

## Mapping Australian Curriculum (AC) Mathematics and VELS Mathematics

In the following document, the left hand column shows AC content that matches VELS content at the corresponding levels. Teaching programs based on the VELS content and structure will generally be consistent with AC Mathematics.

The right hand column shows:

- where the same content is covered but at different levels
- content that is included in the VELS only or the AC only
- differences in emphasis, scope and treatment
- advice on content suitable to prepare student for study of VCE Mathematics studies

<b>Australian Curriculum (AC)</b> <b>Year 9 – Year 10/10A</b>	<b>Comments on differences in content/emphasis/sequence with respect to the VELS Level 6</b>
<p><b>Year 9 Number and Algebra</b></p> <p><b>Real numbers</b></p> <ul style="list-style-type: none"> <li>• <i>Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208)*</i></li> <li>• <i>Apply index laws to numerical expressions with integer indices (ACMNA209)*</i></li> <li>• <i>Express numbers in scientific notation (ACMNA210)*</i></li> </ul> <p><b>Money and financial mathematics</b></p> <ul style="list-style-type: none"> <li>• <i>Solve problems involving simple interest (ACMNA211)*</i></li> </ul> <p><b>Patterns and algebra</b></p> <ul style="list-style-type: none"> <li>• <i>Extend and apply the index laws to variables, using positive integral indices and the zero index (ACMNA212)*</i></li> </ul>	<p>The VELS Level 6 corresponds to Years 9, 10 and most of 10A of the AC. The AC Year 10A material is <i>optional</i>. It indicates some additional content for students preparing in particular for subsequent study of function, algebra, and calculus material at Year 11; and also includes some additional content related to statistics and trigonometry.</p> <p>The VELS progression points (<a href="http://vels.vcaa.vic.edu.au/support/progression/maths.html#beyond6">http://vels.vcaa.vic.edu.au/support/progression/maths.html#beyond6</a>) similarly indicates additional content in <i>Number, Space, Structure, Measurement, chance and data</i> and <i>Working mathematically</i> suitable for students achieving beyond Level 6.</p> <p>Teachers should continue to incorporate a selection of additional content in Year 10 mathematics courses to suitably prepare students who plan to study of Mathematical Methods (CAS) Units 1 and 2. This content is identified in this column.</p>

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- Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (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)\*
- 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 (ACMNA215)\*
- Sketch simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296)\*

### **Year 10 Number and Algebra**

#### **Money and financial mathematics**

- Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)\*

#### **Patterns and algebra**

- Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)\*
- Simplify algebraic products and quotients using index laws (ACMNA231)\*
- Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)\*
- Expand binomial products and factorise monic quadratic

Teachers can continue to provide activities at Level 6 that require students to use the Euclidean division algorithm to find the greatest common factor of two natural numbers. This content is not included in the AC.

For students who plan to study Mathematical Methods (CAS) Units 1 and 2, teachers should continue to provide activities at Level 6 in which students: classify and describe the properties of the real number system and the subsets of rational and irrational numbers and identify subsets of these as discrete or continuous, finite or infinite and provide examples of their elements and apply these to functions and relations and the solution of related equations. This content is not included in the AC.

For students who plan to study Mathematical Methods (CAS) Units 1 and 2, teachers should continue to provide activities at Level 6 that require students to: express relations between sets using membership,  $\in$ , complement,  $'$ , intersection,  $\cap$ , union,  $\cup$ , and subset,  $\subseteq$ , for up to three sets and represent a universal set as the disjoint union of intersections of up to three sets and their

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*expressions using a variety of strategies (ACMNA233)\**

- *Substitute values into formulas to determine an unknown (ACMNA234)\**

### ***Linear and non-linear relationships***

- *Solve problems involving linear equations, including those derived from formulas (ACMNA235)\**
- *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)\**
- *Solve problems involving parallel and perpendicular lines (ACMNA238)\**
- *Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239)\**
- *Solve linear equations involving simple algebraic fractions (ACMNA240)\**
- *Solve simple quadratic equations using a range of strategies (ACMNA241)\**

### ***Year 10A Number and Algebra (optional)***

#### ***Real numbers***

- *Define rational and irrational numbers and perform operations with surds and fractional indices (ACMNA264)\**
- *Use the definition of a logarithm to establish and apply the laws of logarithms (ACMNA265)\**

complements, and illustrate this using a tree diagram, Venn diagram or Karnaugh map. This content is not included in the AC.

For students who plan to study Mathematical Methods (CAS) Units 1 and 2, teachers should continue to cover material on sets as indicated in the VELs Level 6 to consolidate and further develop students understanding and skills in working with number systems, relations and functions, solving equations, statistics and probability.

Across Levels 5 and 6 of the VELs and Years 9 and 10/10A of the AC, students are expected to become familiar with linear functions and their graphs and relations and various non-linear (hyperbola, quadratic and exponential) functions and relations (circle), graphs of transformations of these, and solving related equations, in particular in variation and modelling contexts. At VELs Level 5 students are expected to have familiarity with non-linear relations, graphs and related equations earlier than in the AC. Teachers should continue to teach students how to solve equations using numerical, graphical and algebraic approaches (which involve a sequence of inverse operations) for simple non-linear relations from VELs Level 5.

Where additional material is included, in particular as preparation for subsequent study of Mathematical Methods (CAS) Units 1 and 2, content relating to an introductory treatment of logarithmic functions and circular functions (as functions of a real variable) will be helpful. This could include related algebra and solving simple equations, as well as some simple transformations of graphs, especially in modelling contexts.

Polynomial functions are typically included in detail in the *Functions and graphs, Algebra and Rates of change and calculus* areas of study of Mathematical Methods (CAS) Units 1 and 2 at Year 11, and teachers do not need to include this material prior to VCE Mathematics.

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<p><b>Patterns and algebra</b></p> <ul style="list-style-type: none"> <li>Investigate the concept of a polynomial and apply the factor and remainder theorems to solve problems (ACMNA266)*</li> </ul> <p><b>Linear and non-linear relationships</b></p> <ul style="list-style-type: none"> <li>Solve simple exponential equations (ACMNA270)*</li> <li>Describe, interpret and sketch <b>parabolas, hyperbolas, circles</b> and <b>exponential</b> functions and their transformations (ACMNA267)*</li> <li>Apply understanding of polynomials to sketch a range of curves and describe the features of these curves from their equation (ACMNA268)*</li> <li>Factorise monic and non-monic quadratic expressions and solve a wide range of quadratic equations derived from a variety of contexts (ACMNA269)*</li> </ul>	
<p><b>Year 9 Measurement and Geometry</b></p> <p><b>Geometric reasoning</b></p> <ul style="list-style-type: none"> <li>Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220)*</li> <li>Solve problems using ratio and scale factors in similar figures (ACMMG221)*</li> </ul>	<p>Teachers can continue to provide activities at Level 6 that require students to identify points that are invariant under a given transformation, use latitude and longitude to locate places on the earth’s surface and measure distance between places using great circles, and describe connections between objects, locations and events according to defined relationships (networks). This content is not included in the AC.</p>

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### ***Pythagoras and trigonometry***

- *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)\**

### **Year 10 Measurement and Geometry**

#### ***Geometric reasoning***

- *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)\**

### ***Pythagoras and trigonometry***

- *Solve right-angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)\**

### **Year 10A Measurement and Geometry (optional)**

#### ***Geometric reasoning***

- *Prove and apply angle and chord properties of circles (ACMMG272)\**

### ***Pythagoras and trigonometry***

- *Establish the sine, cosine and area rules for any triangle and solve related problems (ACMMG273)\**

For students who plan to study of Mathematical Methods (CAS) Units 1 and 2, and subsequently Specialist Mathematics, teachers should continue to provide activities at Level 6 that includes proof as part of working mathematically in relation to conjecture derived from contexts for number and structure (sets, logic, function and algebra) as well as in geometric contexts. This is not included in the AC.

The sine, cosine and area rules are typically included in detail in the *Trigonometric ratios and their applications* area of study of General

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<ul style="list-style-type: none"> <li>• <i>Use the unit circle to define trigonometric functions, and graph them with and without the use of digital technologies (ACMMG274)*</i></li> <li>• <i>Solve simple trigonometric equations (ACMMG275)*</i> <i>Apply Pythagoras' theorem and trigonometry to solving three-dimensional problems in right-angled triangles (ACMMG276)*</i></li> </ul>	<p>Mathematics Units 1 and 2 in Year 11 and do not need to be included prior to this.</p>
<p><b>Year 9 Measurement and Geometry</b> <b><i>Using units of measurement</i></b></p> <ul style="list-style-type: none"> <li>• <i>Calculate the areas of composite shapes (ACMMG216)*</i></li> <li>• <i>Calculate the surface area and volume of cylinders and solve related problems (ACMMG217)*</i></li> <li>• <i>Solve problems involving the surface area and volume of right prisms (ACMMG218)*</i></li> <li>• <i>Investigate very small and very large time scales and intervals (ACMMG219)*</i></li> </ul> <p><b>Year 10 Measurement and Geometry</b> <b><i>Using units of measurement</i></b></p> <ul style="list-style-type: none"> <li>• <i>Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids (ACMMG242)*</i></li> </ul> <p><b>Year 10A Measurement and Geometry (optional)</b> <b><i>Using units of measurement</i></b></p> <ul style="list-style-type: none"> <li>• <i>Solve problems involving surface area and volume of right pyramids, right cones, spheres and related composite solids (ACMMG271)*</i></li> </ul>	<p>For students who plan to study of Mathematical Methods (CAS) Units 1 and 2, teachers should continue to provide activities at Level 6 that require students to use both degrees and radians as units of measurement for angles and to convert between these units as appropriate. This content is not included in the AC at Year 9 or 10/10A, but should be incorporated with introductory work on circular functions (graphs, modelling and solving equations).</p>

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## **Year 9 Statistics and Probability**

### **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)\**
- *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)\**

### **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)\**
- *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)\**

## **Year 10 Statistics and Probability**

### **Chance**

- *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 'if ...then', 'given', 'of', 'knowing that' to*

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*investigate conditional statements and identify common mistakes in interpreting such language (ACMMG247)\**

**Data representation and interpretation**

- *Determine quartiles and interquartile range (ACMMG248)\**
- *Construct and interpret box plots and use them to compare data sets (ACMMG249)\**
- *Compare shapes of box plots to corresponding histograms and dot plots (ACMMG250)\**
- *Use scatter plots to investigate and comment on relationships between two numerical variables (ACMMG251)\**
- *Investigate and describe bivariate numerical data where the independent variable is time (ACMMG252)\**
- *Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMMG253)\**

**Year 10A Statistics and Probability (optional)**

**Chance**

- *Investigate reports of studies in digital media and elsewhere for information on the planning and implementation (ACMSP277)\**

**Data representation and interpretation**

- *Calculate and interpret the mean and standard deviation of data and use these to compare data sets (ACMSP278)\**
- *Use information technologies to investigate bivariate numerical data sets. Where appropriate use a straight line to describe the relationship allowing for variation (ACMSP279)\**

At Year 10A, the AC includes standard deviation as optional additional material. Standard deviation is typically dealt with in detail in the *Data analysis and simulation* area of study of General Mathematics Units 1 and 2 in Year 11.

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**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 Year 9:**

**Understanding** *includes describing the relationship between graphs and equations, simplifying a range of algebraic expressions, explaining the function of relative frequencies and probabilities, calculating areas of shapes and surface areas of prisms and the constancy 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*

**Problem Solving** *includes calculating 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 draw conclusions, developing strategies in investigating similarity and sketching linear graphs*

The *Working mathematically* dimension of the VELS can be used to highlight the application of the proficiencies in the strands and sub-strands of the AC across the corresponding year levels. In particular the notion of conjecture proof is to be part of working mathematically in topics across mathematics, including geometry. At Years 9 and 10/10A of the AC (VELS Level 6) this can include:

- Formulating and testing conjectures, generalisations and arguments in natural language and symbolic form (for example, ‘if  $m^2$  is even then  $m$  is even, and if  $m^2$  is odd then  $m$  is odd’)
- Following formal mathematical arguments for the truth of propositions (for example, ‘the sum of three consecutive natural numbers is divisible by 3’)
- Choosing, using and developing mathematical models and procedures to investigate and solve problems set in a wide range of practical, theoretical and historical contexts (for example, exact and approximate measurement formulas for the volumes of various three dimensional objects such as truncated pyramids)
- Generalising from one situation to another, and investigating it further by changing the initial constraints or other boundary conditions
- judging the reasonableness of results based on the context under consideration
- Selecting and using technology in various combinations to assist in mathematical inquiry, to manipulate and represent data, to analyse functions and carry out symbolic manipulation
- Using geometry software or computer algebra systems to create geometric objects and transform them, taking into account invariance under transformation.

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**At Year 10:**

**Understanding** includes describing patterns in uses of indices, applying the four operations to algebraic fractions, finding unknowns in formulas after substitution, making the connection between algebraic and graphical representations of relations, connecting simple and compound interest in financial contexts and determining probabilities of multiple experiments

**Fluency** includes formulating proofs using congruent triangles and angle properties, 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, 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 and their probabilities

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

Students planning to study Mathematical Methods (CAS) Units 1 and 2 should have a sound background in number, algebra, function, sets and probability and related aspects of working mathematically including the effective use of technology for numerical, graphical or symbolic computation.

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