# **Mathematics and Statistics Level 1 Course Outline 3**

# 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.

|  |  |  |
| --- | --- | --- |
| **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 |
| **Number across the curriculum - number, with applications in algebra, measurement, and statistics & probability.***Within the learning of operations with numbers, students will:** use rates, ratios, and percentages in both directions, including to find an original value
* use number knowledge and technology when solving problems
* use a variety of methods — such as number strategies, equations, tables, and graphs — in solving percentage problems, rates, and ratios
* use number knowledge, rather than logarithms, for solving exponential equations
* 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).
 | [Introduction](https://nzmaths.co.nz/number-strategies-and-knowledge-level-6)Students will explore how number skills are used across the topics by engaging in a range of activities such as the following:[Build number sense and maths reasoning](https://estimation180.com/) [Would you rather](https://www.wouldyourathermath.com/category/9to12/)[Investigating GST](https://seniorsecondary.tki.org.nz/content/download/2963/24488/file/Investigating%20GST.doc)[Investigating fence patterns](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#fence)[Working with powers and combining numbers](https://nzmaths.co.nz/resource/powers-investigations) (builds directly on previous learning at Curriculum Level 5).[Investigating debt and compound interest](https://nrich.maths.org/6088)[Looking at the Richter Scale and how it links with powers](https://nzmaths.co.nz/resource/moving-and-shaking)Direct and inverse relationships ([1](https://nrich.maths.org/2787) and [2](https://nrich.maths.org/5988)).[Tower of Hanoi](https://www.transum.org/Maths/Investigation/Tower_Of_Hanoi/) - for investigating exponential relationships.**Work produced as part of this topic will support assessment of *1.2 – Explore mathematical problems that relate to life in Aotearoa New Zealand and the Pacific (Internal – 5 credits)* and build knowledge for *1.3 – Interpret and apply mathematical and statistical information in context (External – 5 credits)*** | 5 weeks |
| **Geometry and measurement across the curriculum***Within the learning of geometry and measurement, students will:** 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 equations to find unknown properties of shapes
* identify, describe, or use key features of transformations, including centres and angles of rotation, centres of enlargement, scale factors, lines of symmetry, and vectors
* find optimal solutions, which are solutions that maximise or minimise a quantity while meeting the constraints of the situation
* model objects using 3D shapes
* use trigonometric ratios and Pythagoras’ theorem to find lengths and angles in 2- and 3- dimensions
* find areas of non-uniform shapes using knowledge of coordinates or maps.
 | [Read this first](https://nzmaths.co.nz/measurement-level-6)Students will explore how geometry and measurement skills are used across the Learning Matrix areas by engaging in a range of activities such as the following:Specific investigation into the [angle properties of circles](https://nzmaths.co.nz/resource/hinea-s-other-watch)A deeper link to investigate [Pythagoras’ theorem](https://nzmaths.co.nz/resource/julie-s-wheels)Using numerical and algebraic thinking to solve for [an optimal geometric problem](https://nzmaths.co.nz/resource/peter-s-third-string)[Measuring with digital pictures](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Learning-programme-design/Year-11-programme-design/Level-5-6/Activity-Measuring-with-pictures)**Work completed within this topic will support assessment of *1.2 – Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific* *(Internal – 5 credits)* and build knowledge for *1.4 - Demonstrate mathematical reasoning (External – 5 credits)*** | 5 weeks |
| **Algebra across the curriculum***Within the learning of algebra and graphs, students will:** 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
* use algebra to describe the properties of operations as they apply to rational numbers and exponents, including expanding, factorising, and simplifying
* demonstrate understanding of linear, quadratic, and simple exponential relationships
* make connections between representations, such as number patterns, spatial patterns, tables, equations, and graphs
* identify and use key features of graphs.
 | [Read this first](https://nzmaths.co.nz/equations-and-expressions-level-6)Students will explore how algebra and graphing skills are used across the Learning Matrix areas by engaging in a range of activities such as the following: [Same and different](https://samedifferentimages.wordpress.com/) [Investigate nth term patterns](http://www.visualpatterns.org/) (alternative [link](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#pattern)).[Fundamental algebraic skills](https://cimt.org.uk/projects/mepres/book7/bk7i16/bk7_16i1.htm)[Graphing sprint race times](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#sprints)[Graphing rates, investigating gradient](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#rates)[Matching graphs to real life situations](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#graphs)[Suggesting contextual situations and equations that model them](https://nrich.maths.org/7502)[Investigating biological growth curves](https://nrich.maths.org/6151)Investigations through Desmos on the various ways to construct and the properties of [quadratic functions](https://teacher.desmos.com/collection/5da649da5a46437eff2441d0) or [linear](https://teacher.desmos.com/collection/5d939bb5a577d244fa315ebd) or [exponential](https://teacher.desmos.com/collection/5da6462c8b305273be677729)[Forming simple in context linear equations](https://nzmaths.co.nz/resource/weighing-time)Forming and solving different looking types of equations that require a high level of reasoning ([1](https://nzmaths.co.nz/resource/diophantus-i) and [2](https://nzmaths.co.nz/resource/diophantus-ii)).[Introducing difference of two squares with a pattern approach](https://nzmaths.co.nz/resource/triangular-number-links)**Work produced as part of this topic will support assessment of 1.2 – *Explore mathematical problems that relate to life in Aotearoa New Zealand or the Pacific* *(Internal – 5 credits)* and build knowledge for *1.4 - Demonstrate mathematical reasoning (External – 5 credits)*** | 10 weeks |
| **Statistics across the curriculum***Within the learning of statistics, 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, seasona, variation.
* 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)
	+ 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.savvy citizens, who can evaluate statistical reports in the media by relating the displays, statistics, processes, and probabilities used to the claims made
 | [Read this first](https://nzmaths.co.nz/statistical-investigations-level-6) and [this](https://nzmaths.co.nz/statistical-literacy-level-6)Students will explore how statistics skills integrate other learning from across the Learning Matrix areas by engaging in a range of activities such as the following:Multiple lesson [investigation](https://nzmaths.co.nz/resource/further-investigations-reaction-times) using reaction time as context.[Investigation](https://nzmaths.co.nz/resource/stork-delivery) into babies being delivered by storks using various visual infographics.Investigating [time series](https://nzmaths.co.nz/resource/time-series) using various contexts or specifically [Olympic sports](https://nrich.maths.org/records)A more detailed[reaction time investigation](https://www.bbc.co.uk/blogs/theoneshow/consumer/2009/01/22/brain-training-how-fast-are-yo.html)Specific [bivariate investigation](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#jump)Both a [comparative and bivariate](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/L6-learning-experiences#writing) investigation.An [overview](https://new.censusatschool.org.nz/resource/making-the-call/) of making the call and appreciation of sampling variation.Guessing the length of a set time [investigation](https://www.amstat.org/asa/files/pdfs/stew/HowLongis30Seconds.pdf) – comparative.[Slow reveal graphs](https://slowrevealgraphs.com/) - students are given a range of unfamiliar displays to learn strategies for analysing and interpreting.**Work produced as part of this topic may contribute towards the assessment of *1.1 – Explore data using a statistical enquiry process (Internal – 5 credits)* and build knowledge for *1.3 – Interpret and apply mathematical and statistical information in context (External – 5 credits)*** | 6 weeks |
| **Probability across the curriculum***Within the learning of probability, students will:** collect and explore data (including summary investigations), selecting appropriate graphs, displays, and summary statistics
* analyse features in context for the following investigation styles:
	+ experimental probability: frequencies.
* form a conclusion, which includes:
	+ telling a story about the wider situation
	+ make generalisations:
		- 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 madesavvy citizens, who can evaluate statistical reports in the media by relating the displays, statistics, processes, and probabilities used to the claims made
* calculate probabilities in discrete situations, using systematic lists, 2-way tables, and tree diagrams
* calculations can include: conditional probability and expected values.
 | [Read this first](https://nzmaths.co.nz/probability-level-6)Investigation into [randomness](https://nzmaths.co.nz/resource/investigation-random-processes)Exploring strategies in games involving two dice using [probability](https://www.transum.org/software/Fun_Maths/Dice_Bingo.asp) as a guide.[Using the PPDAC cycle](https://seniorsecondary.tki.org.nz/content/download/1426/11139/file/04paperscissorsrock.doc) with a focus on probability to investigate paper, scissors, rock.A cross topic [investigation](https://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Learning-programme-design/Year-11-programme-design/Level-5-6/Activity-Culturally-locating-students) focusing on the use and investigation of data to get to know our classes.[Theoretical and practical probability investigation](https://seniorsecondary.tki.org.nz/content/download/1428/11145/file/06quizorno.doc)Using [relative frequency](https://nrich.maths.org/6123) and probability ideas to reverse engineer a problem.Three [investigations](http://www.cimt.org.uk/ske/D1/Activities.pdf) based around the idea of trialling and using relative frequency.Probability [investigation](https://nrich.maths.org/7478) into closely matched sports teams.**Work produced as part of this topic may contribute towards the assessment of *1.1 – Explore data using a statistical enquiry process (Internal – 5 credits)* and build knowledge for *1.3 – Interpret and apply mathematical and statistical information in context* (*External – 5 credits)*** | 4 weeks |
| **Revision, consolidation and building connections***Within their revision programme students will:*Review appropriate pieces of Significant Learning from throughout the year. | Students will:Bring ideas from the year together, looking at how they relate.Solve problems using the whole modelling or statistical cycle.Demonstrate clear and logical working throughout.**Work completed within this topic build will knowledge for assessment of *1.4 - Demonstrate mathematical reasoning (External – 5 credits)*** | 2 weeks |