# **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 |