



YEAR 10 MATHEMATICS

WORK PROGRAM

Year 10 Level Description

In Year 10, 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 10 level:

Understanding includes applying the four operations to algebraic fractions, finding unknowns in formulas after substitution, making the connection between equations of relations and their graphs, comparing simple and compound interest in financial contexts and determining probabilities of two and three step experiments.

Fluency includes factorising and expanding algebraic expressions, using a range of strategies to solve equations and using calculations to investigate the shape of data sets.

Problem Solving includes calculating the surface area and volume of a diverse range of prisms to solve practical problems, finding unknown lengths and angles using applications of trigonometry, using algebraic and graphical techniques to find solutions to simultaneous equations and inequalities, and investigating independence of events.

Reasoning includes formulating geometric proofs involving congruence and similarity, interpreting and evaluating media statements and interpreting and comparing data sets.

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 10 Achievement Standard

By the end of Year 10:

Students recognise the connection between simple and compound interest.
They solve problems involving linear equations and inequalities.
They make the connections between algebraic and graphical representations of relations.
Students solve surface area and volume problems relating to composite solids.
They recognise the relationships between parallel and perpendicular lines.
Students apply deductive reasoning to proofs and numerical exercises involving plane shapes.
They compare data sets by referring to the shapes of the various data displays.
They describe bivariate data where the independent variable is time.
Students describe statistical relationships between two continuous variables.
They evaluate statistical reports.
Students expand binomial expressions and factorise monic quadratic expressions.
They find unknown values after substitution into formulas.
They perform the four operations with simple algebraic fractions.
Students solve simple quadratic equations and pairs of simultaneous equations.
They use triangle and angle properties to prove congruence and similarity.
Students use trigonometry to calculate unknown angles in right-angled triangles.
Students list outcomes for multi-step chance experiments and assign probabilities for these experiments.
They calculate quartiles and inter-quartile ranges.

General Capabilities and Cross-curriculum Priorities



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)

<p>Curriculum intent 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.</p>	<p style="text-align: center;">Content descriptions</p> <p>This work program provides opportunities for students to engage in the Australian Curriculum Content descriptions.</p> <p style="text-align: center;">General capabilities</p> <p>This work program provides opportunities for students to engage in the following General capabilities:</p> <p>Literacy Numeracy ICT Students will have opportunities to demonstrate the Australian Curriculum <i>ICT learning continuum</i> 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</p> <p style="text-align: center;">Relevant prior curriculum</p> <p>Students require prior experience with pre-requisite topics for each unit.</p>
<p>Feedback 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.</p>	<p style="text-align: center;">Supportive learning environment</p> <p>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;</p>

	<p>-rotational groupings allow for more or less scaffolding of student learning.</p> <p>Feedback to students Establish active feedback partnerships between students, teachers and parents to find out:</p> <ul style="list-style-type: none"> • what each student already knows and can do; • how each student is going; • where each student needs to go next. <p>Ensure feedback is timely, ongoing, instructive and purposeful. Use feedback to inform future teaching and learning.</p> <p>Reflection on the unit plan Identify what worked well during and at the end of the unit for future planning. Reflection may include:</p> <ul style="list-style-type: none"> • 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.
<p>Sequencing teaching and learning What do my students already know and can do? What do my students need to learn? How do I teach it?</p>	<p style="text-align: center;">Teaching strategies and learning experiences</p> <p>A suggested learning sequence is outlined for each unit. See the Unit Plans and C2Cs (Teaching Sequence and attached Lesson Plans). 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.</p>
<p>Assessment What do my students understand and can do? How well do they know and do it? Assessment is the purposeful, systematic and ongoing collection of information as evidence for use in making judgments about student learning. Principals, teachers and students use assessment information to support improving student learning. Feedback from evaluation of assessment data helps to determine strengths and weaknesses in students' understanding.</p>	<p style="text-align: center;">Monitoring student learning</p> <p>Student learning should be monitored throughout the teaching and learning process to determine student progress and learning needs. Each lesson provides opportunities to gather evidence about how students are progressing and what they need to learn next. Specific monitoring opportunities in this unit may include:</p> <p>Observation Collect information about students' ability.</p> <p>Consultation Consult with students about their ability level.</p> <p style="text-align: center;">Assessing student learning</p> <p>A variety of assessment should be implemented, reflecting Achievement Standards.</p> <p style="text-align: center;">Moderating Assessment</p> <p>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.</p>
<p>Making judgments How do I know how well my students have learned?</p>	<p style="text-align: center;">Judging student learning</p> <p>The Achievement Standards should be reflected in the Guide to Making Judgements.</p>

Teachers and students use standards to judge the quality of learning based on the available evidence. 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.

The proficiency strands “Understanding and Fluency” and “Problem Solving and Reasoning” are evident in the Guides to Making Judgments.

YEAR 10 COURSE SCOPE AND SEQUENCE

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
1	1	PYTHAGORAS C2C UNIT 1	<p>ACARA: Solve right-angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)</p> <p>GOALS: Find the hypotenuse of a right triangle using Pythagoras Find the leg of a right triangle using Pythagoras</p>	Test-In Class
	2-4	TRIGONOMETRY C2C UNIT 1	<p>ACARA: Solve right-angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)</p> <p>GOALS: Define and calculate trigonometric ratios Find a missing side using trigonometric ratios Find a missing angle using trigonometric ratios Solve trigonometry problems in context Solve problems involving angles of elevation or depressions Solve problems involving bearings Solve mixed two-dimensional problems</p>	
	5	REVIEW/ASSESSMENT		
	6-8	CHANCE C2C UNIT 2	<p>ACARA: Describe the results of two- and three-step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (ACMSP246) Use the language of ‘ifthen’, ‘given’, ‘of’, ‘knowing that’ to investigate conditional statements and identify common mistakes in interpreting such language (ACMSP247)</p> <p>GOALS: Find basic probabilities Find basic probabilities using two-way tables Find basic probabilities using tree diagrams Find probabilities involving mutually exclusive events and the addition principle Find probabilities involving dependent/independent events and the multiplication principle</p>	Test- In Class
	8	REVIEW/ASSESSMENT		
	9	CHANCE C2C UNIT 2	<p>ACARA: Describe the results of two- and three-step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (ACMSP246)</p>	

			Use the language of 'if ...then, 'given', 'of', 'knowing that' to investigate conditional statements and identify common mistakes in interpreting such language (ACMSP247) GOALS: Find basic probabilities using Venn diagrams Find probabilities using probability tree diagrams Find probability using conditional statements	
	10	ASSESSMENT	Assignment on using diagrams in Chance	Assignment
TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
2	1-3	C2C UNIT 3 LINEAR EQUATIONS AND GRAPHS	ACARA: Solve problems involving linear equations, including those derived from formulas (ACMNA235) Solve linear equations involving simple algebraic fractions (ACMNA240) Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232) Solve problems involving parallel and perpendicular lines (ACMNA238) GOALS: Solve linear and algebraic fraction equations Find gradients Find gradients of parallel and perpendicular lines Sketch linear graphs Determine equations of lines	TEST-IN CLASS
	3-4	C2C UNIT 3 SIMULTANEOUS EQUATIONS	ACARA: Solve linear simultaneous equations, using algebraic and graphical techniques including using digital technology (ACMNA237) GOALS: Solve simultaneous equations graphically and by substitution Solve simultaneous equations by elimination Solve contextualised simultaneous equations	
	4-6	C2C UNIT 4 ALGEBRA: EXPAND AND FACTORISE	ACARA: Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230) Simplify algebraic products and quotients using index laws (ACMNA231) Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233) GOALS: Review index laws Expand brackets Expand binomials Factorise using common factors Factorise monic quadratic expressions Factorise using special products	
	6-7	C2C UNIT 4 QUADRATIC EQUATIONS	ACARA: Solve simple quadratic equations using a range of strategies (ACMNA241) GOALS: Solve quadratics using the null factor law Solve quadratics by formula	

			Solve quadratics by completing the square	
	8	REVIEW AND ASSESSMENT		
	9-10	C2C UNIT 4 RELATIONS	<p>ACARA: Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239)</p> <p>GOALS: Transform quadratics Sketch parabolas Sketch and transform circles, exponentials, hyperbola</p>	Worksheets
TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
3	1-4	DATA – C2C UNIT 5	<p>ACARA: Determine quartiles and interquartile range (ACMSP248) Construct and interpret box plots and use them to compare data sets (ACMSP249) Compare shapes of box plots to corresponding histograms and dot plots (ACMSP250) Use scatter plots to investigate and comment on relationships between two numerical variables (ACMSP251) Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252) Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)</p> <p>GOALS: Draw and interpret scatterplots Draw and interpret time-related scatterplots Find measures of central tendency from frequency distribution tables Calculate a 5-number summary and determine outliers Draw boxplots Compare data sets Draw and interpret cumulative frequency graphs Draw and interpret percentage cumulative frequency graphs Apply statistics to practical situations</p>	Test-In Class And/Or Assignment (due week 6)
	5-7	MEASUREMENT C2C UNIT 6	<p>ACARA: Substitute values into formulas to determine an unknown (ACMNA234) Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids (ACMMG242)</p> <p>GOALS: Review basic area and perimeter Find areas of composite shapes Find surface area of prisms Find surface area of cylinders Find volume of prisms</p>	

			Find volume of cylinders	Test-In Class
7-8	CONGRUENCE AND SIMILARITY UNIT 6		<p>ACARA: Formulate proofs involving congruent triangles and angle properties (ACMMG243) Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes (ACMMG244)</p> <p>GOALS: Review angle theorems, symbols, properties of quadrilaterals Establish congruency and similarity of triangles Prove congruence and similarity Construct proofs</p>	
9	REVIEW AND ASSESSMENT			
10	WORK EXPERIENCE		NOTE: If no work experience, then DATA assignment.	

TERM	WEEKS	UNIT	OVERVIEW	ASSESSMENT
4	1-4	FINANCE	<p>ACARA: Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)</p> <p>GOALS: Review simple interest Use repeated simple interest to connect simple and compound interest Use the compound interest formula to find A Use the compound interest formula to find P,R,N Compare interest rates using effective interest Calculate depreciation Explore exponential growth Explore exponential decay</p>	
	5-6	INEQUALITIES	<p>ACARA: Solve linear inequalities and graph their solutions on a number line (ACMNA236)</p> <p>GOALS: Solve and graph linear inequalities Represent inequalities on the Cartesian plane</p>	
	6-7	REVIEW AND ASSESSMENT		TEST-IN CLASS
	8	INEQUALITIES	<p>ACARA: Solve linear inequalities and graph their solutions on a number line (ACMNA236)</p> <p>GOALS: Graph systems of equations</p>	WORKSHEETS

			Apply systems of equations to practical situations	
--	--	--	--	--

ACARA CONTENT DESCRIPTION	TERM 1	TERM 2	TERM 3	TERM 4
Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)				
Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)				
Simplify algebraic products and quotients using index laws (ACMNA231)				
Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)				
Substitute values into formulas to determine an unknown (ACMNA234)				
Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)				
Solve problems involving linear equations, including those derived from formulas (ACMNA235)				
Solve problems involving parallel and perpendicular lines (ACMNA238)				
Solve linear equations involving simple algebraic fractions (ACMNA240)				
Solve linear inequalities and graph their solutions on a number line (ACMNA236)				
Solve linear simultaneous equations, using algebraic and graphical techniques including using digital technology (ACMNA237)				
Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239)				
Solve simple quadratic equations using a range of strategies (ACMNA241)				
Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids (ACMMG242)				
Formulate proofs involving congruent triangles and angle properties (ACMMG243)				
Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes (ACMMG244)				
Solve right-angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)				
Describe the results of two- and three-step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (ACMSP246)				
Use the language of 'ifthen', 'given', 'of', 'knowing that' to investigate conditional statements and identify common mistakes in interpreting such language (ACMSP247)				
Determine quartiles and interquartile range (ACMSP248)				
Construct and interpret box plots and use them to compare data sets (ACMSP249)				
Compare shapes of box plots to corresponding histograms and dot plots (ACMSP250)				
Use scatter plots to investigate and comment on relationships between two numerical variables (ACMSP251)				
Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252)				
Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)				