**AusVELS Mathematics Level 6**

 **Understanding** includes describing properties of different sets of numbers, using fractions and decimals to describe probabilities, representing fractions and decimals

 in various ways and describing connections between them, and making reasonable estimations

 **Fluency** includes representing negative numbers on a number line, calculating simple percentages, using brackets appropriately, converting between fractions and decimals, using operations with fractions, decimals and percentages, measuring using metric units, and interpreting timetables

**Problem Solving** includes formulating and solving authentic problems using numbers and measurements, creating similar shapes through enlargements, representing

secondary data, and calculating angles

 **Reasoning** includes explaining mental strategies for performing calculations, describing results for continuing number sequences, investigating new situations using

 known properties of angles, explaining the transformation of one shape into another, and inferring from the results of experiments

\*This document intends to assist teachers in their implementation of the Australian curriculum through AUSVELS– it combines description and elaboration statements. The blue elaborations are examples of how the learning can be achieved; not a list of tasks that have to be done. Teachers are advised to consult the online documentation to clarify further detail for themselves. The ‘AusVELS’ is the official documentation for Victorian schools.

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| **Number & Algebra:** | **Measurement & Geometry:** | **Statistics & Probability:** |
| **Number & place value:**Identify and describe properties of prime, composite, square and triangular numbers (ACMNA122)* understanding that some numbers have special properties and that these properties can be used to solve problems
* representing composite numbers as a product of their prime factors and using this form to simplify calculations by cancelling common
* understanding that if a number is divisible by a composite number then it is also divisible by the prime factors of that number (for example 216 is divisible by 8 because the number represented by the last three digits is divisible by 8, and hence 216 is also divisible by 2 and 4)

Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers (ACMNA123)* applying strategies already developed for solving problems involving small numbers to those involving large numbers
* applying a range of strategies to solve realistic problems and commenting on the efficiency of different strategies

Investigate everyday situations that use integers. Locate and represent these numbers on a number line (ACMNA124)* understanding that whole numbers can be positive and negative and continue indefinitely in both directions
* investigating everyday situations that use positive and negative integers, such as temperatures, to understand how the positive numbers (whole numbers, fractions, decimals and percentages) can be extended to include negative numbers
* using number lines to position and order positive and negative integers around zero
* solving everyday additive problems involving positive and negative integers without developing formal rules for the operations (for example using a number line and counting to find the resulting outside temperature if it is 5°C at 7pm and drops by 8°C overnight)

**Fractions & Decimals:**Compare fractions with related denominators and locate and represent them on a number line (ACMNA125)* demonstrating equivalence between fractions using drawings and models

Solve problems involving addition and subtraction of fractions with the same or related denominators (ACMNA126)* understanding the processes for adding and subtracting fractions with related denominators and fractions as an operator, in preparation for calculating with all fractions
* solving realistic additive (addition and subtraction) problems involving fractions to develop understanding of equivalent fractions and the use of fractions as operators
* modelling and solving additive problems involving fractions by using methods such as jumps on a number line, or by making diagrams of fractions as parts of shapes

Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies. (ACMNA127)* **recognising that finding one third of a quantity is the same as dividing by 3.**

Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128)* extending whole-number strategies to explore and develop meaningful written strategies for addition and subtraction of decimal numbers to thousandths
* exploring and practising efficient methods for solving problems requiring operations on decimals, to gain fluency with calculating with decimals and with recognising appropriate operations

Multiply decimals by whole numbers and perform divisions by non – zero whole numbers where the results are terminating decimals, with and without digital technologies (ACMNA129)* interpreting the results of calculations to find an answer appropriate to the context. (for example understanding that the result of 6.5 ÷ 4 is sensibly expressed as 1.625km if the context involves dividing a 6.5km running course into four equal legs; $1.63 if it represents the price of one item where four sell for $6.50)

Multiply and divide decimals by powers of 10 (ACMNA130)* understanding and using the fact that equivalent division calculations result if both numbers are multiplied or divided by the same amount (for example 34.87 ÷ 7 is equivalent to 3487 ÷ 700)
* using and explaining the use of multiplication and division by powers of 10 to multiply decimal numbers mentally (for example 1.4 × 0.6 can be calculated by multiplying 14 by 6 and dividing the result by 100)

Make connections between equivalent fractions, decimals and percentages (ACMNA131)* connecting fractions, decimals and percentages as different representations of the same number, moving fluently between representations and choosing the appropriate one for the problem being solved

**Money & Financial mathematics:**Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies (ACMNA132)* using authentic information to calculate prices on sale goods

**Patterns & algebra:**Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (ACMNA133)* identifying and generalising number patterns as the beginning of algebraic thinking
* investigating additive and multiplicative patterns such as the number of tiles in a geometric pattern, or the number of dots or other shapes in successive repeats of a strip or border pattern, looking for patterns in the way the numbers increase/decrease

Explore the use of brackets and order of operations to write number sentences (ACMNA134)* appreciating the need for rules to complete multiple operations within the same number sentence
 | **Using units of measurement:**Connect decimal representations to the metric system (ACMMG135)* recognising the equivalence of measurements such as 1.25 metres and 125 centimetres

Convert between common metric units of length, mass and capacity (ACMMG136)* identifying and using the correct operations when converting units including millimetres, centimetres, metres, kilometres, milligrams, grams, kilograms, tonnes, millilitres, litres, kilolitres and megalitres
* recognising the significance of the prefixes in units of measurement

Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)* recognising and investigating familiar objects using concrete materials and digital technologies

Connect volume and capacity and their units of measurement (ACMMG138)* recognising that 1ml is equivalent to 1cm³

Interpret and use timetables (ACMMG139)* planning a trip involving one or more modes of public transport

**Shape:**Construct simple prisms and pyramids (ACMMG140)http://www.australiancurriculum.edu.au/Static/img/icons/tags/leg-c2.gif* considering the history and significance of pyramids from a range of cultural perspectives including those structures found in China, Korea and Indonesia
* constructing prisms and pyramids from nets, and skeletal models

**Location & transformation:**Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)* understanding that translations, rotations and reflections can change the position and orientation of shapes and objects but not their geometric features or size

Introduce the Cartesian coordinate system using all four quadrants (ACMMG143)* understanding that the Cartesian plane provides a graphical or visual way of describing location, and can be used to represent relationships

**Geometric reasoning:**Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)http://www.australiancurriculum.edu.au/Static/img/icons/tags/leg-c1.gif* building on students' understanding of turn and rotation in mapping and rotational symmetry to measure, estimate and compare angles in degrees and classify angles according to their sizes
* investigating the use of rotation and symmetry in the diagrammatic representations of kinship relationships of Central and Western Desert people
* estimating, measuring and comparing angles, for example, by recognizing the magnitude of angles including 30°, 45°, 90°, 180° and 270° to make reasonable estimates of angles up to a complete turn of 360°, or using a protractor to measure angles to the nearest degree
* identifying that angles have arms and a vertex, and that size is the amount of turn required for one arm to coincide with the other; the size is measured in degrees with a protractor using the two alternate conventions for naming angles
* identifying that the size of a right angle is 90° and defining acute, obtuse and reflex angles and rotation by relating them to right angles
 | **Chance:**Describe probabilities using fractions, decimals and percentages (ACMSP144)http://www.australiancurriculum.edu.au/Static/img/icons/tags/leg-c2.gif* investigating games of chance popular in different cultures and evaluating the relative benefits to the organisers and participants (for example Pachinko)

Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies (ACMSP145)* conducting repeated trials of chance experiments, identifying the variation between trials and realising that the results tend to the prediction with larger numbers of trials

Compare observed frequencies across experiments with expected frequencies (ACMSP146)* predicting likely outcomes from a run of chance events and distinguishing these from surprising results

**Data representation & interpretation:**Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)* understanding that data can be represented in different ways, sometimes with one symbol representing more than one piece of data, and that it is important to read all information about a representation before making judgments
* exploring ways of presenting data and showing the results of investigations, including creating dot plots with many-to-one correspondence between data and symbols
* comparing different student-generated diagrams, tables and graphs, and describing their similarities and differences and commenting on the usefulness of each representation for interpreting the data

Interpret secondary data presented in digital media and elsewhere (ACMSP148)* developing an understanding of sampling and the ability to interpret secondary data in order to critique data-based claims made in the media, advertising and elsewhere
* investigating data representations in the media and discussing what they illustrate and the messages the people who created them might want to convey
* understanding the various influences on data collection and display ,including who created the representation, who funded the data collection and whether the representation is part of an advertisement; in order to be alert to possible biases in data representations
* identifying potentially misleading data representations in the media, such as graphs with ‘broken’ axes or nonlinear scales, graphics not drawn to scale, data not related to the population about which the claims are made, and pie charts in which the whole pie does not represent the entire population about which the claims are made
* considering the need for sampling and recognising when a census of an entire population is not possible or not necessary, and identifying examples of sampling in the media
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| **Level 6 achievement standard****Number and Algebra**Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involvingwhole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane.**Measurement and Geometry**Students relate decimals to the metric system and choose appropriate units of measurement to perform a calculation. They solve problems involving length and area, and make connections between capacity and volume. Students interpret a variety of everyday timetables. They solve problems using the properties of angles and investigate simple combinations of transformations in the plane, with and without the use of digital technology. Students construct simple prisms and pyramids.**Statistics and Probability**Students interpret and compare a variety of data displays, including displays for two categorical variables. They analyse and evaluate data from secondary sources. Students compare observed and expected frequencies of events, including those where outcomes of trials are generated with the use of digital technology. They specify, list and communicate probabilities of events using simple ratios, fractions, decimals and percentages. |

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 ( );

Sustainability ()