**AUSVELS: Australian MATHEMATICS Curriculum, F-10:**

**Proficiency Strands: Understanding, Fluency, Problem Solving and Reasoning**

**Content Strands: Number & Algebra, Measurement & Geometry, Statistics & Probability**

**For Level 10 Maths Students:**

* **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 & graphical representations of relations, connecting simple & compound interest in financial contexts & determining probabilities of multiple experiments
* **Fluency** includes formulating proofs using congruent triangles & angle properties, factorizing & expanding algebraic expressions, using a range of strategies to solve equations & using calculations to investigate the shape of data sets
* **Problem Solving** includes calculating the surface area and volumes of a diverse range of prisms, finding unknown lengths & angles using applications of trigonometry, using algebraic & graphical techniques to find solutions to simultaneous equations & inequalities, & investigating independence of events & their probabilities
* **Reasoning** includes formulating geometric proofs involving congruence & similarity, interpreting & evaluating media statements & interpreting & comparing data sets

\*This document intends to assist teachers in their understanding of the Australian curriculum through AusVELS – it combines description and elaboration statements. Teachers are advised to consult the online documentation to clarify further detail for themselves. ‘AusVELS’ is the official documentation for Victorian schools.

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| **Number & Algebra:** | **Measurement & Geometry:** | **Statistics & Probability:** |
| **Money & Financial maths:**Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)* working with authentic information, data and interest rates to calculate compound interest and solve related problems

**Patterns & algebra:**Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)* factorising a range of expressions by taking out a common factor, including those where the common factor is an algebraic expression

Simplify algebraic products and quotients using index laws (ACMNA231)* understanding that the use of index notation is an efficient way of representing numbers and symbols and has many applications, particularly in science
* connecting different strategies for simplifying expressions with indices to illustrate the meaning of negative indices, expanding and simplifying results
* moving fluently between representations of numeric and algebraic terms with negative indices, and applying understanding of negative indices to calculations
* applying knowledge of index laws to algebraic terms, and simplifying algebraic expressions using both positive and negative integral indices

Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)* solving a wide range of linear equations, including those involving one or two simple algebraic fractions, and checking solutions by substitution

Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)* identifying and using common factors, including binomial terms, to factorise algebraic expressions using the technique of grouping in pairs to factorise algebraic expressions with four terms
* using expansion patterns for the special binomial products (a + b)(a ­ b) and (a ± b)2 inversely to factorise quadratic
* using the area model inversely to factorise quadratic expressions of the form ax2 + bx + c, where a= ±1
* exploring the method of completing the square to factorise quadratic expressions and solve quadratic equations

Substitute values into formulas to determine an unknown (ACMNA234)* representing word problems with simple linear equations and solving them to answer questions

**Linear & non-linear relationships:**Solve problems involving linear equations, including those derived from formulas (ACMNA235)* solving equations that are the result of substitution into common formulas from mathematics and elsewhere, including those that involve rearrangement
* checking the solution by substitution into the equation

Solve linear inequalities and graph their solutions on a number line (ACMNA236)* representing word problems with simple linear inequalities and solving them to answer questions

Solve linear simultaneous equations, using algebraic and graphical techniques including using digital technology (ACMNA237)* using simple algebraic techniques to solve pairs of linear simultaneous equations
* generalising pairs of equations from word problems and choosing an appropriate strategy for solving them simultaneously

Solve problems involving parallel and perpendicular lines (ACMNA238)* Developing fluency with the geometric calculations which connect the graphical and analytical representations of parallel and perpendicular lines, using geometric software to carry out investigations with parallel and perpendicular lines

Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239)* identifying, matching and describing algebraic and graphical representations of parabolas, rectangular hyperbolas, exponential functions and circles, including those that have undergone a single transformation
* sketching the graphical representations of parabolas, exponential functions and circles

Solve linear equations involving simple algebraic fractions (ACMNA240)* solving a wide range of linear equations, including those involving one or two simple algebraic fractions, and checking solutions by substitution
* representing word problems, including those involving fractions, as equations and solving them to answer the question

Solve simple quadratic equations using a range of strategies (ACMNA241)* developing an understanding that many relationships are non­ linear and that these can also be represented graphically and algebraically
* identifying the connection between algebraic and graphical solutions of equations (for example understanding that the x­ intercepts are the solutions of f(x) = 0) exploring the method of completing the square to factorise quadratic expressions and solve quadratic equations
 | **Using units of measurement:**Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids (ACMMG242)* building on understanding of surface areas and volumes of prisms and cylinders, to include pyramids, cones and spheres

**Geometric reasoning:**Formulate proofs involving congruent triangles and angle properties (ACMMG243)* proving that a quadrilateral with equal­length diagonals bisecting at right angles is a square

Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes (ACMMG244)* presenting formal geometric arguments to develop skills in mathematical reasoning and presenting reasoned arguments (proofs)
* using mathematical language and notation, based on congruence and similarity
* applying an understanding of relationships to deduce properties of geometric figures (for example the base angles of an isosceles triangle are equal)
* distinguishing between a practical demonstration and a proof (for example demonstrating triangles are congruent by placing them on top of each other, as compared to using congruence tests to establish that triangles are congruent)

**Pythagoras and trigonometry:**Solve right­angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)* applying Pythagoras’s Theorem and trigonometry to problems in surveying and design
 | **Chance:**Describe the results of two­ and three­step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (ACMSP246)* recognising and identifying that some sets of chance events are dependent on a previous result and others are not, that this distinction is important when calculating probabilities, and that events are independent if P(A) x P(B) = P(A and B)
* distinguishing that event A is mathematically dependent on event B if the occurrence of event B affects the chance of the occurrence of event A (for example, selecting a ball from a bag where one ball has already been taken and not replaced)

Use the language of ‘if ....then, ‘given’, ‘of’, ‘knowing that’ to investigate conditional statements and identify common mistakes in interpreting such language (ACMSP247)* evaluating media reports that refer to data from a range of contexts, where the evaluation allows students to demonstrate their statistical literacy

**Data representation & interpretation:**Determine quartiles and interquartile range (ACMSP248)* finding the five­number summary (minimum and maximum values, median and upper and lower quartiles) and using its graphical representation, the box plot, as tools for both numerically and visually comparing the centre and spread of data sets

Construct and interpret box plots and use them to compare data sets (ACMSP249) * understanding that box plots are an efficient and common way of representing and summarising data and can facilitate comparisons between data sets
* using parallel box plots to compare data about the distribution of Aboriginal and Torres Strait Islander people by age with that of the Australian population as a whole

Compare shapes of box plots to corresponding histograms and dot plots (ACMSP250)* Investigating data in different ways to make comparisons and draw conclusions

Use scatter plots to investigate and comment on relationships between two continuous variables (ACMSP251)* using authentic data to construct scatter plots, make comparisons and draw conclusions

Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252) * constructing and interpreting data displays representing bivariate data over time
* investigating biodiversity changes in Australia since white settlement

Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253) **ã** * investigating real­life examples that demonstrate that predicted outcomes can be accompanied by unpredicted effects, and understanding the causes for this (for example, Chinese one­child policy becoming the ‘one­male’ policy)
* evaluating statistical reports comparing the life expectancy of Aboriginal and Torres Strait Islander people with that of the Australian population as a whole
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| **Level 10 achievement standard**By the end of Level 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 right­angled triangles. Students list outcomes for multi­step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter­quartile ranges. |

Reference : <http://ausvels.vcaa.vic.edu.au/>

This grid is an adaption of the information from the VCAA site to create a visual representation to assist teachers.

Cross-curriculum priorities to be included in all learning areas: Aboriginal and Torres Strait Islander histories and cultures (); Asia and Australia’s engagement with Australia (ã ); Sustainability ()