Changes to F-10 Australian Curriculum: Mathematics – Revised year level descriptions

| **Year level** | **Revised year level description** |
| --- | --- |
| **F** | At this year level:  **Understanding** includes connecting names, numerals and quantities **Fluency** includes readily counting numbers in sequences, continuing patterns, and comparing the lengths of objects ~~directly~~ **Problem Solving** includes using materials to model authentic problems, sorting objects, using familiar counting sequences to solve unfamiliar problems, and discussing the reasonableness of the answer **Reasoning** includes explaining comparisons of quantities, creating patterns, and explaining processes for indirect comparison of length |
| **1** |  |
| **2** | At this year level:  **Understanding** includes connecting number calculations with counting sequences, partitioning and combining numbers flexibly, identifying and describing the relationship between addition and subtraction and between multiplication and division  **Fluency** includes counting numbers in sequences readily, using informal units iteratively to compare measurements, ~~listing possible outcomes of chance events~~, using the language of chance to describe outcomes of familiar chance events and describing and comparing time durations  **Problem Solving** includes formulating problems from authentic situations, making models and using number sentences that represent problem situations, ~~planning routes on maps,~~ and matching transformations with their original shape **Reasoning** includes using known facts to derive strategies for unfamiliar calculations, comparing and contrasting related models of operations~~,~~ ~~describing connections between 2-D and 3-D representations,~~ and creating and interpreting simple representations of data |
| **3** |  |
| **4** | At this year level:  **Understanding** includes making connections between representations of numbers, partitioning and combining numbers flexibly, extending place value to decimals, using appropriate language to communicate times, ~~using informal units for comparing,~~ and describing properties of symmetrical shapes  **Fluency** includes recalling multiplication tables, communicating sequences of simple fractions, using instruments to measure accurately, creating patterns with shapes and their transformations, and collecting and recording data  **Problem Solving** includes formulating, modelling and recording authentic situations involving operations, comparing large numbers with each other, ~~and~~ comparing time durations, and using properties of numbers to continue patterns  **Reasoning** includes using generalising from number properties and results of calculations, deriving strategies for unfamiliar multiplication and division tasks, comparing angles, communicating information using graphical displays and evaluating the appropriateness of different displays |
| **5** | At this year level:  **Understanding** includes making connections between representations of numbers, using fractions to represent probabilities, comparing and ordering fractions and decimals and representing them in various ways, describing transformations and identifying line and rotational symmetry  **Fluency** includes choosing appropriate units of measurement for calculation of perimeter and area, using estimation to check the reasonableness of answers to calculations and using instruments to measure angles  **Problem Solving** includes formulating and solving authentic problems using whole numbers and measurements and creating financial plans ~~creating transformations and identifying line and rotational symmetries~~  **Reasoning** includes investigating strategies to perform calculations efficiently, continuing patterns involving fractions and decimals, ~~creating financial plans,~~ interpreting results of chance experiments, ~~and~~ posing appropriate questions for data investigations and interpreting data sets |
| **6** | At this year level:  **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~~  integers 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~~ fractions, decimals, percentagesand measurements, ~~creating similar shapes through enlargements, representing~~ interpreting secondary data displays, and ~~calculating~~ finding the size of unknown 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~~ explaining why the actual results of chance experiments may differ from expected results |
| **7** | At this year level:  **Understanding** includes describing patterns in uses of indices with whole numbers, recognising ~~commonalities~~ equivalences between fractions, decimals, percentages and ratios, plotting points on the Cartesian plane, identifying angles formed by a transversal crossing a pair of ~~parallel~~ lines, and connecting the laws and properties of numbers to algebraic terms and expressions  **Fluency** includes calculating accurately with integers, representing fractions and decimals in various ways, investigating best buys, ~~evaluating~~ finding measures of central tendency and calculating areas of shapes and volumes of prisms  **Problem Solving** includes formulating and solving authentic problems using numbers and measurements, ~~creating~~ working with transformations and identifying symmetry, calculating angles and interpreting sets of data collected through chance experiments  **Reasoning** includes applying the number laws to calculations, applying known geometric facts to draw conclusions about shapes, applying an understanding of ratio and interpreting data displays |
| **8** | At this year level:  **Understanding** includes describing patterns ~~in uses of~~ involving indices and ~~repeating~~ recurring decimals, identifying commonalities between operations with algebra and arithmetic, connecting rules ~~of~~ for linear relations ~~and functions an~~d their graphs, explaining the ~~function~~ purpose of statistical measures, and ~~contrasting~~ explaining measurements of perimeter and area  **Fluency** includes calculating accurately with simple decimals, indices and integers, recognising equivalence of common decimals and fractions including ~~repeating~~ recurring decimals, factorising and simplifying basic algebraic expressions, and evaluating perimeters, areas of common shapes and their volumes ~~of common shapes~~, and three dimensional objects, ~~and calculating the mean and median of small sets of data~~  **Problem Solving** includes formulating, and modelling practical situations ~~with comparisons of~~ involving ratios, profit and loss, and ~~authentic situations involving~~ areas and perimeters of common shapes,and ~~analysing and interpreting data~~ using two-way tables and Venn diagrams to calculate probabilities  **Reasoning** includes justifying the result of a calculation or estimation as reasonable, ~~explaining formal and intuitive use of ratios for comparing rates and prices,~~ deriving ~~one~~  a probability from its complement, using congruence to deduce properties of triangles, and ~~making inferences about data~~ finding estimates of means and proportions of populations |
| **9** | At this year level:  **Understanding** includes describing the relationship between graphs and equations, simplifying a range of algebraic expressions, explaining the ~~function~~ use of relative frequencies ~~and~~ to estimate probabilities, ~~calculating areas of shapes and surface areas of prisms~~ and the ~~constancy~~ use 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 and calculating areas of shapes and surface areas of prisms  **Problem Solving** includes formulating, and modelling practical situations ~~calculating~~ involving 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~~ clarify situations, developing strategies in investigating similarity and sketching linear graphs |
| **10** | At this year level:  **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~~ equations of relations and their graphs, ~~connecting~~ comparing simple and compound interest in financial contexts and determining probabilities of ~~multiple~~ two and three step 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~~ investigat~~e~~ ing the shape of data sets  **Problem Solving** includes calculating the surface area and volume of a diverse range of prisms to solve practical problems, 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 |

**Changes to F-10 Australian Curriculum: Mathematics Content Descriptions and Content Elaborations**

| **Year** | **Content description code** | **Revised Content Descriptions** | **Revised Elaborations** |
| --- | --- | --- | --- |
| 4 | ACMMG290 |  | comparing areas using grid paper  comparing volume using centicubes  recognising that metric units are not the only units used throughout the world, for example measuring the area of floor space using tatami mats (Japan), using squares for room and house area (Australia) ~~and miles for distance (Britain, USA)~~ - (moved from ACMMG061) |
| 1 | ACMNA012 |  | using the ~~traditional~~ popular Korean counting game (sam-yuk-gu ) for skip counting developing fluency with forwards and backwards counting in meaningful contexts such as circle games |
| 2 | ACMMG040 |  | investigating the seasons used by Aboriginal people, ~~and~~ comparing them to those used in Western society~~,~~ and recognising the connection to weather patterns. |
| 3 | ACMMG061 |  | recognising the importance of using common units of measurement ~~recognising that metric units are not the only units used throughout the world, for example measuring the area of floor space using tatami mats (Japan), using squares for room and house area (Australia) and miles for distance (Britain, USA) -~~ moved to ACMMG290 recognising and using centimetres and metres, grams and kilograms, and millilitres and litres - |
| 3 | ACMSP069 |  | exploring meaningful and increasingly efficient ways to record data, and representing and reporting the results of investigations collecting data to investigate features in the natural environment |
| 5 | ACMMG109 |  | exploring efficient ways of calculating the perimeters of rectangles such as adding the length and width together and doubling the result exploring efficient ways of finding the areas of rectangles~~, such as recognising that counting the number of square centimetres in a grid gives the same result as multiplying the length and width~~ |
| 5. | ACMMG112 |  | measuring and constructing angles using both 180° and 360° protractors recognising that angles have arms and a vertex, and that size is the amount of turn required for one arm to coincide with the other |
| 5 | ACMNA102 |  | recognising the connection between the ~~value~~ order of ~~a~~ unit fractions and ~~its~~ their denominators |
| 5 | ACMNA104 | Recognise that the ~~number~~ place valuesystem can be extended beyond hundredths | using knowledge of place value and division by 10 to extend the number system to thousandths and beyond recognising the equivalence of one thousandth~~s~~ and 0.001 |
| 5 | ACMNA105 |  | ~~recognising that the number of digits after the decimal place is not equivalent to the value of the fraction~~ locating decimals on a number line |
| 5 | ACMSP120 |  | using and comparing data representations for different data sets to help decision making~~, such as choosing the best mobile phone plan~~ |
| 6 | ACMMG139 |  | planning a trip involving one or more modes of public transport developing a timetable of daily activities |
| 6 | ACMMG141 |  | identifying ~~that~~ the size of a right angle as ~~is~~ 90° and defining acute, obtuse, straightand reflex angles ~~and rotation by relating them to right angles~~ ~~building on students' understanding of turn and rotation in mapping and rotational symmetry to~~ measur~~e~~ing, estimat~~e~~ing and compar~~e~~ing angles in degrees and classifying 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 recognising 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 near~~ ~~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~~ recognising and using the two alternate conventions for naming angles |
| 6 | ACMMG142 |  | ~~visualising, demonstrating and describing the effects of transformations, such as using computer technology to visualise, test and record the movement of two-dimensional shapes, or~~ designing a school or brand logo using transformation of one or more shapes understanding that translations, rotations and reflections can change the position and orientation ~~of shapes and objects~~ but not ~~their geometric features~~ shape or size |
| 6 | ACMMG143 |  | understanding that the Cartesian plane provides a graphical or visual way of describing location~~, and can be used to represent relationships~~ |
| 6 | ACMNA124 | Investigate everyday situations that use ~~positive and negative whole numbers and zero~~ integers. Locate and represent these numbers on a number line | understanding that integers are ...-3, -2, -1, 0, 1, 2, 3,..... ~~understanding that whole numbers can be positive and negative and continue indefinitely in both directions~~ 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 over~~ 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 |
| 6 | ACMNA127 |  | recognising that finding one third of a quantity is the same as dividing by 3 |
| 6 | ACMNA129 | Multiply decimals by whole numbers and perform divisions by non-zero whole numbers ~~that~~ where the results ~~in~~ are terminating decimals, with and without digital technologies | ~~interpreting and representing the remainder in division calculations, including non-integral remainders, 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.~~ interpreting the results of calculations to provide an answer appropriate to the context |
| 6 | ACMNA130 |  | ~~sing and explaining the use of multiplication and division by powers of 10 to multiply and divide decimal numbers mentally (for example 1.4 × 0.6 can be calculated by multiplying 14 by 6 and dividing the result by 100)~~ ~~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)~~ Multiplying and dividing decimals by multiples of powers of 10 |
| 6 | 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 |
| 6 | ACMSP147 |  | ~~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 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 |
| 6 | ACMSP148 |  | investigating data representations in the media and discussing what they illustrate and the messages the people who created them might want to conveyidentifying potentially misleading data representations in the media, such as graphs with broken axes or non-linear scales, graphics not drawn to scale, data not related to the population about which the claimsare 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 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 repres 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~~ |
| 7 | ACMMG159 |  | building on the understanding of the area of rectangles to develop formulas for the area of triangles~~, using manual strategies and digital technologies~~ establishing that the area of a triangle is half the area of an appropriate rectangle ~~and using the formula A = ½bh, where b is the base and h is the perpendicular height of the triangle~~ using area formulas for rectangles and triangles to solve problems involving areas of surfaces~~, such as how many litres of paint will be needed to paint a shed wall if each litre covers 16m<sup>2</sup>~~ |
| 7 | ACMMG163 | Identify corresponding, alternate and co-interior angles when two ~~parallel~~ straight lines are crossed by a transversal | ~~constructing parallel and perpendicular lines using their properties, a pair of compasses and a ruler, and dynamic geometry software~~ defining and classifying ~~angles such as acute, right, obtuse, straight, reflex and revolution, and~~ pairs of angles ~~such~~ as complementary, supplementary, adjacent and vertically opposite |
| 7 | ACMMG164 |  | constructing parallel and perpendicular lines using their properties, a pair of compasses and a ruler, and dynamic geometry software defining and identifying ~~alternate, corresponding and allied angles and~~ the relationships between ~~them~~ alternate, corresponding and co-interior angles for a pair of parallel lines cut by a transversal~~, including~~ ~~using dynamic geometry software~~ |
| 7 | ACMMG181 |  | ~~building on students understanding of the reflection and rotation of figures, and reflection and rotational symmetry, to identify combinations of transformations that produce the same result, and to distinguish this as an example of how mathematical results can often be obtained using multiple alternative methods~~ describing patterns and investigating different ways to produce the same transformation~~al changes~~, such as using two successive reflections to provide the same result as a translation~~, or~~  ~~to~~ experimenting with, creating and re-creating patterns using combinations of reflections and rotations using digital technologies |
| 7 | ACMNA152 | Compare fractions using equivalence. Locate and represent positive and negative fractions and mixed ~~numerals~~ numbers on a number line |  |
| 7 | ACMNA157 |  | justifying choices of written, mental or calculator strategies for solving specific problems including those involving large numbers understanding that quantities can be represented by different number types and calculated using various operations, and that choices need to be made about each calculating the percentage of the total local municipal area set aside for parkland, manufacturing, retail and residential dwellings to compare land use |
| 7 | ACMNA179 |  | solving equations using concrete materials, such as the balance model, and explain the need to do the same thing to each side of the equation using substitution to check solutions ~~using strategies such as backtracking and guess, check and improve to solve equations~~ investigating a range of strategies to solve equations ~~writing an equation, estimating the answer, solving and checking the solution and creating linear relationships to represent the answer/sequence of operation~~ ~~solving real-life problems by using pronumerals variables to represent unknowns~~ |
| 7 | ACMSP167 |  | discussing the meaning of probability terminology (for example probability, sample space, favourable outcomes, trial, ~~chance~~ events and experiments) distinguishing between equally likely outcomes and outcomes that are not equally likely |
| 7 | ACMSP168 |  | expressing probabilities ~~in common and~~ as decimals, fraction~~al~~s and percentages ~~forms~~ ~~understanding the advantages and limitations of calculating theoretical probabilities~~ |
| 7 | ACMSP169 | Identify and investigate issues involving ~~continuous or large count~~ numerical data collected from primary and secondary sources | obtaining secondary data from newspapers, the Internet and the Australian Bureau of Statistics investigating secondary data relating to the distribution and use of non-renewable resources around the world |
| 7 | ACMSP170 |  | understanding that some data representations are more appropriate than others for particular data sets, and answering questions about those data sets using ~~ordered~~ stem-and-leaf plots to record and display numerical data collected in a class investigation, such as constructing a class plot of height in centimetres on a shared stem-and-leaf plot for which the stems 12, 13, 14, 15, 16 and 17 have been pro |
| 7 | ACMSP171 |  | understanding that summarising data by calculating measures of centre and spread can help make sense of the data ~~calculating mean areas set aside for parkland, manufacturing, retail and residential dwellings to compare land use in the local municipality~~ |
| 7 | ACMSP172 | Describe and interpret data displays ~~and the relationship between the~~ using median, ~~and~~ mean and range |  |
| 8 | ACMMG196 | Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites | ~~exploring the use of parallelograms, rhombuses and kites in art and architecture~~ establishing and using formulas for areas such as trapeziums, rhombuses and kites |
| 8 | ACMMG200 |  | understanding the properties that determine congruence of triangles and recognising which transformations create congruent figures establishing that two figures are congruent if one shape lies exactly on top of the other after one or more transformations (translation, reflection, rotation), and recognising ~~the equivalence of corresponding sides and angles~~ that matching sides and matching angles are equal |
| 8 | ACMMG201 |  | ~~plotting the vertices of two-dimensional shapes on the Cartesian plane, translating, rotating or reflecting the shape and using coordinates to describe the transformation~~ investigating the minimal conditions needed for the unique construction of triangles, leading to the establishment of the conditions for congruence (SSS, SAS, ASA and RHS)~~, and demonstrating which conditions do not prescribe congruence (ASS, AAA)~~ solving problems using the properties of congruent figures~~, justifying reasoning and making generalisations~~ constructing triangles using the conditions for congruence |
| 8 | ACMMG202 |  | establishing the properties of squares, rectangles, parallelograms, rhombuses, trapeziums and kites identifying properties related to side lengths, ~~parallelism~~ parallel sides, angles, diagonals and symmetry |
| 8 | ACMNA183 | Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies | using patterns to assist in finding rules for the multiplication and division of integers using the number line to develop strategies for adding and subtracting rational numbers |
| 8 | ACMNA186 |  | understanding that the real number system includes irrational numbers ~~and that certain subsets of the real number system have particular properties~~ |
| 8 | ACMNA187 |  | using percentages to solve problems, including those involving mark-ups, discounts, ~~profit and loss~~ and GST using percentages to calculate population increases and decreases |
| 8 | ACMNA191 |  | recognising the relationship between ~~and that~~ factorising ~~is the opposite of~~  and expanding identifying the greatest common divisor (highest common factor) of numeric and algebraic expressions and using a range of strategies to factorise algebraic expressions |
| 8 | ACMNA192 |  | understanding that the laws ~~that apply~~ used with numbers can also be used with algebra ~~generalised using variables~~ ~~understanding that arithmetic laws are powerful ways of describing and simplifying calculations and that using these laws leads to the generality of algebra~~ |
| 8 | ACMNA193 |  | ~~plotting points for tables of values from non-rule-based data, such as water consumption over a month~~ completing a table of values, plotting the resulting points and determining whether the relationship is linear finding the rule for a linear relationship |
| 8 | ACMNA194 |  | ~~solving equations using concrete materials, such as the balance model, and explain the need to do the same thing to each side of the equation using strategies, such as backtracking and guess, check and improve to solve equations using variables to symbolise simple linear equations and using a variety of strategies to solve them~~ solving real life problems by using variables to represent unknowns |
| 8 | ACMSP204 |  | identifying the complement of familiar events ~~(for example the complement of getting a head on a coin is getting a tail, the complement of winning a game is not winning the game)~~ understanding that probabilities range between 0 to 1 and that calculating the probability of an event allows the probability of its complement to be ~~identified~~ found |
| 8 | ACMSP205 |  | posing 'and', 'or' and 'not' ~~and given~~ probability questions about objects or people |
| 8 | ACMSP292 | Represent ~~such~~ events in two-way tables and Venn diagrams and solve related problems | using Venn diagrams and two-way tables to calculate probabilities for events, satisfying 'and', 'or' and 'not' conditions understanding that representing data in Venn diagrams or two-way tables facilitates the calculation of probabilities collecting data to answer the questions using Venn diagrams or two-way tables |
| 8 | ACMSP207 |  | ~~using sample properties (for example mean, median, range, large gaps visible on a graph) to predict characteristics of the population (for example using mean height for a class to predict year-group mean height), acknowledging uncertainty~~ using displays of data to explore and investigate effects |
| ~~9~~ | ACMSP284 | Investigate techniques for collecting data, including census and sampling ~~and observation~~ | identifying situations where data can be collected by census and those where a sample is appropriate |
| 8 | ACMSP206 | Explore the practicalities and implications of obtaining ~~representative~~ data through sampling using a variety of investigative processes | ~~investigating an international issue where media reporting and the use of data reflects different cultural or social emphases (for example whaling, football World Cup outcomes) understanding that making decisions and drawing conclusions based on data may differ from those based on preferences and beliefs~~ investigating the uses of random sampling to collect data |
| 8 | ACMSP293 | Explore the variation of means and proportions in ~~representative data~~ of random samples drawn from the same population | using sample properties to predict characteristics of the population |
| 9 | ACMMG216 |  | understanding that partitioning composite shapes into rectangles and triangles is a strategy for solving problems involving ~~perimeter and~~ area |
| 9 | ACMMG217 |  | analysing nets of ~~prisms and~~ cylinders to establish formulas for surface area connecting the volume and capacity of a cylinder to solve authentic problems |
| 9 | 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~~ solving practical problems involving surface area and volume of right prisms |
| 9 | ACMMG220 |  | 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) using the enlargement transformation to establish similarity understanding that similarity and congruence help describe relationships between geometrical shapes and ~~form the basis~~ are important elements of reasoning and proof |
| 9 | ACMMG222 |  | understanding that Pythagoras' Theorem is a useful tool in determining unknown lengths in right-angled triangles and has widespread applications recognising that right-angled triangle calculations may generate results that can be ~~integral~~ integers, fractions~~al~~ or irrational numbers ~~known as surds~~ |
| 9 | ACMNA208 |  | ~~understanding the difference between direct and inverse proportion, identifying these in real-life contexts and using these relationships to solve problems~~ identifying direct proportion in real-life contexts |
| 9 | ACMNA209 |  | ~~applying knowledge of index laws to algebraic terms and simplifying algebraic~~ simplifying and evaluating numerical expressions~~, using~~ involving both positive and negative ~~integral~~ integer indices ~~moving fluently between representations of numeric and algebraic terms with negative indices, and applying understanding of negative indices to calculations connecting different strategies for simplifying expressions with indices to illustrate the meaning of negative indices~~ |
| 9 | 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 |
| 9 | ACMNA212 | Extend and apply the index laws to variables, using positive ~~integral~~ integer indices and the zero index | understanding that index laws apply to variables as well as numbers ~~evaluating numbers expressed as powers of positive integers~~ |
| 9 | ACMNA213 |  | understanding that the distributive law can be applied to algebraic expressions as well as numbers understanding the ~~inverse~~ relationship between expansion and factorisation and identifying algebraic factors in algebraic expressions |
| 9 | ACMNA214 |  | investigating graphical and algebraic techniques for finding distance between two points using Pythagoras' theorem to calculate distance between two points |
| 9 | ACMNA215 | Sketch linear graphs using the coordinates of two points and solve linear equations | determining linear rules from suitable diagrams, tables of values and graphs and describing them ~~both~~ using both words and algebra |
| 9 | ACMNA294 |  | investigating graphical and algebraic techniques for finding midpoint and gradient recognising that the gradient of a line is the same as the gradient of any line segment on that line |
| 9 | ACMNA296 | ~~Sketch~~ graph simple non-linear relations with and without the use of digital technologies and solve simple related equations | ~~sketching~~ graphing parabolas, ~~hyperbolas,~~ and circles connecting x-intercepts of a graph to a related equation |
| 9 | ACMSP225 |  | conducting two-step chance experiments  using systematic methods to list outcomes of experiments and to list outcomes favourable to an event. comparing experiments which differ only by being undertaken with replacement or without replacement |
| 9 | ACMSP226 |  | ~~collecting data to answer the questions~~ using Venn diagrams or two-way tables to calculate relative frequencies of events involving ‘and’, ‘or’ questions using relative frequencies to find an estimate of probabilities of ‘and’, ‘or’ events |
| 9 | ACMSP282 |  | using stem-and-leaf plots to compare two like sets of data such as the heights of girls and the heights of boys in a class. describing the shape of the distribution of data using terms such as ‘positive skewed’, ‘negative skewed’ and 'symmetric' and 'bi-modal' |
| 9 | ACMSP283 |  | comparing means, medians and ranges of two sets of numerical data which have been displayed using histograms, dot plots, or stem and leaf plots |
| ~~9~~ | ~~ACMSP284~~ | ~~Investigate techniques for collecting data, including census and sampling and observation~~ | ~~identifying situations where data can be collected by census and those where a sample is appropriate~~ |
| 10 | ACMMG242 |  | ~~building on understanding of surface areas and volumes of prisms and cylinders, to include pyramids, cones and spheres~~ Investigating and determining the volumes and surface areas of composite solids by considering the individual solids from which they are constructed |
| 10 | ACMMG243 |  | ~~proving that a quadrilateral with equal-length diagonals bisecting at right angles is a square~~ applying an understanding of relationships to deduce properties of geometric figures (for example the base angles of an isosceles triangle are equal) |
| 10 | ACMMG244 |  | ~~applying an understanding of relationships to deduce properties of geometric figures (for example the base angles of an isosceles triangle are equal)~~ ~~using mathematical language and notation, based on congruence and similarity~~ ~~presenting formal geometric arguments to develop skills in mathematical reasoning and presenting reasoned arguments (proofs)~~ 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)  Performing a sequence of steps to determine an unknown angle giving a justification in moving from one step to the next. Communicating a proof using a sequence of logically connected statements |
| 10 | ACMMG245 |  | applying Pythagoras's Theorem and trigonometry to problems in surveying and design |
| 10 | ACMNA230 |  | using the distributive law and the index laws to factorise algebraic expressions understanding the relationship between factorisation and expansion |
| 10 | ACMNA231 |  | ~~moving fluently between representations of numeric and algebraic terms with negative indices, and applying understanding of negative indices to calculations connecting different strategies for simplifying expressions with indices to illustrate the meaning of negative indices, expanding and simplifying results understanding that the use of index notation is an efficient way of representing numbers and symbols and has many applications, particularly in science~~ applying knowledge of index laws to algebraic terms, and simplifying algebraic expressions using both positive and negative ~~integral~~ integer indices. |
| 10 | ACMNA232 |  | ~~solving a wide range of linear equations, including those involving one or two simple algebraic fractions, and checking solutions by substitution~~  expressing the sum and difference of algebraic fractions with a common denominator using the index laws to simplify products and quotients of algebraic fractions |
| 10 | ACMNA233 |  | exploring the method of completing the square to factorise quadratic expressions and solve quadratic equations ~~using expansion patterns for the special binomial products (a + b)(a - b) and (a ± b)<sup>2</sup> inversely to factorise quadratic using the area model inversely to factorise quadratic expressions of the form ax<sup>2</sup> + bx + c, where a= ±1~~ identifying and using common factors, including binomial expressions ~~terms,~~ to factorise algebraic expressions using the technique of grouping in pairs ~~to factorise algebraic expressions with four terms~~ using the identities for perfect squares and the difference of squares to factorise quadratic expressions |
| 10 | ACMNA234 |  | ~~representing word problems with simple linear equations and solving them to answer questions~~ solving simple equations arising from formulas |
| 10 | ACMNA235 |  | ~~checking the solution by substitution into the equation solving equations that are the result of substitution into common formulas from mathematics and elsewhere, including those that involve rearrangement~~  representing word problems with simple linear equations and solving them to answer questions |
| 10 | ACMNA237 |  | ~~generalising pairs of equations from word problems and choosing an appropriate strategy for solving them simultaneously using simple algebraic techniques to solve pairs of linear simultaneous equations~~  associating the solution of simultaneous equations with the coordinates of the intersection of their corresponding graphs |
| 10 | 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~~  solving problems using the fact that parallel lines have the same gradient and conversely that if two lines have the same gradient then they are parallel solving problems using the fact that the product of the gradients of perpendicular lines is –1 and conversely that if the product of the gradients of two lines is –1 then they are perpendicular |
| 10 | ACMNA239 |  | ~~sketching the graphical representations of parabolas, exponential functions and circles 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 graphs of parabolas, and circles applying translations, reflections and stretches to parabolas and circles  sketching the graphs of exponential functions using transformations |
| 10 | 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 a variety of techniques to solve quadratic equations, including grouping, completing the square, the quadratic formula and choosing two integers with the required product and sum |
| 10 | ACMSP246 |  | ~~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)~~ ~~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~~ recognising that an event can be dependent on another event and that this will affect the way its probability is caluclated |
| 10 | ACMSP247 |  | ~~evaluating media reports that refer to data from a range of contexts, where the evaluation allows students to demonstrate their statistical literacy~~  using two-way tables and Venn diagrams to understand conditional statements. using arrays and tree diagrams to determine probabilities |
| 10 | 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 age distribution of Aboriginal and Torres Strait Islander people ~~by age~~ with that of the Australian population as a whole |
| 10 | ACMSP251 | Use scatter plots to investigate and comment on relationships between two ~~continuous~~ numerical variables |  |
| 10 | ACMSP252 |  | investigating biodiversity changes in Australia since ~~white settlement~~ European occupation constructing and interpreting data displays representing bivariate data over time |
| 10 | ACMSP253 |  | ~~investigating real-life examples that demonstrate that predicted outcomes can be accompanied by unpredicted effects, and understanding the causes for this (for example, Chinese one-child policy becoming the one-male policy)~~  investigating the use of statistics in reports regarding the growth of Australia's trade with other countries of the Asia region evaluating statistical reports comparing the life expectancy of Aboriginal and Torres Strait Islander people with that of the Australian population as a whole |
| 10A | ACMMG272 |  | ~~applying properties of circles to develop formal proofs~~ performing a sequence of steps to determine an unknown angle or length in a diagram involving a circle, or circles, giving a justification in moving from one step to the next. communicating a proof using a logical sequence of statements proving results involving chords of circles |
| 10A | ACMMG274 |  | establishing the symmetrical properties of trigonometric functions investigating angles of any magnitude understanding that trigonometric functions are periodic and that this can be used to describe motion |
| 10A | ACMMG275 |  | ~~understanding that trigonometric functions are periodic and that this can be used to describe motion~~ using ~~the notion of~~ periodicity and symmetry to ~~consider an infinite number of solutions~~  solve equations |
| 10A | ACMMG276 |  | investigating the applications of Pythagoras's theorem in authentic problems |
| 10A | ACMNA264 |  | ~~applying the index laws to numeric and algebraic expressions and evaluating or simplifying them as required~~ understanding that the real number system includes irrational numbers ~~and that certain subsets of the real number system have particular propertie~~ extending the index laws to rational number indices ~~Developing fluency~~ performing the four operations with surds |
| 10A | ACMNA265 |  | investigating the relationship between exponential and logarithmic expressions ~~investigating the use of logarithmic scale~~  simplifying expressions using the logarithm laws |
| 10A | ACMNA267 |  | ~~using a range of strategies to investigate the effect of multiplying by a constant term, including negative numbers connecting the graphical and algebraic representations and describing the transformation~~  applying transformations, including translations, reflections in the axes and stretches to help graph parabolas, rectangular hyperbolas, circles and exponential functions |
| 10A | ACMNA268 |  | investigating the features of graphs of polynomials ~~using digital technology~~ including axes intercepts and the effect of repeated factors |
| 10A | ACMNA269 |  | ~~developing fluency with algebraic techniques associated with quadratics to facilitate describing relationships and solving problems~~  writing quadratic equations that represent practical problems |
| 10A | ACMSP277 | Investigate reports of studies in digital media and elsewhere for information on their planning and implementation ~~of such studies, and the reporting of variability~~ | evaluating the appropriateness of sampling methods ~~and sample size~~ in reports where statements about a population are based on a sample evaluating whether graphs in a report could mislead, and whether graphs and numerical information support the claims ~~evaluating media reports that refer to data from a range of contexts~~ |
| 10A | ACMSP278 |  | ~~evaluating the appropriateness of sampling methods and sample size in reports where statements about a population are based on a sample~~ using the standard deviation to describe the spread of a set of data using the mean and standard deviation to compare numerical data sets |