

Rationale

Learning mathematics creates opportunities for and enriches the lives of all Australians. The Australian Curriculum: Mathematics provides students with essential mathematical skills and knowledge in *Number and Algebra*, *Measurement and Geometry*, and *Statistics and Probability*. It develops the numeracy capabilities that all students need in their personal, work and civic life, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

Mathematics has its own value and beauty and the Australian Curriculum: Mathematics aims to instil in students an appreciation of the elegance and power of mathematical reasoning. Mathematical ideas have evolved across all cultures over thousands of years, and are constantly developing. Digital technologies are facilitating this expansion of ideas and providing access to new tools for continuing mathematical exploration and invention. The curriculum focuses on developing increasingly sophisticated and refined mathematical understanding, fluency, reasoning and problem-solving skills. These capabilities enable students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.

The Australian Curriculum: Mathematics ensures that the links between the various components of mathematics, as well as the relationship between mathematics and other disciplines, are made clear. Mathematics is composed of multiple but interrelated and interdependent concepts and systems which students apply beyond the mathematics classroom. In science, for example, understanding sources of error and their impact on the confidence of conclusions is vital, as is the use of mathematical models in other disciplines. In geography, interpretation of data underpins the study of human populations and their physical environments; in history, students need to be able to imagine timelines and time frames to reconcile related events; and in English, deriving quantitative and spatial information is an important aspect of making meaning of texts.

The curriculum anticipates that schools will ensure all students benefit from access to the power of mathematical reasoning and learn to apply their mathematical understanding creatively and efficiently. The mathematics curriculum provides students with carefully paced, in-depth study of critical skills and concepts. It encourages teachers to help students become self-motivated, confident learners through inquiry and active participation in challenging and engaging experiences.

Year 8 Achievement Standard

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They describe index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. They identify conditions for the congruence of triangles and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data. Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine the probabilities of complementary events and calculate the sum of probabilities.

Aims

The Australian Curriculum: Mathematics aims to ensure that students:

- are confident, creative users and communicators of mathematics, able to investigate, represent and interpret situations in their personal and work lives and as active citizens
- develop an increasingly sophisticated understanding of mathematical concepts and fluency with processes, and are able to pose and solve problems and reason in *Number and Algebra*, *Measurement and Geometry*, and *Statistics and Probability*
- recognise connections between the areas of mathematics and other disciplines and appreciate mathematics as an accessible and enjoyable discipline to study.

Key Ideas

In Mathematics, the key ideas are the proficiency strands of understanding, fluency, problem-solving and reasoning. The proficiency strands describe the actions in which students can engage when learning and using the content. While not all proficiency strands apply to every content description, they indicate the breadth of mathematical actions that teachers can emphasise.

Understanding

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.

Fluency

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.

Problem Solving

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.

Reasoning

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.

Year 8 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 patterns involving indices and recurring decimals, identifying commonalities between operations with algebra and arithmetic, connecting rules for linear relations with their graphs, explaining the purpose of statistical measures and explaining measurements of perimeter and area

Fluency includes calculating accurately with simple decimals, indices and integers; recognising equivalence of common decimals and fractions including recurring decimals; factorising and simplifying basic algebraic expressions and evaluating perimeters and areas of common shapes and volumes of three-dimensional objects

Problem Solving includes formulating and modelling practical situations involving ratios, profit and loss, areas and perimeters of common shapes and using two-way tables and Venn diagrams to calculate probabilities

Reasoning includes justifying the result of a calculation or estimation as reasonable, deriving probability from its complement, using congruence to deduce properties of triangles, finding estimates of means and proportions of populations.

Year 8 Content Descriptions**Number and Algebra****Number and place value**

Use index notation with numbers to establish the index laws with positive integral indices and the zero index. Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies.

Real numbers

Investigate terminating and recurring decimals. Investigate the concept of irrational numbers, including π . Solve problems involving the use of percentages, including percentage increases and decreases, with and without digital technologies. Solve a range of problems involving rates and ratios, with and without digital technologies.

Money and financial mathematics

Solve problems involving profit and loss, with and without digital technologies.

Patterns and algebra

Extend and apply the distributive law to the expansion of algebraic expressions. Factorise algebraic expressions by identifying numerical factors. Simplify algebraic expressions involving the four operations.

Linear and non-linear relationships

Plot linear relationships on the Cartesian plane with and without the use of digital technologies. Solve linear equations using algebraic and graphical techniques. Verify solutions by substitution.

Measurement and Geometry**Using units of measurement**

Choose appropriate units of measurement for area and volume and convert from one unit to another. Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites. Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area.

Develop the formulas for volumes of rectangular and triangular prisms and prisms in general. Use formulas to solve problems involving volume. Solve problems involving duration, including using 12- and 24-hour time within a single time zone.

Geometric reasoning

Define congruence of plane shapes using transformations. Develop the conditions for congruence of triangles. Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning.

Statistics and Probability**Chance**

Identify complementary events and use the sum of probabilities to solve problems. Describe events using language of 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) and 'and'. Represent events in two-way tables and Venn diagrams and solve related problems.

Data representation and interpretation

Investigate techniques for collecting data, including census, sampling and observation. Explore the practicalities and implications of obtaining data through sampling using a variety of investigative processes. Explore the variation of means and proportions of random samples drawn from the same population. Investigate the effect of individual data values, including outliers, on the mean and median.