YEAR 9 MATHEMATICS

WORK PROGRAM

Year 9 Level Description

In Year 9, students apply a variety of mathematical concepts in real-life, life-like and purely mathematical situations.

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 the year 9 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.

ICT Statement

Throughout Year 9, students will require ready access to ICTs at a whole-class, small group and individual level. Such ICTs include spreadsheet software, graphing software, graphic calculators or mobile device apps.

Note: A mobile device is a portable computing device, typically having a display screen with touch input or a miniature keyboard.
Ensure that the use of ICT in the classroom, including mobile devices, complies with DET policy requirements – SCM-PR-003:
Appropriate use of mobile telephones and other electronic equipment by students (http://ppr.det.qld.gov.au/education/learning/Pages/Appropriate-Use-of-Mobile-Telephones-and-other-Electronic-Equipment-by- Students.aspx).

Year 9 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 in 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.

General Capabilities and Cross-curriculum Priorities

Literacy   Numeracy   ICT capability   Critical and creative thinking   Ethical behaviour   Personal and social capability   Intercultural understanding

Aboriginal and Torres Strait Islander histories and cultures   Asia and Australia's engagement with Asia   Sustainability

Mathematics provides opportunities for students to strengthen their appreciation and understanding of Aboriginal peoples and Torres Strait Islander peoples and their living cultures. Specific content and skills within relevant sections of the curriculum can be drawn upon to encourage engagement with:

- Aboriginal and Torres Strait Islander frameworks of knowing and ways of learning
- Social, historical and cultural contexts associated with different uses of mathematical concepts in Australian Indigenous societies
- Aboriginal peoples' and Torres Strait Islander peoples' contributions to Australian society and cultures.

Mathematics provides opportunities to explore aspects of Australian Indigenous knowing in connection to, and with guidance from, the communities who own them. Using a respectful inquiry approach, students have the opportunity to explore mathematical concepts in Aboriginal and Torres Strait Islander lifestyles including knowledge of number, space, measurement and time. Through these experiences, students have opportunities to learn that Aboriginal peoples and Torres Strait Islander peoples have sophisticated applications of mathematical concepts which may be applied in other peoples' ways of knowing.

Aboriginal and Torres Strait Islander histories and cultures

https://8ways.wikispaces.com/8way+maths

-Have a yarn-up about times when you've used maths to solve real problems in your life. Highlight the importance of yarning as a way of creating and passing on knowledge in Aboriginal culture.

-Use pictorial graphs to make learning maps showing student progress and desired outcomes. Explain that visualising plans and pathways is an important part of Aboriginal culture.

-Do hands-on problem-solving activities and allow time for reflection. Explore unspoken values and ethical issues in content. Explain that learning without words by using your hands, thinking deeply and finding unspoken meanings are all central to Aboriginal culture.

-Use visuals and create symbols to help students understand and remember content. Promote this as an Aboriginal form of communication.

-If you have to measure something, why not measure natural objects from the local landscape? Highlight Aboriginal connection to Country.

-Apply mathematical knowledge to unrelated/unexpected domains and contexts. Set problems with multiple creative solutions. Celebrate this kind of creative and adaptive thinking as the reason for Aboriginal culture being the longest surviving culture on the planet.

-Model every activity for students, promoting an Aboriginal protocol of "Watch first, then do".

-Relate problems and maths applications back to community life wherever possible. Where a community equivalent does not exist for content you are teaching, discuss ways in which the new knowledge could be applied for community benefit. Create outlets and projects for students to teach/apply important mathematical knowledge to the community.

Asia and Australia's engagement with Asia

-Use Australia's business with Asia as a basis for work with finance and percentage.

-Investigate time zones in Asia when doing time units.

-Find distances on maps including Asia or Asian cities when studying scale factor.

-For units on data, use data on Asia as a secondary source for creating graphs and compiling statistics.

Sustainability

-For units on measurement: find perimeters and areas of sustainable garden plots, fish farming areas; find surface area and volume of mulch bins, rainwater storage tanks;

-For units on data, use data on sustainability as a secondary source for creating graphs and compiling statistics.

ASOT (DIMENSIONS)

Curriculum intent	Content descriptions
What do my students need to learn? Curriculum is the planned learning that a school offers and enacts. Curriculum intent is what we want students to learn from the mandated curriculum. Teachers decide how best to plan and deliver the curriculum to ensure all students have opportunities to engage in meaningful learning.	This work program provides opportunities for students to engage in the Australian Curriculum Content descriptions. **General capabilities** This work program provides opportunities for students to engage in the following General capabilities: **Literacy** **Numeracy** **ICT** Students will have opportunities to demonstrate the Australian Curriculum *ICT learning continuum* in: −Investigating with ICT −Managing and operating with ICT **Critical and creative thinking** −Analysing, synthesising and evaluating reasoning and procedures. **Personal and social capability** −Social awareness **Relevant prior curriculum** Students require prior experience with pre-requisite topics for each unit.
Feedback	**Supportive learning environment**
What do my students already know? What do my students need to learn? How do I teach it? Feedback is information and advice provided by a teacher, peer, parent or self about aspects of someone's performance. The aim of feedback is to improve learning and is used to plan what to teach next and how to teach it. Teachers and students use feedback to close the gap between where students are and where they aim to be. Teachers use self-feedback to guide and improve their teaching practice.	**Differentiation** What do your students already know and what do your students need to learn? Consider the individual needs of your students - including ESL, gifted and talented and students requiring additional support. Start where students are at and differentiate teaching and learning to support the learning needs of all students. Plan and document how you will cater for individual learning needs. The learning experiences within this unit can be differentiated by increasing: -the frequency of exposure for some students; -the intensity of teaching by adjusting the group size; -the duration needed to complete tasks and assessment. For guided and/or independent practice tasks: -student groupings will offer tasks with a range of complexities to cater for individual learning needs; -rotational groupings allow for more or less scaffolding of student learning. **Feedback to students** Establish active feedback partnerships between students, teachers and parents to find out: • what each student already knows and can do; • how each student is going; • where each student needs to go next.

	Ensure feedback is timely, ongoing, instructive and purposeful.
	Use feedback to inform future teaching and learning.
	Reflection on the unit plan
	Identify what worked well during and at the end of the unit for future planning. Reflection may include:
	• activities that worked well and why;
	• activities that could be improved and how;
	• monitoring and assessment that worked well and why;
	• monitoring and assessment that could be improved and how;
	• common student misconceptions that need, or needed, to be clarified
	• differentiation and future student learning needs.
Sequencing teaching and learning	**Teaching strategies and learning experiences**
What do my students already know and can do?	A suggested learning sequence is outlined for each unit.
What do my students need to learn?	See the Unit Plans and C2Cs (Teaching Sequence and attached Lesson Plans).
How do I teach it?	The relationship between what is taught and how it is taught is critical in maximising student learning.
	Start with what your students already know and set goals for the next steps for learning.
	Decide how to provide multiple opportunities for all students to explore and consolidate ideas, skills and concepts by considering how students learn best and by using a variety of teaching strategies.
Assessment	**Monitoring student learning**
What do my students understand and can do?	Student learning should be monitored throughout the teaching and learning process to determine student progress and learning needs.
How well do they know and do it?	Each lesson provides opportunities to gather evidence about how students are progressing and what they need to learn next.
Assessment is the purposeful, systematic and ongoing collection of information as evidence for use in making judgments about student learning.	Specific monitoring opportunities in this unit may include:
Principals, teachers and students use assessment information to support improving student learning.	**Observation**
	Collect information about students' ability.
Feedback from evaluation of assessment data helps to determine strengths and weaknesses in students' understanding.	**Consultation**
	Consult with students about their ability level.
	Assessing student learning
	A variety of assessment should be implemented, reflecting the Achievement Standards.
	Moderating Assessment
	Before the task, teachers discuss task-specific descriptors of the quality of student performance.
	Teachers individually mark all student responses, applying the shared understanding achieved through this calibration process. Teachers moderate samples to ensure consistency of judgments.
Making judgments	**Judging student learning**
How do I know how well my students have learned?	The Achievement Standards should be reflected in the Guide to Making Judgements.
Teachers and students use standards to judge the quality of learning based on the available evidence.	The proficiency strands "Understanding and Fluency" and "Problem Solving and Reasoning" are evident in the Guides to Making Judgments.
The process of judging and evaluating the quality of performance and depth of learning is important to promoting learning.	
Teachers identify the task-specific assessable elements to make judgments against specified	

standards on evidence.				

YEAR 9 COURSE SCOPE AND SEQUENCE

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
1	1	C2C UNIT 1 PROPORTION	ACARA: Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208) GOALS: Review ratio, rate, and proportion	
	2-5	C2C UNIT 1 LINEAR RELATIONSHIPS	ACARA: Find the distance between two points located on a 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) GOALS: Solve and apply linear equations Plot linear graphs Calculate the midpoint Calculate the distance between two points Find the gradient of a line Sketch graphs using the gradient and y-intercept Sketch graphs using the x and y intercepts	Test-In Class
	5-9	C2C UNIT 2 MEASUREMENT	ACARA: 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) GOALS: Find perimeter/circumference Find areas Find the surface area of prisms Find the surface area of cylinders Find the volume of prisms Find the volume of cylinders	Test-In Class
	10	NUMERACY AND NAPLAN	Review numeracy and NAPLAN skills	

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
2	1-5	C2C UNIT 4 PYTHAGORAS AND TRIGONOMETRY	ACARA: 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) GOALS: Find the hypotenuse of a right triangle using Pythagoras Find the legs of a right triangle using Pythagoras Apply Pythagoras to practical situations Introduce and calculate trigonometric ratios Calculate side lengths of right triangles using trigonometric ratios Calculate angles of right triangles using trigonometric ratios Solve problems using trigonometry	Test-In Class
	6-8	C2C UNIT 3 ALGEBRA-EXPAND AND FACTORISE	ACARA: Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213) GOALS: Consolidate the distributive law Expand binomials Expand special case binomials Factorise expressions Factorise more difficult expressions	Test-In Class
	8-10	C2C UNIT 3 SIMILAR TRIANGLES NON-LINEAR GRAPHS	ACARA: 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) Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296) GOALS: Enlarge and reduce shapes using scale factor Establish and find dimensions for similar triangles Graph non-linear functions by plotting points. Identify features of non-linear graphs from a graph and from a binomial expression	Assignment

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
3	1-3	C2C UNIT 6 INDICES AND SCIENTIFIC NOTATION	ACARA: Apply index laws to numerical expressions with integer indices (ACMNA209) Express numbers in scientific notation (ACMNA210) Extend and apply the index laws to variables, using positive integer indices and the zero index (ACMNA212) GOALS: Define indices and use the product index law Use the quotient index law and the zero index law Use the power of a power index law Use the negative index law Combine the index laws Review rounding and use significant figures Convert to/from scientific notation Calculate with scientific notation	Test-In Class
	4-6	C2C UNIT 6 FORMULAS AND SIMPLE INTEREST	ACARA: Solve problems involving simple interest (ACMNA211) GOALS: Rearrange and substitute into formulae Calculate simple interest Solve for P,R,T using the simple interest formula Explore household bills and payments	

	6-9	C2C UNIT 5
		DATA REPRESENTATION AND INTERPRETATION
			ACARA:
			Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227)
			Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and 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)
			GOALS:
			Investigate data
			Find measures of centre and spread for ungrouped data
			Create frequency distribution tables for ungrouped data,
			   and use them to find measures of centre and spread
			Create frequency distribution tables for grouped data,
			   and use them to find measures of centre and spread
			Create and interpret bar charts and histograms
			Create and interpret stem and leaf plots
			Compare data sets
			Interpret data
				Test-In Class

	10	C2C UNIT 5 DATA REPRESENTATION AND INTERPRETATION ASSIGNMENT	Assignment on writing a statistical report	Assignment

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
4	1-4	C2C UNIT 7 CHANCE	ACARA: 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) GOALS: Review basic probability Find probability using tables and relative frequency Compare theoretical and experimental probability Apply probability Use the concept of mutually exclusive in probability Create and use Venn diagrams to find probability Use arrays/two-way tables to find probabilities of multiple events Use tree diagrams to find probabilities of multiple events Use the multiplication and addition rules to find probabilities	
	5-6	C2C UNIT 6 PERCENTAGE AND FINANCE	ACARA: Solve problems involving direct proportion. (ACMNA208) GOALS: Review percentage Calculate percentage profits Find percentage increase/decrease and markup/discount Apply percentage to other buy and sell situations Calculate earnings Calculate tax and net pay	Test-In Class
	7	C2C UNIT 8 TIMESCALES	ACARA: Investigate very small and very large time scales and intervals (ACMMG219) GOALS: Convert between metric prefixes and scientific notation Operate with very small and very large timescales Use a scaled timeline to represent life on Earth	
	8	C2C UNIT 8 PROBLEM-SOLVING	GOALS: Model relationships, recognise patterns, explore and attempt puzzles	
	9	FINANCIAL MATHS (Support) OR CONIC SECTIONS (Extension)	ACARA: Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296) Solve problems involving direct proportion. (ACMNA208) GOALS: Financial Maths: Investigate: payment methods, cost of resources, communication costs Conic Sections: Identify features of and sketch: circles, exponentials, and hyperbola	Class activities/worksheets
	10	ALTERNATIVE PROGRAM	Numeracy/NAPLAN skills	

ACARA CONTENT DESCRIPTIONS

ACARA CONTENT DESCRIPTION	TERM 1	TERM 2	TERM 3	TERM 4
Solve problems involving direct proportion. Explore the relationship between 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)			▓	
Solve problems involving simple interest (ACMNA211)			▓	
Extend and apply the index laws to variables, using positive integer 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)		▓		
Find the distance between two points located on a 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)		▓		▓
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)			▓	
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)		▓		
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)		▓		
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) Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and 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)			▓	