Australian Curriculum: Mathematics — Year 9
Year level plan- 2023

Year 9 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. The achievement standards reflect the content and encompass the proficiencies.

At this year level:

- **understanding** includes describing the relationship between graphs and equations, simplifying a range of algebraic expressions and explaining the use of relative frequencies to estimate probabilities and 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, 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.

CURRICULUM	SEMESTER 1		SEMESTER 2	
	Term 1	**Term 2**	**Term 3**	**Term 4**
Unit description	**Real numbers AT1** • Apply index laws to numerical expressions with integer indices (ACMNA209) • Express numbers in scientific notation (ACMNA210) **Patterns and algebra AT1** • Extend and apply the index laws to variables, using positive integer indices and the zero index (ACMNA212) **Using units of measurement AT2** • Calculate the areas of composite shapes (ACMMG216) • Calculate the surface area and volume of cylinders and solve related problems (ACMMG217) • Solve problems involving the surface area and volume of right prisms (ACMMG218) • Investigate very small and very large time scales and intervals (ACMMG219) **This unit is supported by a Virtual Reality Module-** *Measurement & Geometry.* **Immersive Pedagogy supporting**	**Pythagoras and trigonometry AT2** • Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles (ACMMG222) **Real numbers AT3** • Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208) **Linear and non-linear relationships AT3** •Find the 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)	**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** • 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) **Chance** • Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227) PSMT **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) PSMT • Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282) PSMT	**Money and financial mathematics** • Solve problems involving simple interest (ACMNA211) **Patterns and algebra** • Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213) **Linear and non-linear relationships** • Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296) **Chance** • Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226) • 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) **This unit is supported by a Virtual Reality Module-** *Statistics & Probability.* **Immersive Pedagogy supporting documentation is available as part of this module.**

			• Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283) PSMT	

ASSESSMENT		SEMESTER 1			SEMESTER 2		
		Term 1	**Term 2**	**Term 2**	**Term 3**	**Term 3**	**Term 4**
		Number with index laws & scientific notation – AT1	**Measurement & Pythagoras – AT2**	**Rates, ratios & Cartesian planes – AT3**	**Similarity, & Trigonometry – AT4**	**Statistics- comparing body measurements – AT5**	**Money, distributive law, non-linear relationships & chance-AT6**
Range and balance of summative assessment conventions	**Technique**	Exam	Exam	Exam	Exam	Assignment	Exam
	Type of text	Short response	Short response	Short response	Short response	Report	Short response
	Mode	Written	Written	Written	Written	Written	Written
	Conditions	• Completed in class individually • 1 lessons • Exam conditions • Calculator allowed • Formula sheet allowed	• Completed in class individually • 1 lessons • Exam conditions • Calculator allowed • Formula sheet allowed	• Completed in class individually • 1 lesson • Exam conditions • Calculator allowed • Formula sheet allowed	• Completed in class individually • 2 lessons • Exam conditions • Calculator allowed • Formula sheet allowed	• 4 lessons class • Feedback and adjustments provided on Draft	• Completed in class individually • 2 lessons • Exam conditions • Calculator allowed • Formula sheet allowed
Aspects of the achievement standard							
solve problems involving simple interest							✓
interpret ratio and scale factors in similar figures				✓	✓		
explain similarity of triangles					✓		
recognise the connections between similarity and the trigonometric ratios					✓		
compare techniques for collecting data from primary and secondary sources						✓	
make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data						✓	

apply the index laws to numbers and express numbers in scientific notation	✓					
expand binomial expressions						✓
find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment			✓			
sketch linear (T2) and non-linear (T4) relations			✓			✓
calculate areas of shapes and the volume and surface area of right prisms and cylinders		✓				
use Pythagoras' Theorem (T2) and trigonometry (T3) to find unknown sides of right-angled triangles		✓		✓		
calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes						✓
construct histograms and back-to-back stem-and-leaf plots					✓	

Term 1   **Term 2**   **Term 3**   **Term 4**   ✓ indicate opportunities that summative assessments provide for students to demonstrate evidence against aspects of the achievement standard

PROFICIENCIES

The Australian Curriculum: Mathematics proficiency strands are understanding, fluency, problem-solving and reasoning. They describe how content is explored or developed; that is, the thinking and doing of mathematics. The inclusion of the proficiencies in the curriculum is to ensure that student learning and student independence are at the centre of the curriculum. The curriculum focuses on developing increasingly sophisticated and refined mathematical proficiency skills. They enable students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.

Understanding	Fluency	Problem-solving	Reasoning
Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information.	Students develop skills in choosing appropriate procedures; carrying out procedures flexibly, accurately, efficiently and appropriately; and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.	Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively. Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.	Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false, and when they compare and contrast related ideas and explain their choices.