Year 9 Mathematics
Curriculum and assessment plan

Example

Level description	Context and cohort considerations
In Year 9, learning in Mathematics builds on each student's prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures, and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently. Students further develop proficiency and positive dispositions towards mathematics and its use as they: • apply scientific notation in measurement contexts, routinely consider accuracy in measurement and work with absolute, relative and percentage errors in a range of different measurement contexts • work with the real number line as a geometric model for real numbers that provides a continuous measurement scale; locate different fractions exactly on the common scale of the real number line using scale and similarity, and locate some irrational square roots of natural numbers using Pythagoras' theorem • use linear and quadratic functions to model a broad range of phenomena and contexts, make predictions, and represent these using tables, graphs and algebra, including with the use of digital tools • manipulate algebraic expressions involving variables, exponents, and the expansion and factorisation of simple quadratic expressions using a variety of techniques including tables, diagrams, algorithms and digital tools • formulate and solve related linear and non-linear equations exactly or approximately using numerical, graphical and algebraic approaches • solve measurement problems about the surface area and volume of objects and apply formulas to solve problems, calculating these and related dimensions of objects as required • use similarity, scale, trigonometry, enlargement transformations, the triangle inequality and Pythagoras' theorem to solve practical problems using given sets of information • investigate probabilities of compound events from two-step experiments and solve related problems; use a variety of representations such as Venn diagrams, tree diagrams, two-way tables and grids to assist in determining the probabilities for these events; design experiments to gather empirical data about relative frequencies and use these to check their reasoning • compare multiple numerical data subsets in context and analyse their distributions with consideration of symmetry and skew; justify their choice of data representation with respect to data types and context, and critically review the statistical presentation of data and related arguments of others.	The Year 9 cohort participates in regular mathematics lessons. This plan has considered: • timing of NAPLAN in Term 1 • summative and formative data from Year 8 showing the need to support and extend on their knowledge of algebra • exploration and use of digital tools, e.g. virtual material, electronic devices, simulation programs and dynamic geometric software, in relevant contexts that support the learning and doing of mathematics.

Unit 1 — Shaping up nicely	Unit 2 — Functioning in everyday life	Unit 3 —Possibilities and decisions	Unit 4 — Thinking outside the box
Duration: 10 weeks	Duration: 10 weeks	Duration: 10 weeks	Duration: 10 weeks
Trigonometry supports the development of flexible, creative and logical thinking needed for problem-solving, through the application of theorems and algorithms. This unit focuses on building student understanding and skills in trigonometry, enlargement and reduction of objects and shapes and geometic constructions. In the first phase of this unit, students extend their knowledge of similarity, ratio and Pythagoras' theorem from Year 8 to develop their understanding of scale factor and trigonometry. Through practical investigations, using hands on materials, e.g. rope, string and tape measures, and diagrams, e.g. architecture designs, house and garden designs, students make conceptual connections between direct proportion, ratio, similarity and scale factor involving the enlargement and reduction of objects and shapes. They apply this knowledge to explain these transformations and solve problems. Students continue to use this knowledge to investigate and understand trigonometric ratios using materials, e.g. hand made clinometers to solve problems involving right-angled triangles in the school environment, e.g measuring the height of buildngs and sport equipment. Student understanding and fluency is assessed in an end-of-semester examination at the end of Unit 2. In the second phase of this unit, students use computational thinking skills to design, use, test and refine algorithms based on a geometric constructions, e.g. drawing shapes accurately in the structure of a fractal found in nature, such as a snowflake, and/or theorems of choice, e.g. triangle inequality theorem. Students use digital tools, e.g. geometric and coding software, to present their algorithms and reasoning in a computational thinking multimodal presentation.	The use of mathematical expressions and models can enhance problem-solving skills, providing a systematic and structured approach when analysing real-world scenarios. Students are able to develop critical thinking and logical reasoning to break down complex problems into manageable components. Additionally, the application of mathematical models fosters a deeper understanding of quantitative relationships, empowering students to make informed decisions in various aspects of their daily lives. In this unit, students explore the use of mathematical expressions and models to represent and solve practical everyday problems. In the first phase of this unit, students extend their algebraic knowledge of exponent laws from Year 8 to simplify and evaluate expressions involving integer exponents and variables. Students connect this knowledge to explore real-world contexts, e.g. the size of organisms that can't been seen with the naked eye, the distance between planets, speed of light and area, to scientific notation and solve problems involving very small and very large measurements, and time scales. Students use materials, e.g. algebra tiles and area models, to build an understanding of associative, commutative and distributive properties. They are introduced to the concept of quadratic functions through real-world scenarios, e.g throwing of a ball into the air can be represented as a quadratic function. They connect the relatonship of expansion and factorisation to expand binomials and factorise monic quadratic expressions. They use digital tools to graph quadratic functions, interpreting features, e.g symmetry, turning point and solve monic quadratic equations with integer roots using school environment scenarios, e.g expressing the area of garden bed as a monic quadratic equation to maximise or minimise perimeter. In the second phase of this unit students use critical thinking skills and knowledge of linear and quadratic representations to demonstrate how either linear or quadratic functions can be chosen to model solutions. To understand how algebra is purposeful in the world, students connect their mathematical knowledge to create models in real-world contexts, e.g. modelling the height of a projectile, such as a ball, over time or comparing two financial investments over time. This unit concludes with an end-of-semester examination, using understanding, fluency, reasoning and problem-solving concepts from Units 1 and 2.	When reaching complex financial and practical decisions, it is important to make conceptual connections across different strands of mathematics. In this unit, students compare values, identify and interrogate relationships, solve equations and use mathematical models and simulations to find solutions to problems. In the first phase of this unit, students explore through practical examples, e.g. a map of the school, line segments on a Carteasian plane and make connections between distance, midpoint and gradient of a line segment with other mathematical concepts including Pythagoras theorem, mean, ratios and rates. This part of the unit will be assessed in the end-of-semester examination in Term 4. In the second part of this phase, students then apply their knowledge of direct proportion, ratio and scale factor, from Unit 2, to solve practical problems, including ones with financial contexts, e.g. creating a floor plan for a space in a house and the cost of resources to build. Students demonstrate their understanding, fluency and reasoning skills in a mathematical modelling task to design and provide the cost to produce a logo for a company. In the second phase of this unit, students use their critical and creative thinking skills to design and conduct repeated chance experiments and simulations for combined events, using digital tools. They trial various experiments to list outcomes for compound evens, with and without replacement and calculate relative frequencies to estimate probabilities of events involving 'and', inclusive 'or' and exclusive 'or'. They make connections in their mathematical learning through the use of real-world contexts, e.g. planning a weekend outing with several activities to analyse the probabilities of different combinations of events during the outing. Through their probability experiment and simulation problem-solving task, they determine the outcomes for compound events and represent and assign probabilities in different ways, e.g. lists, tree diagrams, tables. Students demonstrate their results in a multimodal presentation.	Breaking down complex mathematical information demonstrates a proficiency in dissecting challenging concepts into fundamental components. Through the use of critical and creative thinking, students can navigate and master intricate concepts across various mathematical strands. Using this information and data, student are able to make claims or find possible solutions to problems. In this unit, students break down complex or comprehensive data into fundamental parts for analysis in statistics and measurement design. In the first phase of this unit, students build on their knowledge of data collection and representation techniques from Year 8 and use analytical and critical thinking skills to investigate and analyse a variety of reports, e.g. public opinion surveys and data from the Australian Bureau of Statistics, collected from online databases. Students analyse how sampling methods and representation choices can be used to support or question conclusions or to promote a point of view. Students then plan and conduct a statistical investigation and use digital tools, e.g. spreadsheets and data analysis software, to represent the distribution of multiple data sets using comparative data displays for analysis. Students report their findings in a statistical investigation report, including a discussion on the strength of evidence to support their conclusions. In the second phase of this unit, students build critical and creative skills using environmental stimulus, e.g rain water tank design, to develop understanding and fluency in solving problems involving volume, surface area of right prisms and cylinders. This builds on students' understanding and fluency of volume and area from Year 8. This unit concludes with an end-of-semester examination, using understanding and fluency concepts from Units 3 and 4.

Where there is one assessment item within a unit, the corresponding achievement standard aspect/s is indicated in blue.
Where there is a second assessment item within a unit, the corresponding achievement standard aspect/s is indicated in yellow.
Where there is an assessment item that is assessed across units, e.g. end-of-semester examination, the corresponding achievement standard aspect/s is indicated in green.

	Unit 1 — Shaping up nicely		Unit 2 — Functioning in everyday life		Unit 3 — Possiblities and decisions		Unit 4 — Thinking outside the box	
	Assessment 1 — Project: Computational thinking	**Term/ week**	**Assessment 3 — Examination**	**Term/ week**	**Assessment 4 — Project: Mathematical modelling**	**Term/ week**	**Assessment 6 — Project: Statistical investigation**	**Term/ week**
Assessment	**Description:** Students use computational thinking skills in this short, focused task to choose either a geometric construction process, e.g. using a compass to bisect a line to measure segments and angles for a shape in nature, such as the petals of a flower, or a theorem, e.g. Pythagorean triplets, to investigate and present to the class. Students use digital tools to design and test their algorithm to ensure the sequence of steps can be applied to different conditions or variables. Students present their algorithm and reasoning to the class through a multimedia presentation. **Technique:** Project **Mode:** Spoken/signed **Conditions:** • issued in week 7 and completed by end of week 9 (including 3 hours of class time) • spoken/signed response up to 5 minutes	Term 1 Week 9	**Description:** Students undertake a two-part end-of-semester examination covering topics from Units 1 and 2. Part A: Short response Students respond to understanding, fluency and reasoning questions focusing on: • recognising and using rational and irrational numbers to solve problems • applying the exponent laws to numerical expressions with integer exponets and extend to variables • expanding binomial products and factorising monic quadratic expressions, simplifying algebraic expressions • identifying and graphing quadratic functions, solving quadratic equations graphically and numerically • solving monic quadratic equations with integer roots algebraically • expressing small and large numbers in scientific notation • solving problems involving ratio, similarity and scale in two-dimensional situations determining percentage errors in measurements • applying Pythagoras' theorem and using trigonometric ratios to solve problems involving right-angled triangles • applying the enlargement transformation to images of shapes and objects and interpreting results. Part B: Extended response Students use stimulus to respond to a mathematical modelling scenario to choose linear or quadratic functions to compare two investment options to determine maximise return over a period of time. Students experiment with the effect of variations of parameters, graphically and algebraically, to evaluate the model and report their findings. **Technique :** Examination **Mode :** Written **Conditions :** • Part A and Part B each up to 70 minutes, plus 5 minutes perusal, under supervised conditions • calculator allowed	Term 2 Week 8	**Description:** In this task, students apply their understanding and skills of direct proportion, ratio and scale to design a logo for a billboard advertisement. Included in the written report response, students include costings to replicate the enlarged logo demonstrating their use of mathematical modelling problem-solving proficiency processes. **Technique:** Project **Mode:** Written **Conditions:** • issued in week 3 and completed by the end of week 5 (including 3 hours of class time) • written responses up to 800 words	Term 3 Week 5	**Description:** In this task, students plan and conduct a statistical investigation to identify who they believe is the greatest of all time (GOAT) in a field of their choosing. Through a written response, students will develop their own criteria to make a justified decision. Students will include tables, figures and diagrams to support their conclusions. **Technique:** Project **Mode:** Written **Conditions:** • issued in week 3 and completed by the end of week 5 (including 2 hours of class time) • written responses up to 800 words	Term 4 Week 5
					Assessment 5 — Probability experiment and simulations	**Term/ week**	**Assessment 7 — Examination**	**Term/ week**
					Description: Through a short, focused probability experiment and simulation project, students design a dice game for a local board game night. The game is to involve non-conventional dice with different numbers of sides. By investigating both theoretical and experimental probabilities, students compare the probabilities of simple events to related compound events and determine if the game is fair, giving reasons for conclusions made. **Technique:** Project **Mode:** Written, practical **Conditions:** • issued in week 7 and by end of week 9 (including 3 hours of class time) • multimodal response up to 5 minutes • practical as negotiated	Term 3 Week 9	**Description:** In this task, students answer short response understanding, fluency and resoning questions, focusing on: • finding the distance between two points on the Cartesian plane, and the gradient and midpoint of a line segment • applying formulas to solve problems involving the surface area and volume of right prisms and cylinders. **Technique:** Examination **Mode:** Written **Conditions:** • up to 70 minutes, plus 5 minutes perusal, under supervised conditions • calculator allowed	Term 4 Week 9

	Unit 1 — Shaping up nicely	Unit 2 — Functioning in everyday life	Unit 3 — Possiblities and decisions	Unit 4 — Thinking outside the box
Achievement standard	By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations. They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles. They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools.	By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations. They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles. They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools..	By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations. They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles. They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools.	By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations. They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles. They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools.
Moderation	**Calibration:** Refer to QCAA moderation advice on the QCAA website under the Assessment tab in the learning area.	**Consensus:** Refer to QCAA moderation advice on the QCAA website under the Assessment tab in the learning area.	**Expert:** Refer to QCAA moderation advice on the QCAA website under the Assessment tab in the learning area.	**Calibration:** Refer to QCAA moderation advice on the QCAA website under the Assessment tab in the learning area.

Content descriptions	Units				Content descriptions	Units				Content descriptions	Units			
Number	**1**	**2**	**3**	**4**	**Algebra**	**1**	**2**	**3**	**4**	**Measurement**	**1**	**2**	**3**	**4**
recognise that the real number system includes the rational numbers and the irrational numbers, and solve problems involving real numbers using digital tools AC9M9N01	☑	☐	☐	☐	apply the exponent laws to numerical expressions with integer exponents and extend to variables AC9M9A01	☐	☑	☐	☐	solve problems involving the volume and surface area of right prisms and cylinders using appropriate units AC9M9M01	☐	☐	☐	☑
					simplify algebraic expressions, expand binomial products and factorise monic quadratic expressions AC9M9A02	☐	☑	☐	☐	solve problems involving very small and very large measurements, time scales and intervals expressed in scientific notation AC9M9M02	☐	☑	☐	☐
					find the gradient of a line segment, the midpoint of the line interval and the distance between 2 distinct points on the Cartesian plane AC9M9A03	☐	☐	☑	☐	solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles AC9M9M03	☑	☐	☐	☐
					identify and graph quadratic functions, solve quadratic equations graphically and numerically, and solve monic quadratic equations with integer roots algebraically, using graphing software and digital tools as appropriate AC9M9A04	☐	☑	☐	☐	calculate and interpret absolute, relative and percentage errors in measurements, recognising that all measurements are estimates AC9M9M04	☑	☐	☐	☐
					use mathematical modelling to solve applied problems involving change including financial contexts; formulate problems, choosing to use either linear or quadratic functions; interpret solutions in terms of the situation; evaluate the model and report methods and findings AC9M9A05	☐	☑	☐	☐	use mathematical modelling to solve practical problems involving direct proportion, rates, ratio and scale, including financial contexts; formulate the problems and interpret solutions in terms of the situation; evaluate the model and report methods and findings AC9M9M05	☐	☐	☑	☐
					experiment with the effects of the variation of parameters on graphs of related functions, using digital tools, making connections between graphical and algebraic representations, and generalising emerging patterns AC9M9A06	☐	☑	☐	☐					

Content descriptions	Units				Content descriptions	Units				Content descriptions	Units			
Space	**1**	**2**	**3**	**4**	**Statistics**	**1**	**2**	**3**	**4**	**Probability**	**1**	**2**	**3**	**4**
recognise the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles using properties of similarity AC9M9SP01	☑	☐	☑	☐	analyse reports of surveys in digital media and elsewhere for information on how data was obtained to estimate population means and medians AC9M9ST01	☐	☐	☐	☑	list all outcomes for compound events both with and without replacement, using lists, tree diagrams, tables or arrays; assign probabilities to outcomes AC9M9P01	☐	☐	☑	☐
apply the enlargement transformation to shapes and objects using dynamic geometry software as appropriate; identify and explain aspects that remain the same and those that change AC9M9SP02	☑	☐	☐	☐	analyse how different sampling methods can affect the results of surveys and how choice of representation can be used to support a particular point of view AC9M9ST02	☑	☐	☐	☑	calculate relative frequencies from given or collected data to estimate probabilities of events involving "and", inclusive "or" and exclusive "or" AC9M9P02	☐	☐	☑	☐
design, test and refine algorithms involving a sequence of steps and decisions based on geometric constructions and theorems; discuss and evaluate refinements AC9M9SP03	☑	☐	☐	☐	represent the distribution of multiple data sets for numerical variables using comparative representations; compare data distributions with consideration of centre, spread and shape, and the effect of outliers on these measures AC9M9ST03	☐	☐	☐	☑	design and conduct repeated chance experiments and simulations, using digital tools to compare probabilities of simple events to related compound events, and describe results AC9M9P03	☐	☐	☑	☐
					choose appropriate forms of display or visualisation for a given type of data; justify selections and interpret displays for a given context AC9M9ST04	☐	☐	☐	☑					

General capabilities	Units			
	1	2	3	4
Critical and creative thinking	☑	☑	☑	☑
Digital literacy	☑	☑	☑	☑
Ethical understanding	☐	☐	☐	☐
Intercultural understanding	☐	☐	☐	☐
Literacy	☑	☐	☑	☐
Numeracy	☑	☑	☑	☑
Personal and social capability	☐	☐	☐	☐

Cross-curriculum priorities	Units			
	1	2	3	4
Aboriginal and Torres Strait Islander histories and cultures	☐	☐	☐	☐
Asia and Australia's engagement with Asia	☐	☐	☐	☐
Sustainability	☐	☐	☐	☐