Year 9 plan — Australian Curriculum: Mathematics

Implementation year: School name:

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| Identify curriculum | 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 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. |
| Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum v3.0: Mathematics for Foundation–10*, <www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10>. |
| Teaching and learning | Term overview | Term 1 | Term 2 | Term 3 | Term 4 |
| Exemplar unit: Pythagoras’ Theorem, linear graphs and direct proportion This term builds upon students’ understanding of linear graphs, and rates and ratio. Students investigate, create, evaluate and manipulate mathematical models showing the relationship between two variables. They are introduced to: * Pythagoras’ Theorem
* direct proportion
* coordinate geometry
* using the distributive law.

(10 weeks) | Algebraic expressions and the index lawsStudents continue to develop their understanding of algebra to solve problems involving numeric and algebraic situations. They:* perform algebraic expansions, including binomials
* extend their understanding of the index laws, including application to scientific notation
* extend proportional reasoning to include simple interest.

(6 weeks) | Designing the best gameStudents’ understanding of the fundamentals of probability and statistics includes identifying complementary events, using two-way tables and Venn diagrams, and exploring the mean and median. This unit extends student learning to:* identify numerical and categorical variables
* conduct two-step chance experiments with and without replacement
* calculate relative frequencies
* investigate surveys used in the media
* describe the spread of data.

(10 weeks) | Eureka! I’ve solved the problemBuilding on understanding developed throughout the year, students apply learning to a series of problem-solving and reasoning tasks that include: * the application of trigonometric ratios to solve right-angled triangle problems
* Pythagoras’ Theorem
* using similarity with trigonometry to solve problems
* linear relations and graphing.

(10 weeks) |
| **Measurement, area and volume**This unit builds upon students’ understanding of measurement and geometry. They investigate similar figures, areas of composite shapes, surface areas and volumes. (4 weeks) |

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| Teaching and learning | Aboriginal and Torres Strait Islander perspectives | 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.  |
| Teaching and learning | General capabilities and cross‑curriculum priorities | Opportunities to engage with:gc_literacygc_numeracygc_ictgc_critical | Opportunities to engage with:gc_literacygc_numeracygc_ictgc_critical | Opportunities to engage with:gc_literacygc_numeracygc_ictgc_criticalgc_ethicalcc_asia | Opportunities to engage with:gc_literacygc_numeracygc_ictgc_critical |
| Key to general capabilities and cross-curriculum priorities | gc_literacy Literacy  gc_numeracy Numeracy  gc_ict ICT capability  gc_critical Critical and creative thinking  gc_ethical Ethical behaviour  gc_personal_social Personal and social capability  gc_intercultural Intercultural understanding Aboriginal and Torres Strait Islander histories and cultures  cc_asia Asia and Australia’s engagement with Asia  cc_sust Sustainability |
| Develop assessment | AssessmentFor advice and guidelines on assessment, see [www.qsa.qld.edu.au](http://www.qsa.qld.edu.au) | A folio is a targeted selection of evidence of student learning and includes a range of responses to a variety of assessment techniques. A folio is used to make an overall on-balance judgment about student achievement and progress at appropriate points and informs the reporting process. |
| Term 1 | Term 2 | Term 3 | Term 4 |
| Week | Assessment instrument | Week | Assessment instrument | Week | Assessment instrument | Week | Assessment instrument |
| 4 | Supervised assessment: Short response (Written)Represent the relationship between cost and distance using linear functions. This assessment instrument is a modified version of the assessment package *Taxi fares* in the QSA Assessment Bank. | 9 | Supervised assessment: Short response (Written)Solve problems related to:* algebraic expressions
* index laws
* area, surface area and volume.
 | 7–9 | Mathematical investigation: Report (Written)Design and conduct an investigation into a popular dice game.  | 2–9 | Collection of work (Written )Complete a collection of tasks throughout the term relating to concepts of:* trigonometric ratios
* Pythagoras’ Theorem
* linear relations.
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| 9 | Modelling and problem-solving task Report (Written)Solve problems related to forensics using geometrical concepts. |  |  |  |  | 9 | Supervised assessment: Short response (Written)Solve problems related to:* trigonometric ratios
* Pythagoras’ Theorem
* linear relations.
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|  |  |  | **NAPLAN** | **QCATs:** Identify the curriculum targeted by the QCAT and schedule its implementation appropriate to the sequence of learning. |
| Make judgments and use feedback | Moderation | Teachers develop tasks and plan units.Before the report 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 develop tasks and plan units.Teachers mark student responses individually, then select samples representative of the A–E qualities for moderation.Teachers moderate samples to ensure consistency of judgments. | Teachers develop tasks and plan units.Teachers mark a small random sample of the report task, moderate the samples to ensure consistency of judgments, then mark their own class.Teachers moderate the QCATs to identify A–E samples to take to cluster moderation in Term 4. | Teachers develop tasks and plan units.Before the journal 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 participate in cluster moderation of the QCATs. |

Year 9 Mathematics: review for balance and coverage of content descriptions

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| Number and Algebra | 1 | 2 | 3 | 4 |
| Real numbers |
| Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate  problems [(ACMNA208)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA208) | ✓ |  |  | ✓ |
| Apply index laws to numerical expressions with integer indices [(ACMNA209)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA209) |  | ✓ |  |  |
| Express numbers in scientific notation  [(ACMNA210)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA210) |  | ✓ |  | ✓ |
| Money and financial mathematics |
| Solve problems involving simple interest  [(ACMNA211)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA211) |  | ✓ |  |  |
| Patterns and algebra |
| Extend and apply the index laws to variables, using positive integer indices and the zero index [(ACMNA212)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA212) | ✓ |  |  |  |
| Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate  [(ACMNA213)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA213) | ✓ | ✓ |  | ✓ |
| Linear and non-linear relationships |
| Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software  [(ACMNA214)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA214) | ✓ |  |  | ✓ |
| Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software [(ACMNA294)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA294) | ✓ |  |  | ✓ |
| Sketch linear graphs using the coordinates of two points and solve linear equations [(ACMNA215)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA215) | ✓ |  |  | ✓ |
| Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations [(ACMNA296)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA296) | ✓ |  |  | ✓ |

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| Measurement and Geometry | 1 | 2 | 3 | 4 |
| Using units of measurement  |
| Calculate the areas of composite shapes [(ACMMG216)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG216) |  | ✓ |  |  |
| Calculate the surface area and volume of cylinders and solve related problems [(ACMMG217)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG217) |  | ✓ |  |  |
| Solve problems involving the surface area and  volume of right prisms [(ACMMG218)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG218) |  | ✓ |  |  |
| Investigate very small and very large time scales and intervals [(ACMMG219)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG219) |  | ✓ | ✓ |  |
| Geometric reasoning |
| Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar [(ACMMG220)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG220) |  | ✓ |  |  |
| Solve problems using ratio and scale factors in similar figures [(ACMMG221)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG221) |  | ✓ |  | ✓ |
| Pythagoras and trigonometry |
| Investigate Pythagoras’ Theorem and its application to solving simple problems involving right angled triangles [(ACMMG222)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG222) | ✓ |  |  | ✓ |
| Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles  [(ACMMG223)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG223) |  |  |  | ✓ |
| Apply trigonometry to solve right-angled triangle problems [(ACMMG224)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMMG224) |  |  |  | ✓ |

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| Statistics and Probability | 1 | 2 | 3 | 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)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP225) |  |  | ✓ |  |
| Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' [(ACMSP226)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP226) |  |  | ✓ |  |
| Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians [(ACMSP227)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/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)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP228) |  |  | ✓ |  |
| Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including ‘skewed’, ‘symmetric’ and ‘bi modal’ [(ACMSP282)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP282) |  |  | ✓ |  |
| Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread [(ACMSP283)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP283) |  |  | ✓ |  |

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum v3.0: Mathematics for Foundation–10*, <www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10>.