Year level plan	Mathematics	Year level	Year 9

Curriculum intent	**Year level description**	The proficiency strands *Understanding, Fluency, Problem Solving and Reasoning* are an integral part of mathematics content across the three content strands: Number and Algebra, Measurement and Geometry, and Statistics and Probability. The proficiencies reinforce the significance of working mathematically within the content and describe how the content is explored or developed. They provide the language to build in the developmental aspects of the learning of mathematics. At this year level: **Understanding** includes describing the relationship between graphs and equations, simplifying a range of algebraic expressions, explaining the use of relative frequencies to estimate probabilities, and the use of the trigonometric ratios for right-angle triangles **Fluency** includes applying the index laws to expressions with integer indices, expressing numbers in scientific notation, listing outcomes for experiments and developing familiarity with calculations involving the Cartesian plane and calculating areas of shapes and surface areas of prisms **Problem Solving** includes formulating, and modelling practical situations involving surface areas and volumes of right prisms, applying ratio and scale factors to similar figures, solving problems involving right-angle trigonometry, and collecting data from secondary sources to investigate an issue **Reasoning** includes following mathematical arguments, evaluating media reports and using statistical knowledge to clarify situations, developing strategies in investigating similarity and sketching linear graphs
	Achievement standard	By the end of Year 9, students solve problems involving simple interest. They interpret ratio and scale factors in similar figures. Students explain similarity of triangles. They recognise the connections between similarity and the trigonometric ratios. Students compare techniques for collecting data from primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data. Students apply the index laws to numbers and express numbers in scientific notation. They expand binomial expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment. They sketch linear and non-linear relations. Students calculate areas of shapes and the volume and surface area of right prisms and cylinders. They use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles. Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem-and-leaf plots.

Unit Overview		SEMESTER 1		SEMESTER 2	
Sequencing teaching and learning		**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**
		Students have opportunities to develop understandings of: • Real numbers — Solving rates problems, simplifying rates, identifying additive and multiplicative patterns in direct proportion, representing rates graphically and algebraically • Linear and non-linear relationships — Calculate gradient, calculate the distance between two points on a Cartesian plane using Pythagoras's theorem, calculate the midpoint of a line segment. • Using units of measurement — calculate the area of composite shapes, calculate the surface area and volume of right prisms and cylinders solve problems involving the surface area and volume of right prisms and cylinders, apply reasoning around volume to design a rainwater collection system for a school.	Students have opportunities to develop understandings of: • Patterns and algebra — expand and factorise algebraic expressions, expand binomial expressions, sketch non-linear relations and find x- and y- intercepts of parabolic functions • Geometric reasoning — describe the conditions for similarity, draw scaled enlargements, determine scale factors, interpret scale drawings, assess the similarity of triangles using tests, and investigate scale and area. • Pythagoras and trigonometry — apply Pythagoras' Theorem to check if a triangle is acute, right-angled or obtuse, determine unknown side lengths of right-angled triangles, solve problems involving right-angled triangles, apply naming conventions for sides of right-angled triangles, use similarity to investigate the constancy of the sin, cos and tan ratios, investigate patterns in trigonometric ratios, calculate trigonometric ratios using known angle or side length values, calculate unknown side lengths in right-angled triangles, solve problems using trigonometry, & calculate unknown angles in right-angled triangles.	Students have opportunities to develop understandings of: • Real numbers — understand and use index notation, convert index notation to expanded notation and vice versa, investigate the index laws for multiplication, division, zero index, power of a power, power of a product, power of a quotient, the negative indices and simplify expressions using the index laws, convert numbers from scientific notation to standard decimal form and vice versa, use index laws to solve problems involving scientific notation. • Money and financial mathematics — use the simple interest formula, rearrange the simple interest formula, solve problems using simple interest. • Patterns and algebra — review the distributive law, expand and simplify binomial expressions, apply the index laws to expansion, investigate special cases of binomial expansion (perfect squares, the difference of squares). • Data representation and interpretation — consolidate types of statistical variables, collect primary and secondary data to investigate statistical questions, calculate, interpret and describe statistics from both raw data and data representations using non-digital and digital resources, construct and compare histograms and back-to-back stem-and-leaf plots and use statistical knowledge to draw conclusions.	Students have opportunities to develop understandings of: • Real numbers — express numbers using scientific notation and perform operations using the index laws. • Linear and non-linear relationships — model relationships between variables and link algebraic, graphical and tabular representations of those relationships. • Using units of measurement — investigate very large and very small time scales, express time scales using metric prefixes and scientific notation, convert units of time using the index laws. • Chance —determine outcomes of two-step chance experiments using tree diagrams and arrays, assign probabilities to outcomes, calculate relative frequencies, determine probabilities of events (including those involving 'and' and 'or' criteria), organise data and determine relative frequencies in Venn diagrams and two-way tables, investigate data used in media reports (estimate population means and medians and evaluate the validity of statistics used).

	General capabilities and cross-curriculum priorities	Opportunities to engage with:	Opportunities to engage with:	Opportunities to engage with:	Opportunities to engage with:
	Key	*General capabilities* Literacy Numeracy Information and Communication Technology (ICT) Capability Personal and Social Capability Ethical Understanding Intercultural Understanding Critical and Creative thinking		*Cross-curriculum priorities* Aboriginal and Torres Strait Islander Histories and Cultures Asia and Australia's Engagement with Asia Sustainability	

Assessment	**Assessment**	Student responses to summative assessment tasks contribute to their assessment folio. It provides evidence of their learning and represents their achievements over reporting period. The assessment folio should include a range and balance of assessments to make valid judgments about whether the student has met the achievement standard.			
		Semester 1		**Semester 2**	
		Unit 1: Solving analytical geometry problems *Short answer questions* Students calculate and solve analytical geometry problems	**Unit 2: Connecting and applying trigonometry, similarity and algebraic concepts** *Short answer questions* Students connect and apply mathematical concepts involving geometry, algebra and measurement.	**Unit 3: Investigating secondary data** *Assignment/Project* Students draw informed conclusions from a data investigation using secondary data.	**Unit 4: Calculating probability and using timescales** *Short answer questions* Students solve problems involving scientific notation, timescales, scale factors and the calculation of relative frequencies and probabilities.
		Unit 1: Investigating area and volume problem situations *Assignment/Project* Students investigate an area and volume problem situation and justify conclusions made.		**Unit 3: Applying index laws and simple interest formula** *Short answer questions* Students apply the index laws to numbers, express numbers in scientific notation, expand and simplify binomial expressions, and solve problems involving simple interest.	
Moderation	**Consistency of teacher judgments**	Teachers use moderation to support consistency of teacher judgments and comparability of reported results against the relevant achievement standards.			

Content descriptions for Year 9 Mathematics

Review for balance and coverage of content descriptions

Number and Algebra	Semester 1		Semester 2	
	Unit 1	Unit 2	Unit 3	Unit 4
Number and place value				
Solve problems involving direct proportion. Explore the relationship between the graphs and equations corresponding to simple rate problems. (ACMNA208)	✓			
Apply index laws to numerical expressions with integer indices. (ACMNA209)			✓	✓
Express numbers in scientific notation. (ACMNA210)			✓	✓
Money and financial mathematics				
Solve problems involving simple interest. (ACMNA211)			✓	
Patterns and algebra				
Extend and apply the index laws to variables, using positive integral indices and the zero index. (ACMNA212)			✓	
Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate. (ACMNA213)		✓	✓	✓
Linear and non-linear relationships				
Find distance between two points located on the Cartesian plane using a range of strategies, including graphing software. (ACMNA214)	✓			
Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software. (ACMNA294)	✓			
Sketch linear graphs using the coordinates of two points and solve linear equations. (ACMNA215)	✓			✓
Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations. (ACMNA296)		✓		
Measurement and Geometry	**Semester 1**		**Semester 2**	
	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**
Using units of measurement				
Calculate the areas of composite shapes. (ACMMG216)	✓			
Calculate the surface area and volume of cylinders and solve related problems. (ACMMG217)	✓			
Solve problems involving surface area and volume of right prisms. (ACMMG218)	✓			
Investigate very small and very large time scales and intervals. (ACMMG219)				✓
Geometric reasoning				
Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar. (ACMMG220)		✓		
Solve problems using ratio and scale factors in similar figures. (ACMMG221)		✓		
Pythagoras and trigonometry				
Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles. (ACMMG222)	✓	✓		
Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles. (ACMMG223)		✓		
Apply trigonometry to solve right-angled triangle problems. (ACMMG224)		✓		

Statistics and Probability	Semester 1		Semester 2	
	Unit 1	Unit 2	Unit 3	Unit 4
Chance				
List all outcomes for two-step chance experiments, both with and without replacement, using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events. (ACMSP225)				✓
Calculate relative frequencies from given or collected data to estimate probabilities of events involving ‘and’ or ‘or’. (ACMSP226)				✓
Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians. (ACMSP227)				✓
Data representation and interpretation				
Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly from secondary sources. (ACMSP228)			✓	
Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including ‘skewed’, ‘symmetric’ and ‘bi-modal’. (ACMSP282)			✓	
Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread. (ACMSP283)			✓	