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

# 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 |
| **This theme integrates learning from statistics, number, and measurement:***Within the learning of this theme, students will:** 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
	+ experimental probability: frequencies
* form a conclusion, which includes:
	+ telling a story about the wider situation
	+ make generalisations:
		- inferences about the population from sample data (summary and comparison),
		- making predictions (bivariate and time series)
		- estimating long-run-relative frequencies (experimental probability).
	+ discuss 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.
 | **Theme 1: understanding ourselves and others using data**Kaiako will start with a demonstration of a dataset that has been collected, representing the kaiako at their school. They will use this data to teach ākonga how to quantify, measure, collect, clean and explore data. This example will be used throughout the 8-week period to help guide ākonga as they work, using a flipped learning approach.[iNZight](https://lite.docker.stat.auckland.ac.nz/) lite has some wonderful and interesting new graphs, along with interactive graphs. [Here](https://new.censusatschool.org.nz/resource/adding-spice-to-statistics-with-dynamic-and-interactive-graphics/) is a link to a workshop on CensusAtSchool with a handout to help guide teachers and students to explore. Another workshop is [here](https://new.censusatschool.org.nz/search/?q=lego+emma+wilson). We will spend several lessons exploring different graphs and learning to extract information from them.Other websites to explore data visualisations are: [Gapminder](https://www.gapminder.org/), [Figure.nz](https://figure.nz/), [Google trends](https://trends.google.com/trends/?geo=NZ) (good for time series data), and [NZGrapher](https://grapher.nz/).Some revision of important number and measurement ideas (eg measuring with precision, converting metric units, rates) will be integrated into this programme of learning.Kaiako and ākonga will explore media reports that use statistics. [Here](https://www.visualcapitalist.com/history-of-pandemics-deadliest/) is an interesting link to an article and infographics about Covid19. We will use a workbook created by Liz Sneddon (currently in development), along with her website, to explore statistical literacy ideas.***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)*** | 8 weeks |
| **This theme integrates learning from number, geometry, and measurement:***Within the learning of this theme, students will:** use rates, ratios, and percentages in both directions, including finding an original value
* use number knowledge and technology when solving problems
* use a variety of methods in solving percentage problems, rates, and ratios, such as number strategies, equations, tables, and graphs
* 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
* convert between metric units
* solve problems which involve finding volume(s)
* find areas of non-uniform shapes using knowledge of coordinates or maps
* use trigonometric ratios and Pythagoras’ theorem to find lengths and angles in 2- and 3- dimensions.
 | **Theme 2: problem solving**Ākonga will start with revision of:* number skills such as percentage increase and decrease, simple interest
* measurement skills such as converting units, perimeter, area, volume, and surface area
* geometry skills such as Pythagoras’ theorem and bearings.

They will move onto learning the skills listed in the Significant Learning. Then they will move into problem solving. Here is a link to a mathematical problem solving model - Link 1Desmos (and Ken Clarkson) have a range of activities through teacher.desmos.com. Here are a few links: [right angle triangles](https://teacher.desmos.com/activitybuilder/custom/5b42f323980e50321b1d4a73?collections=5cfb68f55873b67025f06b45), [can design](https://teacher.desmos.com/activitybuilder/custom/5b2c725bf291dd5594a5614d?collections=5cfb68f55873b67025f06b45), [pennies and circles](https://teacher.desmos.com/activitybuilder/custom/586ab17c2f8cd5bc3bcaf259?collections=5da649ac6254f22e20fd1107)***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:******AS1.3 (91946) Interpret and apply mathematical and statistical information in context (External – 5 credits)*** | 8 weeks |
| **This theme integrates learning from number and algebra:***Within the learning of this theme, students will:** make connections between representations, such as number patterns, spatial patterns, tables, equations, and graphs
* use graphing and algebra for solving simultaneous equations
* demonstrate understanding of linear, quadratic, and simple exponential relationships
* use algebra and graphing for solving linear equations and inequations
* find optimal solutions, which are solutions that maximise or minimise a quantity while meeting the constraints of the situation
* use algebra and graphing for solving linear equations and inequations
* use factorising, graphical relationships, and knowledge of parabolas to solve quadratic equations and inequations
* identify and use key features of graphs.
 | **Theme 3: modelling**Revision of key ideas including:* general equations of linear, quadratic and exponential models
* plotting coordinates and equations, and
* using Desmos to draw equations.

Ākonga will be taught the skills required as shown in the Significant Learning. This will include making sure students are comfortable using Desmos to move between tables, equations and graphs for linear, quadratic, and exponential models.Once the skills have been covered, ākonga will explore fitting mathematical models to problems.Desmos has a range of activities through teacher.desmos.com. Here are a few links: [iPhone 6](https://teacher.desmos.com/activitybuilder/custom/561d6a780784861e06c3a6d5?collections=5da649ac6254f22e20fd1107), [tortoise and the hare](https://teacher.desmos.com/activitybuilder/custom/5f6bcf37028fd337f1e4b29c?collections=5e44be054273ab1a7f4e7471) ***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:******AS1.3 (91946) Interpret and apply mathematical and statistical information in context (External – 5 credits)*** | 8 weeks |
| **This theme integrates learning from algebra, geometry, measurement, and statistics (probability):***Within the learning of this theme, students will:** use algebra to describe the properties of operations as they apply to rational numbers and exponents, including expanding, factorising, and simplifying
* use factorising, graphical relationships, and knowledge of parabolas to solve quadratic equations and inequations
* use number knowledge, rather than logarithms, for solving exponential equations
* identify, describe, or use key features of transformations, including centres and angles of rotation, centres of enlargement, scale factors, lines of symmetry, and vectors
* 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 knowledge of linear expressions to find unknown properties of shapes
* find areas of non-uniform shapes using knowledge of coordinates or maps
* calculate probabilities in discrete situations, using systematic lists, 2-way tables, and tree diagrams (calculations can include: conditional probability and expected values).
 | **Theme 4: reasoning**Revision of geometry of parallel lines, interior and exterior angles in polygons, etc.Teach the skills required, such as algebra (solving, factorising, etc), geometry of circles, and probability. For geometry this may include using digital tools such as Geogebra and Desmos. eg [here](https://www.geogebra.org/m/kxgHfpBT) is a link to a whole range of applets around circle geometry developed by Tim Brzezinski in Geogebra.Once the skills have been learnt, ākonga will work on investigations to explore and develop their reasoning skills.Ākonga need to:* solve and demonstrate reasoning and working at all times
* communicate reasoning and solutions.

***This topic will build knowledge for assessment of:******AS1.4 (91947) Demonstrate mathematical reasoning (External – 5 credits)*** | 8 weeks |