, such as number patterns, spatial patterns, tables, equations, and graphs
* use algebra and graphing for solving linear equations and inequations
* use factorising, graphical relationships, and knowledge of parabolas to solve quadratic equations and inequations
* use graphing and algebra for solving simultaneous equations
* demonstrate understanding of linear, quadratic, and simple exponential relationships
* use number knowledge, rather than logarithms, for solving exponential equations
* identify and use key features of graphs
* find optimal solutions, which are solutions that maximise or minimise a quantity while meeting the constraints of the situation
* use algebra to describe the properties of operations as they apply to rational numbers and exponents, including expanding, factorising, and simplifying
* find optimal solutions, which are solutions that maximise or minimise a quantity while meeting the constraints of the situation.

***Overlaid learning:**** use a variety of methods in solving percentage problems, rates, and ratios, such as number strategies, equations, tables, and graphs
* use knowledge of linear expressions to find unknown properties of shapes
* use a variety of methods in solving percentage problems, rates, and ratios, such as number strategies, equations, tables, and graphs
* use algebra to describe the properties of operations as they apply to rational numbers and exponents, including expanding, factorising, and simplifying
* make connections between representations, such as number patterns, spatial patterns, tables, equations, and graphs.
 | Solve problems involving: * simplifying algebraic expressions
* expanding, factorising
* substitution
* rearranging formulae
* solving linear equations, inequations
* expanding, factorising quadratics
* simplifying rational expressions
* solving quadratic equations, inequations
* solving simple exponential and power equations
* patterns
* straight line graphs
* rates
* simultaneous equations
* parabolas, optimising solutions
* exponential curves.

*This topic may contribute to assessment of:**AS1.2 (91945) Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific (Internal – 5 credits)**AS1.4 (91947) Demonstrate mathematical reasoning (External – 5 credits)* | 8 weeks |

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| **Statistics** |
| * plan the collection of data. This includes identifying variables, identifying and controlling sources of variation
* collect and explore data (including summary investigations), selecting appropriate graphs, displays, and summary statistics
* analyse features in context for the following investigation styles:
* comparison: shape, centre, spread
* relationship: trend, direction, strength
* time series: trend, seasonality, variation.
* form a conclusion, which includes telling a story about the wider situation, making generalisations (inferences about the population from sample data - summary and comparison, making predictions - bivariate and time series) and discussing sampling variability
* be data savvy citizens, who can evaluate statistical reports in the media by relating the displays, statistics, processes, and probabilities used to the claims made.
 | * overarching enquiry cycle
* posing a problem

- understanding the problem- defining the problem- how do we go about answering the problem?- summary, comparative, and relationship questions.* planning

- what to measure and how?- study design?- recording data- collecting data.* data

- collection- management (put into a table etc)- cleaning (removing extreme values)- calculating statistics.* analysis

- sort data- construct tables graphs, etc- look for patterns.* conclusion.

Useful apps: <https://grapher.nz/><https://lite.docker.stat.auckland.ac.nz/>*This topic may contribute to assessment of:**AS1.1 (91944) Explore data using a statistical enquiry process (Internal – 5 credits)**AS1.3 (91946) Interpret and apply mathematical and statistical information in context (External – 5 credits)* | 8 weeks |
| **Probability** |
| * calculate probabilities in discrete situations, using systematic lists, 2-way tables, and tree diagrams
* calculations can include: conditional probability and expected values
* analyse key features in context. This includes:
	+ experimental probability: frequencies
* form a conclusion, which includes telling a story about the wider situation, making generalisations (estimating long-run-relative frequencies - experimental probability)
* be data savvy citizens, who can evaluate statistical reports in the media by relating the displays, statistics, processes, and probabilities used to the claims made.
 | Solve problems involving: * theoretical/experimental probabilities
* probabilities from tables
* multiplication principle, conditional probability, expected values
* tree diagrams
* risk
* application of a probability enquiry.

*This topic may contribute to assessment of:**AS1.1 (91944) Explore data using a statistical enquiry process (Internal – 5 credits)**And build knowledge for:**AS1.3 (91946) Interpret and apply mathematical and statistical information in context (External – 5 credits)* | 4 weeks |