Te Tāhuhu o te Mātauranga
Ministry of Education

Te Poutāhū
Curriculum Centre

## The New Zealand Curriculum

# Mathematics and Statistics Year 9

October 2025

Te Kāwanatanga o Aotearoa
New Zealand Government

# Contents

# Purpose statement

*Ānō me he whare pūngāwerewere.*

*Behold, it is like the web of a spider.*

*This whakataukī celebrates intricacy, complexity, interconnectedness, and strength. The Learning Area of Mathematics and Statistics weaves together the effort and creativity of many cultures that over time have used mathematical and statistical ideas to understand their world.*

The Mathematics and Statistics Learning Area equips students with conceptual and procedural knowledge that empowers them to explore and make sense of the world. Mathematics and Statistics allows students to appreciate and draw on the power of abstraction, visualisation, and symbolic representation to connect new knowledge to their current understandings of quantity, space, time, data, and uncertainty. Students are taught logical reasoning and critical thinking skills that help them to evaluate information, question assumptions, and express ideas clearly.

Through the study of mathematical and statistical reasoning, students learn how to differentiate what is probable from what is possible and draw reliable conclusions about what is reasonable. As students are taught to notice patterns and variation, select approaches, draw conclusions, and justify their solutions, they build confidence in their mathematical and statistical abilities and problem-solving skills, applying these to new contexts.

The Mathematics and Statistics Learning Area provides students with concepts and tools to investigate, represent, and connect situations, as well as to generalise, explain, and justify their findings. Students learn that Mathematics and Statistics is a creative discipline that sparks curiosity and wonder and that it has been shaped by the contributions of diverse people and cultures over time.

As students progress through the Learning Area, they deepen their understanding of how to use mathematics and statistics accurately, efficiently, and confidently in increasingly complex ways. They are encouraged to engage with important societal issues — such as ethically gathering, interpreting, and communicating data — and to observe and describe similarities, patterns, and trends across natural, technological, and social contexts.

# Learning area structure

The year-by-year teaching sequences for Mathematics and Statistics lay out the knowledge and practices to be taught each year. The teaching sequences for Years 0–10 are organised into six strands: Number, Algebra, Measurement, Geometry, Statistics, and Probability.

**Number** focuses on numerical concepts and systems. It develops students' understanding of how numbers are used to represent quantities, estimate, measure, and perform calculations, and how number systems have evolved to meet practical and social needs.

**Algebra** focuses on generalisation and mathematical reasoning. It develops students' understanding of how patterns and relationships can be represented using symbols, graphs, and diagrams, and how algebraic thinking supports problem solving and communication.

**Measurement** focuses on quantifying phenomena using units and systems. It develops students' understanding of how to measure tangible and intangible quantities using standard and non-standard units, and how measurement systems vary across cultures and contexts.

**Geometry** focuses on shape, space, and transformation. It develops students' understanding of how to visualise, represent, and reason about objects and their position, orientation, and movement, drawing on geometric ideas used across cultures and in the natural world.

**Statistics** focuses on data and uncertainty. It develops students' understanding of how to collect, organise, and interpret data in context, and how statistical thinking supports informed decision making.

**Probability** focuses on chance and likelihood. It develops students' understanding of how to quantify uncertainty, make predictions, and evaluate the likelihood of events, supporting probabilistic reasoning in everyday and applied contexts.

The year-by-year teaching sequences, organised through strands and elements, set out what is to be taught. Their enactment is shaped by teachers, who design learning in response to their learners, adjusting the order and emphasis, and adding contexts and content as appropriate.

# Introduction

Across Years 0–10, Mathematics and Statistics takes students on a journey of increasingly sophisticated thinking about number, patterns, space, and data. Through purposeful exploration and practice, students build the knowledge and fluency they need to solve problems, reason logically, and make sense of the world around them.

The mathematical and statistical processes of investigating, representing and connecting situations, and generalising, explaining, and justifying findings are fundamental to all mathematical and statistical teaching and underpin the way students gain understanding of the knowledge and practices being taught.

## Years 0–3

In Years 0–3, teaching focuses on building students' ability to investigate, classify, and describe quantities, shapes, and data. Teachers draw attention to properties of numbers and attributes of shapes. Materials and pictures support visualisation of these numerical and geometric concepts. Explicit teaching enables students to make connections between representations and to develop their reasoning.

## Years 4–6

In Years 4–6, teaching focuses on students' use of a variety of representations to model number operations and to solve word problems. They extend their understanding of whole numbers to fractions and decimals, and they visualise, classify, and draw angles using benchmarks to support and justify their classifications. Students apply their knowledge of number operations to reasoning about measurements and to investigating variations in patterns, shapes, probabilities, and data. They begin to work with exponents, can tell the time, and convert between units of time.

## Years 7–8

In Years 7 and 8, teaching focuses on students' use of logic and reasoning to identify, clarify, and solve problems, make connections between mathematical and statistical concepts, and investigate patterns and variation. They use appropriate conventions, vocabulary, and algebraic notation to clearly explain solutions and justify their approaches to solving problems. Students select, use, and adapt representations to visualise and extend their reasoning (e.g. number lines to represent integers, and equations to represent linear patterns). They make generalisations, identify and calculate unknown quantities (e.g. the size of angles), and use data visualisations to evaluate claims and make conjectures. They begin to explore irrational numbers and to operate fluently with integers.

## Years 9–10

In Years 9 and 10, teaching focuses on students' use of proportional reasoning to transform numerical quantities, measurements, and shapes, including right-angled triangles. They begin to generalise their understanding and application of tables, equations, and graphs, including to explore patterns and the connections between different representations. They extend their understanding of area, perimeter, and volume for a variety of 2D shapes, including circles, and 3D shapes, including prisms. They use data visualisations to investigate, represent, and explain patterns, trends, and variation, and they apply their knowledge to situations involving chance.

The Mathematics and Statistics learning area prepares students with the knowledge and practices they need to access related curriculum subjects in Years 11–13, such as **Statistics**, **Mathematics**, and **Physics**.

The New Zealand Curriculum

# Mathematics and Statistics

## Year 9 teaching sequence

# Number

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Number structures and operations** | • A number written in scientific notation has the form $a \times 10^k$, where $1 \leq a < 10$ and $k$ is an integer.<br>• Repeated division can be summarised using exponent notation with a negative exponent.<br>• There are an infinite number of rational numbers between any two numbers; these can be represented by terminating decimals, recurring decimals, and fractions.<br>• Multiplying a fraction by an equivalent form of 1, such as $\frac{3}{3}$, results in an equivalent fraction.<br>• When giving a fraction as an answer, there should be a positive or negative integer in the numerator and a positive integer in the denominator.<br>• Numbers, including fractions, decimals, and percentages, can be represented using number lines. | • Identifying, reading, writing, representing, comparing, ordering, and converting between fractions, decimals, and percentages<br>***This content is to be taught across Years 9 and 10.*** |
| | | • Recording, comparing, and ordering whole and decimal numbers using scientific notation (e.g. $3.14 \times 10^3$)<br>• Finding equivalent fractions, simplifying fractions, and converting between improper fractions and mixed numbers<br>• Expressing remainders from division as fractions or decimals, depending on the context<br>• Identifying powers of 2 through to $2^{10}$<br>• Converting between negative powers and unit fractions (e.g. $3^{-2} = \frac{1}{9}$)<br>• Approximately locating roots on the number line with reference to the closest perfect square (e.g. $\sqrt{48}$ is between $\sqrt{36} = 6$ and $\sqrt{49} = 7$, but closer to 7) |
| | • Rounding and estimation support efficiently predicting results and checking the reasonableness of calculations. | • Using rounding and estimation to predict results and to check the reasonableness of calculations |
| | | • Rounding to the degree of precision required for the context<br>***This content is to be taught across Years 9 and 10.*** |
| | • The order of operations is important when evaluating or forming expressions. Operations are done as follows:<br>1. grouped operations (e.g. expressions under a square root, involving the numerator of a fraction, or inside brackets)<br>2. exponents or powers<br>3. multiplication and division, from left to right<br>4. addition and subtraction, from left to right.<br>• A mnemonic, such as GEMA — Grouped (e.g. $\sqrt{3^2 + 4^2}$), Exponents (e.g.$(-2)^3$), Multiplicative (× and ÷), Additive (+ and −) — can be used to remember the order of operations.<br>• Every non-zero number has a multiplicative inverse (reciprocal), and their product is 1 (e.g. 5 and $\frac{1}{5}$ are reciprocals, so $5 \times \frac{1}{5} = \frac{1}{5} \times 5 = 1$).<br>***This content is to be taught across Years 9 and 10.*** | • Generalising about exponents of 0 and 1<br>• Adding, subtracting, multiplying, and dividing integers<br>• Generalising the rule for dividing by a fraction by starting with dividing a whole number by a fraction<br>• Adding, subtracting, multiplying, and dividing fractions and decimals<br>• Connecting multiplying or dividing decimals with multiplying or dividing fractions (e.g. $0.3 \times 0.15 = \frac{3}{10} \times \frac{15}{100}$).<br>• Checking for equivalence in expressions involving negative numbers (e.g. $(-3)^2 \neq -3^2$, $-2 + 3 = 3 + (-2)$, $2 \times (-3) = (-3) \times 2 = (-2) \times 3$, $\frac{2}{-3} = \frac{-2}{3} = -\frac{2}{3}$) |
| | • Percentages are a way of expressing a fraction of 100. | • Finding a fraction or percentage of a number<br>• Finding the whole amount, given a fraction or percentage (e.g. 20% of an amount is 30. What is the original amount?) |

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| | • Percentages can be used to proportionally increase or decrease a quantity by multiplication and can be presented as decimal multipliers.<br>  ○ A percentage increase can be described by the additional percentage or the percentage of the final amount compared to the original amount (e.g. a 20% increase represents 120% of the original amount).<br>  ○ A percentage decrease can be described by the percentage lost or the percentage of the final amount compared to the original amount (e.g. a 20% decrease represents 80% of the original amount).<br>• Ratios show part-to-part or part-to-whole comparisons of two or more quantities.<br>• Ratios can be scaled up or down or simplified.<br>• A rate proportionally compares two quantities that have different units of measure; when working with rates, 'per' means 'for every' in day-to-day contexts.<br>***This content is to be taught across Years 9 and 10.*** | • Expressing a number as a fraction or percentage of another number<br>***This content is to be taught across Years 9 and 10.***<br><br>• Increasing or decreasing a number by a given proportion<br>• Representing proportional relationships using whole-number ratios, including reducing the ratios to their simplest form<br>• Dividing a quantity into two parts, given the part:part or part:whole ratio<br>• Finding equivalent ratios and rates by scaling up or down |
| **Financial mathematics** | • Percentages, ratios, rates, and proportions are often applied in financial situations.<br>***This content is to be taught across Years 9 and 10.*** | • Applying percentage mark-ups and discounts<br>• Calculating simple interest and GST on dollar amounts (e.g. finding 15% GST on $432) |

# Algebra

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Equations and relationships** | • The properties of operations (commutative, distributive, associative, inverse, and identity) and the order of operations apply to numbers and variables.<br>• When operating on or writing equations with fractions, fractions of magnitude greater than 1 are usually written as improper fractions.<br>***This content is to be taught across Years 9 and 10.*** | • Simplifying and manipulating algebraic expressions involving sums, products, differences, and positive integer powers, by:<br>  ○ collecting like terms<br>  ○ factorising using common factors<br>  ○ expanding products, including multiplying a single term by a bracketed term. |
| | | • Generalising the properties of operations with variables (e.g. multiplication is distributive over subtraction)<br>• Multiplying or dividing by $-1$ in inequalities (e.g.$-3 < 5$)<br>• Forming and solving linear equations with rational number coefficients and linear inequalities with positive coefficients<br>• Using substitution to find the value of an expression or a formula, given the values of its variables<br>• Rearranging formulae (e.g. solving P $= 2l + 2w$ for $w$) |

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| | • For a specific straight line, the gradient, $m$, and $y$-intercept, $c$, are fixed, and $x$ varies with $y$ according to the rule $y = mx + c$.<br>• The $y$-intercept touches the $y$ −axis and has coordinates $(0, c)$.<br>***This content is to be taught across Years 9 and 10.*** | • Interpreting rules of the form $y = mx + c$ and using a combination of substitution and tables to plot points from the linear graph, connecting the points to form a line<br>• Identifying the sign of $m$ from tables of values, and linear graphs<br>• Identifying the value of $c$ for a straight line, from tables of values and from linear graphs<br>• Using tables and graphs in the coordinate plane (showing all four quadrants), and diagrams to recognise the relationship between the ordinal position and its corresponding element in a linear pattern; developing a rule for the pattern in words; and making conjectures about further elements in the pattern<br>• Identifying the constant increase or decrease in a linear pattern, using variables and algebraic notation to represent the rule in an equation, and drawing on the rule to make conjectures |
| | • In the equation of a line $y = mx + c$, $m$ and $c$ represent constants (they are unchanging), $y$ and $x$ can vary, and all the values of $x$ and $y$ that satisfy the equation create an infinite number of points that form the line.<br>• The gradient is a ratio that can be interpreted as the 'steepness' of a linear graph.<br>  ○ A positive gradient slopes upwards when the graph is read from left to right.<br>  ○ A negative gradient slopes downwards when the graph is read from left to right.<br>  ○ A horizontal line has a gradient equal to zero. Its equation will be $y = c$. | |

# Measurement

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Measuring** | • A solution to a calculation cannot be more precise than the least precise number used in that calculation.<br>***This content is to be taught across Years 9 and 10.*** | • Estimating, calculating, converting, and accurately representing measurements |
| | • Conversions between different-sized metric units may be needed to give the appropriate units for a measurement or calculation.<br>• The metric prefixes 'kilo–', 'mega–', 'giga–', and 'tera–' signify a unit that is one thousand, one million, one billion, and one trillion times larger than the base unit.<br>• The metric prefixes 'centi–', 'milli–', 'micro–', and 'nano–' signify a unit one hundredth, one thousandth, one millionth, and one billionth the size of the base unit.<br>• Derived units (e.g. $\mathrm{cm}^2$, $\mathrm{km/h}$) reflect a relationship — a product or quotient — between two different measurements.<br>***This content is to be taught across Years 9 and 10.*** | • Selecting and using appropriate measurement units for a given context, converting between metric units if necessary and using appropriate prefixes |
| | • The constant $\pi$ is found by dividing a circle's circumference by its diameter.<br>• For a circle of radius $r$, the circumference is $2\pi r$. | • Finding:<br>  ○ the perimeter of 2D shapes<br>  ○ the circumference of circles |

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| | | ○ the area of parallelograms, trapeziums, and kites, relating the formulae used to the formula for a rectangle<br>• Deriving the formulae for the perimeter of half and quarter circles from the formula for a full circle<br>• Calculating the perimeter of half circles and quarter circles |
| | • For right-angled triangles, Pythagoras' theorem states that the square of the hypotenuse (longest side) is equal to the sum of the squares of the other two sides.<br>• If $(a, b, c)$ is a Pythagorean triple, then so is $(ka, kb, kc)$, where $k$ is a positive integer.<br>***This content is to be taught across Years 9 and 10.*** | • Using Pythagoras' theorem to:<br>○ verify that given side lengths in a right-angled triangle satisfy the theorem<br>○ find the length of the hypotenuse in a right-angled triangle, given the lengths of the other two sides<br>• Proving Pythagoras' theorem (e.g. by rearranging four congruent right-angled triangles into a square)<br>• Finding another Pythagorean triple from a given Pythagorean triple |
| | • There is a fixed relationship between speed, distance, and time: $\text{speed} = \frac{\text{distance}}{\text{time}}$.<br>• In position-time graphs, the gradient represents speed.<br>***This content is to be taught across Years 9 and 10.*** | • Finding distance, given speed and time<br>• Finding time, given distance and speed |
| | • Decimal measures are used for very small durations (e.g. milliseconds); the rest of time measurement uses a different system, based principally on 12 and 60.<br>***This content is to be taught across Years 9 and 10.*** | • Reasoning about duration using different units of time, including decimal fractions of milliseconds where appropriate<br>***This content is to be taught across Years 9 and 10.*** |

# Geometry

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Shapes** | • A circle is the path traced out by a point moving in a plane and always a fixed distance (the radius) from a central point.<br>• Angles between parallel lines and a transversal can be corresponding, co-interior, or alternate; corresponding angles are equal, and alternate angles are equal. | • Identifying and describing parts of a circle (e.g. a chord; the diameter, radius, and circumference) and how they relate to each other<br>• Reasoning about unknown angles in situations involving intersecting and parallel lines and transversals.<br>• Verifying that two lines are parallel, using angles at the intersections of a transversal |
| **Spatial reasoning** | • A set of points in a plane can be transformed by translation, reflection about a line, and rotation about a fixed point.<br>***This content is to be taught across Years 9 and 10.*** | • Representing and constructing 3D shapes, including rectangular and triangular prisms and pyramids, from nets and plan views drawings<br>• Transforming 2D shapes in the coordinate plane by translation, reflection about a given line of symmetry, and rotation about a given point by a multiple of 90 degrees |

# Statistics

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Developing knowledge from data** | • Multivariate data is data in a set that has more than two variables.<br>• Data can be collected from observational studies in which the observers do not alter or control the behaviour of the subjects.<br>• Statistical questions clearly identify the variable, group of interest, and the intent of an investigation.<br>  ○ A summary investigation is about a group.<br>  ○ A comparison investigation compares a variable across two clearly identified groups.<br>  ○ A relationship investigation looks for a connection between paired numerical or paired categorical variables.<br>  ○ A time-series investigation looks at a variable over time.<br>• Primary data is data that is collected first-hand.<br>• Secondary data is data collected by someone else. | • Planning and collecting multivariate data to respond to a statistical question and where at least one variable is categorical and at least one is numerical<br>• Calculating the five-point-summary for numerical data:<br>  ○ the minimum value<br>  ○ the value of quartile 1, or $Q_1$<br>  ○ the value of the median or quartile 2, or $Q_2$<br>  ○ the value of quartile 3, or $Q_3$<br>  ○ the maximum value<br>• Calculating the interquartile range as $IQR = Q_3 - Q_1$ |
| **Visualisation of data** | • A distribution is formed from all the possible values of a variable and their frequencies. It can be shown using data visualisations that show patterns, trends, and variations and that include dot plots, bar graphs, frequency tables, box plots, histograms, time-series graphs, scatter plots, and two-way tables.<br>• A good data visualisation should allow viewers to discern the variable(s) and who the data was collected from, and then, depending on the type of visualisation, additional information such as frequency, proportions, patterns or trends, and units for numerical variables.<br>***This content is to be taught across Years 9 and 10.*** | • Creating multiple data visualisations for an investigation<br>• Selecting appropriate scales for data<br>***This content is to be taught across Years 9 and 10.*** |
| | • In relationship investigations:<br>  ○ sometimes one variable is thought of as predictive of the other variable; then the response or dependent variable is on the $y$-axis, and the 'predictive', explanatory, or independent variable is on the $x$-axis<br>  ○ an eyeballed line or curve of best fit can be added for paired numerical data.<br>***This content is to be taught across Years 9 and 10.*** | • For relationship investigations, drawing an eyeballed line or curve of best fit to predict possible $y$-values (the response variable) for given $x$-values (the explanatory variable)<br>***This content is to be taught across Years 9 and 10.*** |
| **Interpretation of data** | • Elements of chance affect the certainty of results from observational studies and experiments.<br>• Uncertainty should be taken into account when making claims.<br>***This content is to be taught across Years 9 and 10.*** | • Critically considering data visualisations, including those from contemporary media, to see if they support or misrepresent the data<br>***This content is to be taught across Years 9 and 10.*** |
| | • Data visualisations need to be critically assessed to see if they support or misrepresent the data. | • Communicating findings in context to answer an investigative question, using evidence<br>• Providing possible explanations for findings |

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| | | • Comparing findings to initial conjectures or assertions and existing knowledge<br>• Evaluating findings and data-collection methods to check whether claims or statements are supported by the data |

# Probability

| Year 9 | | |
|---|---|---|
| | **Knowledge**<br>*The facts, concepts, principles, and theories to teach.* | **Practices**<br>*The skills, strategies, and applications to teach.* |
| **Experimental and theoretical probability** | • Some chance-based situations, such as tossing a non-regular 3D shape, can only be explored through probability experiments.<br>• Results from sets of repeated trials for the same experiment may vary.<br>• The Law of Large Numbers states that as the number of trials in a chance experiment increases, the experimental probability will approach the experiment's theoretical probability.<br>• Lists, tables, two-way tables, and tree diagrams are useful systematic methods for generating all possible outcomes.<br>• In joint events, events can be dependent or independent.<br>• Probabilities for joint events cannot simply be added, because doing so would double-count outcomes that are common to both events.<br>• Mutually exclusive events cannot occur together.<br>• The estimated probability of an event from an experiment is the number of times the event happens divided by the total number of trials in the experiment (i.e. the relative frequency for that event).<br>***This content is to be taught across Years 9 and 10.*** | • Carrying out a chance experiment, including running simulations for a large number of trials using digital tools<br>• Systematically listing outcomes for the sample space<br>• Comparing experimental probability (from at least 30 trials) to theoretical probability for a chance experiment, and explaining why they differ and how increasing the number of trials reduces this difference<br>• Carrying out chance experiments of at least 100 trials and comparing the experimental probability of each individual outcome to its theoretical probability, in order to demonstrate the Law of Large Numbers<br>• Creating and describing data visualisations for the distribution of observed outcomes from a chance experiment<br>• Calculating probability estimates for different outcomes<br>***This content is to be taught across Years 9 and 10.*** |

# The language of Mathematics and Statistics for Year 9

| | **Year 9**<br>*Students will be taught the following new words:* | |
|---|---|---|
| **Number** | • GST<br>• index<br>• irrational number<br>• like roots<br>• original amount<br>• precision | • rate<br>• reciprocal<br>• recurring<br>• scientific notation<br>• simple interest |
| **Algebra** | • expanding<br>• gradient, slope<br>• intercept | • linear relationship<br>• rate of change |
| **Measurement** | • accuracy<br>• chord<br>• congruent<br>• derived unit<br>• hypotenuse | • mega–, giga–, tera–<br>• micro–, nano–<br>• Pythagorean triple<br>• speed |
| **Geometry** | • alternate, co-interior, or corresponding angles<br>• intersect | • transversal |
| **Statistics** | • comparison investigation, relationship investigation, summary investigation, time-series investigation<br>• distribution<br>• explanatory variable | • line or curve of best fit<br>• multivariate data<br>• population<br>• quartile |
| **Probability** | • elements of chance<br>• joint events<br>• mutually exclusive | • probability estimate<br>• simulation |