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

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

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

**For Level 9 Maths Students:**

* **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 and 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

\*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:** |
| **Real numbers:**Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208)* understanding the difference between direct and inverse proportion, identifying these in real­life contexts and using these relationships to solve problems

Apply index laws to numerical expressions with integer indices (ACMNA209)* connecting different strategies for simplifying expressions with indices to illustrate the meaning of negative indices
* 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

Express numbers in scientific notation (ACMNA210)* understanding that the use of index notation is an efficient way of representing numbers and symbols and has many applications, particularly in science
* representing extremely large and small numbers in scientific notation, and numbers expressed in scientific notation as whole numbers or decimals

**Money & Financial maths:**Solve problems involving simple interest (ACMNA211)* understanding that financial decisions can be assisted by mathematical calculations

**Patterns & algebra:**Extend and apply the index laws to variables, using positive integral indices and the zero index (ACMNA212)* understanding that index laws apply to variables as well as numbers
* evaluating numbers expressed as powers of positive integers

Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213)* understanding that the distributive law can be applied to algebraic expressions as well as numbers, and understanding the inverse relationship between expansion and factorisation

**Linear & non-linear relationships:**Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software (ACMNA214)* investigating graphical and algebraic techniques for finding distance

Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software (ACMNA294)* investigating graphical and algebraic techniques for finding midpoint and gradient

Sketch linear graphs using the coordinates of two points (ACMNA215)* determining linear rules from suitable diagrams, tables of values and graphs and describing them both using words and algebra

Sketch simple non­linear relations with and without the use of digital technologies (ACMNA296)* sketching parabolas, hyperbolas, circles
 | **Using units of measurement:**Calculate the areas of composite shapes (ACMMG216)* understanding that partitioning composite shapes into rectangles and triangles is a strategy for solving problems involving perimeter and area

Calculate the surface area and volume of cylinders and solve related problems (ACMMG217)* analysing nets of prisms and cylinders to establish formulas for surface area

Solve problems involving the surface area and volume of right prisms (ACMMG218)* building on the understanding of area and volume to become fluent with calculation, and identifying that area and volume relationships are used in the workplace and everyday life

Investigate very small and very large time scales and intervals (ACMMG219)* investigating the usefulness of scientific notation in representing very large and very small numbers

**Geometric reasoning:**Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220)* understanding that similarity and congruence help describe relationships between geometrical shapes and form the basis of reasoning and proof
* using the enlargement transformation to establish similarity
* establishing the conditions for similarity of two triangles and comparing this to the conditions for congruence
* using the properties of similarity and ratio, and correct mathematical notation and language, to solve problems involving enlargement (for example scale diagrams)

Solve problems using ratio and scale factors in similar figures (ACMMG221)* establishing the relationship between areas of similar figures and the ratio of corresponding sides (scale factor)

**Pythagoras and trigonometry:**Investigate Pythagoras’ Theorem and its application to solving simple problems involving right angled triangles (ACMMG222)* understanding that Pythagoras’ Theorem is a useful tool in determining unknown lengths in right­angled triangles and has widespread applications
* recognising that right­angled triangle calculations may generate results that can be integral, fractional or irrational numbers known as surds

Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right­angled triangles (ACMMG223)* developing understanding of the relationship between the corresponding sides of similar right­angled triangles

Apply trigonometry to solve right­angled triangle problems (ACMMG224)* understanding the terms 'adjacent' and 'opposite' sides in a right­angled triangle
* selecting and accurately using the correct trigonometric ratio to find unknown sides (adjacent, opposite and hypotenuse) and angles in right­angled triangles
 | **Chance:**List all outcomes for two­step 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)* posing ‘and’, ‘or’, ‘not’ and ‘given’ probability questions about objects or people
* collecting data to answer the questions using Venn diagrams or two­way tables

Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227) **ã*** investigating a range of data and its sources, for example the age of residents in Australia, Cambodia and Tonga; the number of subjects studied at school in a level by 14­level­ old students in Australia, Japan and Timor­Leste

**Data representation & 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) **ã*** comparing the annual rainfall in various parts of Australia, Pakistan, New Guinea and Malaysia

Construct back­to­back stem­and­leaf 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)Investigate techniques for collecting data, including census, sampling and observation (ACMSP284) |
| **Level 9 achievement standard**By the end of Level 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 bi­modal 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 non­linear 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 right­angled triangles. Students calculate relative frequencies to estimate probabilities, list outcomes for two­step experiments and assign probabilities for those outcomes. They construct histograms and back­to­back stem­and­leaf plots. |

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 ()