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CURRICULUM ELEMENTS

Foundation

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| **Year level description** |
| In Foundation, learning in Mathematics builds on the Early Years Learning Framework and each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, skills, procedures and processes by making connections, reasoning, problem-solving, and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * explore situations, sparked by curiosity, using physical and virtual materials to represent, sort, quantify, compare and solve everyday problems * look for and make connections between number names, numerals, and quantities, and compare quantities and shapes, using elementary mathematical reasoning in active learning experiences * bring mathematical meaning to their use of familiar terms and language when they pose and respond to questions, and explain their thinking and reasoning * build confidence and autonomy in being able to make and justify mathematical decisions based on quantification and direct comparisons * learn to recognise repetition in pattern sequences and apply this to creatively build repeating patterns in a range of contexts * develop a sense of sameness, difference and change when they engage in play-based activities. |
| **Achievement standard** |
| By the end of Foundation Year, students make connections between number names, numerals and position in the sequence of numbers from zero to at least 20. They use subitising and counting strategies to quantify collections. Students compare the size of collections to at least 20. They partition and combine collections up to 10 in different ways, representing these with numbers. Students represent practical situations that involve quantifying, equal sharing, adding to and taking away from collections to at least 10. They copy and continue repeating patterns.  Students identify the attributes of mass, capacity, length and duration, and use direct comparison strategies to compare objects and events. They sequence and connect familiar events to the time of day. Students name, create and sort familiar shapes and give their reasoning. They describe the position and the location of themselves and objects in relation to other objects and people within a familiar space.  Students collect, sort and compare data in response to questions in familiar contexts. |

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| **Strand: Number** | | **Foundation** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| name, represent and order numbers including zero to at least 20, using physical and virtual materials and numerals  AC9MFN01 | * responding to a request to collect a quantity of objects or reading a numeral and selecting the associated quantity of items from a collection to match the number required; for example, collecting 9 paint brushes after hearing the word ‘nine’ * recognising the order in the sequence of numbers to 20 and identifying the number that is “one less” than a given number and the number that is “one more”; for example, playing instructive card games that involve reading and ordering number cards; using counting songs, story books and rhymes to establish the forwards and backwards counting sequence of numbers in the context of active counting activities * understanding and using terms such as “first”, “second”, “third”, … “fifth”… to indicate ordinal position in a sequence; for example, creating a number track using cards with the numerals zero to 20 and describing positions using terms such as first, last, before, after, between * recognising, writing and reading numerals written on familiar objects; for example, in images, text or illustrations in story books; writing a numeral on a container as a label to show how many objects it contains * connecting quantities to number names and numerals when reading and reciting stories and playing counting games or determining and reasoning about the size of sets of objects within First Nation Australians’ instructive games; for example, Segur etug from Mer Island in the Torres Strait region | |
| recognise and name the number of objects within a collection up to 5 using subitising  AC9MFN02 | * recognising how many objects are in a collection or in images on a card with a quick look and saying the associated number without counting * playing instructive card games that rely on the recognition of numbers represented in different ways; for example, playing memory games, matching pairs of quantities on dot cards or similar where the arrangement on each is different; using subitising to compare and order collections and to say who has more when sharing items in a game | |
| quantify and compare collections to at least 20 using counting and explain or demonstrate reasoning  AC9MFN03 | * establishing the language and process of counting, understanding that each object must be counted only once, that the arrangement of objects does not affect how many there are, and that the last number counted answers the question of “How many?”; for example, saying numbers in sequence while playing and performing actions * using counting to compare the size of two or more collections of like items to justify which collection contains more or less items * using counting and one-to-one correspondence to quantify the number of items required for a purpose; for example, when asked to collect enough scissors for each member of their group to have a pair, counting each member and using the total count to know how many to collect * discussing how different cultures may have alternative ways of representing the count; for example, discussing how people of the Asia region use an abacus or Chinese hand gestures * using body-tallying that involves body parts and one-to-one correspondence from counting systems of First Nations Peoples of Australia, to count to 20 | |
| partition and combine collections up to 10 using part-part-whole relationships and subitising to recognise and name the parts  AC9MFN04 | * recognising numbers represented in physical or virtual ten-frames, and describing their reasoning: *“*It’s 7 because there is 5 there and 2 more” * partitioning collections of up to 10 objects in different ways and saying the part-part-whole relationship; for example, partitioning a collection of 6 counters into 4 counters and 2 counters and saying, *“*6 is 4 and 2 more, it’s 2 and 4””, then partitioning the same collection into 5 and one or 3 and 3 * representing part-part-whole relationships in numbers up to 10 using physical or virtual materials; for example, identifying numbers represented by dots in standard number configurations such as dominos and dice by recognising parts that form the whole * exploring number groupings in First Nations Australians’ counting systems and the different ways of representing these groupings to form and partition numbers, applying this to quantify collections of objects in the environment on Country/Place up to 10 | |
| represent practical situations involving addition, subtraction and quantification with physical and virtual materials and use counting or subitising strategies  AC9MFN05 | * using role-play and materials to represent mathematical relationships in stories; for example, “Eight kangaroos were drinking at the river and 3 hopped away”; drawing a picture and using materials to represent the situation, discussing, and recording the result of the action with a numeral * role playing or actively engaging in situations that involve quantifying or comparing collections of items or simple money transactions; for example, “Do we have enough scissors for our group so that each person has their own pair?”; role-playing using $1 coins to pay for items in a shop where items are priced in whole dollars * representing situations expressed in First Nations Australians’ stories, such as “Tiddalick, the greedy frog”, that describe additive situations and their connections to Country/Place * representing addition and subtraction situations found in leaf games involving sets of objects used to tell stories, such as games from the Warlpiri Peoples of Yuendumu in the Northern Territory | |
| represent practical situations involving equal sharing and grouping with physical and virtual materials and use counting or subitising strategies  AC9MFN06 | * using materials to role-play equal sharing; for example, sharing pieces of fruit or a bunch of grapes between 4 people and discussing how you would know they have been shared equally; when playing card games where each player is dealt the same number of cards, and counting the number of cards after the deal to ensure they have the same amount * representing situations that involve counting several items; for example, 9 beads or 6 $1 coins, and sharing them equally between 3 people by subitising or counting each group by ones to decide how many beads or coins each person will receive * exploring instructive games of First Nations Australians that involve sharing; for example, playing Yangamini of the Tiwi Peoples of Bathurst Island to investigate and discuss equal sharing | |

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| **Strand: Algebra** | | **Foundation** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, copy and continue repeating patterns represented in different ways  AC9MFA01 | * recognising, copying and describing different repeating patterns using materials, shapes, sounds and movements during activities and play; for example, making a bead necklace and describing the pattern they have created, such as, “red, blue, green, red, blue, green, red, blue, green”; copying repeating patterns of drumbeats or dance moves during music activities * recognising repeating patterns used at home and in daily activities to help make tasks easier or to solve problems; for example, setting the table to eat * recognising and describing repeating patterns that can be observed on Country/Place and in First Nation Australians artwork, cultural performances and material cultures; for example, shell and seed necklaces, dances and songs | |

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| **Strand: Measurement** | | **Foundation** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| identify and compare attributes of objects and events, including length, capacity, mass and duration, using direct comparisons and communicating reasoning  AC9MFM01 | * using language to describe the measurement attributes of length, mass, capacity and duration, and connecting the words with the appropriate attribute; for example, using words like “tall”, “short”, “wide”, “long”, “high” to describe the attribute of length * directly comparing pairs of objects to say which is longer/shorter, and explaining or demonstrating how they know; for example, standing back-to-back to determine who is taller; choosing to line up the bases of a spoon and fork to decide which is longer and explaining why * starting 2 events at the same time to decide which takes longer; for example, putting on a pair of sandals with buckles or Velcro, describing the duration using familiar terms and reasoning, “I took a longer time because I’m still learning to do up my buckles” * directly comparing pairs of everyday objects from the kitchen pantry to say which is heavier/lighter; for example, hefting a tin of baked beans and a packet of marshmallows; comparing the same pair of objects to say which is longer/shorter and discussing comparisons | |
| sequence days of the week and times of the day including morning, lunchtime, afternoon and night time, and connect them to familiar events and actions  AC9MFM02 | * ordering images of daily events on a string line across the room, and justifying the placement by referring to morning, lunchtime, afternoon, and night time * distinguishing between the days of the school week and weekends, and recognising that the days of the week form a sequence that repeats, with Monday always following on from Sunday * sequencing the events from a story in the order in which they occurred using language like, “This happened first” then “This happened next” * creating, interpreting and discussing classroom rosters; for example, a roster for watering the classroom garden and asking, “Who watered the garden yesterday?” or “Whose turn is it today?” * creating a pictorial diary to show the important events that happen on the various days of the week | |

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| **Strand: Space** | | **Foundation** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| sort, name and create familiar shapes; recognise and describe familiar shapes within objects in the environment, giving reasons  AC9MFSP01 | * sorting a collection of shapes into groups based on different features such as the number of sides, colour or size, and describing how they have been sorted * creating a picture using a variety of shapes and a range of materials, including objects to trace around, describing the shapes they have created or used and sharing why they chose each shape in their picture * creating familiar shapes using groups of people; for example, holding hands and creating a circle * recognising and naming shapes that are (close to) rectangles, squares, triangles and circles in component parts of everyday items; for example, on bicycles, toy vehicles or kitchen pantry items * describing and naming shapes within objects that can be observed on Country/Place, recreating and sorting into groups based on their shape | |
| describe the position and location of themselves and objects in relation to other people and objects within a familiar space  AC9MFSP02 | * describing the position of an item in relation to other items in the space using language like “inside”, “underneath” and “on top of”; for example, when asked “Where are the scissors kept?”, responding with “They are in a box, on the bottom shelf at the back of the classroom” * describing where they have moved themselves and items in relation to other items within a space, using familiar terms; for example, playing a hiding game and when asked “Where did you hide the ball?”, responding, “I hid it behind the garbage bin over there near the bench” * exploring First Nations Australians’ instructive games; for example, Thapumpan from the Wik-Mungkan Peoples of Cape Bedford in north Queensland, describing position and movement of self in relation to other participants, objects or locations | |

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| **Strand: Statistics** | | **Foundation** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| collect, sort and compare data represented by objects and images in response to given investigative questions that relate to familiar situations  AC9MFST01 | * collecting, and sorting data collected through everyday activities or events; for example, sorting toys into categories, such as “toys that move” and “toys that don’t move” * collecting and deciding how to organise data to answer “Yes/No” questions; for example, “Do more people in our class today have shoes with laces than without?”; explaining that lining up, and matching shoes with and without laces one-to-one will answer the question * creating classroom charts and rosters using stickers to represent data; comparing and interpreting representations * investigating statistical contexts after reading a story, such as “The Waterhole” by Graeme Base; asking and responding to questions like “What different animals did you see?”, “How many different types of animals were there?” or “Were there more tigers or kangaroos?” * exploring what and how information from the environment is collected and used by First Nations Australians to predict weather events | |

Year 1

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| **Year level description** |
| In Year 1, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * use their curiosity and imagination to explore situations, recognise patterns in their environment and choose ways of representing their thinking when communicating with others * demonstrate that numbers can be represented, partitioned, and composed in various ways, recognise patterns in numbers and extend their knowledge of numbers beyond 2 digits * use physical or virtual materials and diagrams when modelling practical problems through active learning experiences, recognise existing patterns, employ different strategies and discuss the reasonableness of answers * explain ways of making direct and indirect comparisons and begin to use uniform, informal units to measure some attributes * reason spatially and use spatial features to classify shapes and objects; they recognise these shapes and objects in their environment and use simple transformations, directions and pathways to move the positions of shapes and objects within a space * use simple surveys to collect and sort data, based on a question of interest, recognise that data can be represented in different ways, and explain patterns that they see in the results * develop a sense of equivalence, fairness, repetition and variability when they engage in play-based and practical activities. |
| **Achievement standard** |
| By the end of Year 1, students connect number names, numerals and quantities, and order numbers to at least 120. They demonstrate how one- and two-digit numbers can be partitioned in different ways and that two-digit numbers can be partitioned into tens and ones. Students partition collections into equal groups and skip count in twos, fives or tens to quantify collections to at least 120. They solve problems involving addition and subtraction of numbers to 20 and use mathematical modelling to solve practical problems involving addition, subtraction, equal sharing and grouping, using calculation strategies. Students use numbers, symbols and objects to create skip counting and repeating patterns, identifying the repeating unit.  They compare and order objects and events based on the attributes of length, mass, capacity and duration, communicating reasoning. Students measure the length of shapes and objects using uniform informal units. They make, compare and classify shapes and objects using obvious features. Students give and follow directions to move people and objects within a space.  They collect and record categorical data, create one-to-one displays, and compare and discuss the data using frequencies. |

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| **Strand: Number** | | **Year 1** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, represent and order numbers to at least 120 using physical and virtual materials, numerals, number lines and charts  AC9M1N01 | * reading, writing and naming numerals and ordering two-digit numbers from zero to at least 120, using patterns within the natural number system, including numbers that look and sound similar; for example, 16, 60, 61 and 66 * using number tracks or positioning a set of numbered cards in the correct order and relative location by pegging on an empty number line * using hundreds charts to build understanding and fluency with numbers; for example, collaboratively building a hundreds chart using cards numbered from zero to 99; colour code the count of tens in a hundreds chart using one colour to represent the number of tens and another to represent the number of ones * recognising that numbers are used in all languages and cultures but may be represented differently in words and symbols; for example, through kanji numbers in Japanese and characters in Chinese, and that there are alternate numeration systems; for example, using special characters for 10 and 100 and other multiples of 10 in Japanese and Chinese numeration | |
| partition one- and two-digit numbers in different ways using physical and virtual materials, including partitioning two-digit numbers into tens and ones  AC9M1N02 | * building knowledge and understanding of the part-part-whole facts to 10, using physical and virtual materials; for example, using virtual ten-frames through a digital app or website to identify pairs of numbers that combine to make 10 * using physical and virtual materials to partition numbers into counts of tens and ones; for example, recognise 35 as 3 tens and 5 ones or as 2 tens and 15 ones * using part-part-whole reasoning and physical or virtual materials to represent 24, then partitioning 24 in different ways and recording the partitions using numbers; for example, 10, 10 and 4 combine to make 24 or 10 and 14 combine to make 24 | |
| quantify sets of objects, to at least 120, by partitioning collections into equal groups using number knowledge and skip counting  AC9M1N03 | * counting a large collection of items using groups of fives or tens and skip counting to work out how many there are; recording the amount and connecting the digits in the number to the grouped materials when using groups of 10 * counting collections of objects such as pencils or images of birds in a tree, by grouping them in tens to enable efficient counting and connecting the digits in the number to the groups of tens and ones * counting a large collection of Australian $1 coins by stacking them into piles of 10, skip counting in tens and including any leftover coins to determine the total value | |
| add and subtract numbers within 20, using physical and virtual materials, part-part-whole knowledge to 10 and a variety of calculation strategies  AC9M1N04 | * using drawings, physical and virtual materials and number combinations within 10 to add and subtract collections to 20 * adding and subtracting numbers within 20, using a variety of representations and strategies such as counting on, counting back, partitioning and part-part-whole knowledge of numbers to 10; for example, using partitioning and combining * developing and using strategies for one-digit addition and subtraction based on part-part-whole relationships for each of the numbers to 10 and subitising with physical and virtual materials; for example, 8 and 6 is the same as 8 and 2 and 4 * representing story problems involving addition and subtraction of numbers within 20 using a Think Board, recognising and using and symbols and the equal sign to represent the operations of addition and subtraction; showing and explaining the connections between any materials used using the language of plus and minus, and the numbers within the story problem * creating and performing addition and subtraction stories told through First Nations Australians’ dances | |
| use mathematical modelling to solve practical problems involving additive situations, including simple money transactions; represent the situations with diagrams, physical and virtual materials, and use calculation strategies to solve the problem  AC9M1N05 | * modelling problems involving addition and subtraction presented in stories, using a Think Board to represent the problem, solving the problem using physical materials and explaining the connections between any materials used, the Think Board diagram and the numbers within the story * modelling simple money problems involving addition and subtraction using whole dollar amounts; for example, setting up a shop and role-playing practical problems of buying and selling of goods, using addition and subtraction with play money and prices in whole dollar amounts; solving the problem “I had $14 and was given $15 for my birthday” using addition to answer the problem * modelling a variety of different additive situations to solve practical problems; for example, keeping track of the number of people on a bus as it stops to pick up and drop off passengers or the number of people entering a lift | |
| use mathematical modelling to solve practical problems involving equal sharing and grouping; represent the situations with diagrams, physical and virtual materials, and use calculation strategies to solve the problem  AC9M1N06 | * modelling problems involving repeated equal group situations, such as, “How many wheels are needed for 3 cars?”, using materials and drawing a picture to show what they did, and recording the results with a number * modelling practical problems involving equal sharing situations; for example, sharing a set of dominoes between the 2 players in a game, and then counting or subitising to ensure they both have the same number of tiles * modelling money problems involving equal sharing; for example, sorting coins from a money box according to their denominations, sharing the coins equally between 4 people, and using counting or subitising to ensure they have equal amounts of each denomination | |

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| **Strand: Algebra** | | **Year 1** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, continue and create pattern sequences, with numbers, symbols, shapes and objects, formed by skip counting, initially by twos, fives and tens  AC9M1A01 | * using number charts, songs, rhymes and stories to establish skip counting sequences of twos, fives and tens * using shapes and objects to represent a growing pattern formed by skip counting; for example, using blocks or beads to represent the growing patterns 2, 4, 6, 8, 10 … and 5, 10, 15, 20 … * recognising the patterns in sequences formed by skip counting; for example, that skip counting in fives starting from zero always results in either a 5 or zero as the final digit * counting by twos, fives, or tens to determine how much money is in a collection of coins or notes of the same denomination; for example, 5 cent, 10 cent and $2 coins or $5 and $10 notes * using different variations of the popular Korean counting game Sam-yuk-gu for generating skip counting pattern sequences | |
| recognise, continue and create repeating patterns with numbers, symbols, shapes and objects, identifying the repeating unit  AC9M1A02 | * interpreting a repeating pattern sequence created by someone else, noticing and describing the repeating part of the pattern and explaining how they know what comes next in the sequence * generalising a repeating pattern by identifying the unit of repeat and representing the elements using numbers, letters or symbols; for example, representing the repeating pattern of stamp, stamp, clap, stamp clap, stamp, stamp, clap, stamp, clap as SSCSC SSCSC SSCSC... recognising the elements that are repeating, describing the unit of repeat as SSCSC and continuing the pattern * recognising within the sequencing of natural numbers that 0 – 9 digits are repeated both in and between the decades and using this pattern to continue the sequence and name two-digit numbers beyond 20 * identifying the repeating patterns in First Nations Australians’ systems of counting, exploring different ways of representing numbers including oral and gestural language * considering how the making of shell or seed necklaces by First Nations Australians includes practices such as sorting shells and beads based on colour, size and shape, and creating a repeating pattern sequence | |

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| **Strand: Measurement** | | **Year 1** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| compare directly and indirectly and order objects and events using attributes of length, mass, capacity and duration, communicating reasoning  AC9M1M01 | * using a piece of string to indirectly compare the length of several objects, deciding which will fit within a space; using comparative language to describe the order: shortest, short, longer, longest * ordering the mass of 3 or more objects such as rocks, using hefting and balance scales; using comparative language to explain the order: lightest, light, heavier, heaviest, and how they decided on the order * pouring sand/rice/water from one container to another to compare and order the capacity of 3 or more containers; describing the order of the results in terms of which holds the most/least, and those in between * creating sand timers from everyday items or recycled material and comparing them to order the duration of time required for the sand to run through * investigating situations where First Nations Australians estimate, compare and communicate measurements; for example, the duration of seasons; understanding animal behaviour using the length of animal tracks; investigating capacity through water management techniques of First Nations Australians, such as traditional water carrying vessels and rock holes | |
| measure the length of shapes and objects using informal units, recognising that units need to be uniform and used end-to-end  AC9M1M02 | * using 2 different units; for example, pop sticks and pencils, to measure the length of an object such as a desk, and explaining why the number of units used may be different * comparing the length of 2 objects such as a desk and a bookshelf by laying multiple copies of a unit and counting to say which is longer and how much longer; explaining why they shouldn’t have gaps or overlaps between the units as this will change the length of the unit * measuring the distance between 2 locations using footsteps, comparing the results and explaining why there may be different results; for example, referring to the different length of footsteps as using different units * measuring and comparing the length of objects using blocks; for example, comparing the height of 2 toys by stacking blocks one on top of the other and counting how many it takes to reach the height of each object to decide which is taller | |
| describe the duration and sequence of events using years, months, weeks, days and hours  AC9M1M03 | * naming, listing and using familiar units of time, such as hours, days, weeks, years, * comparing the number of days in the months of the year and explaining how the months cycle from one year to the next * sequencing familiar events including the representation of time with pictorial timelines * discussing events and activities and deciding whether they would take closer to an hour, a day, a week, a month or a year; for example, it takes a day for the sun to rise and fall and rise again, but it takes less than an hour for me to walk to school * investigating durations of time represented in First Nations Australians’ seasonal calendars | |

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| **Strand: Space** | | **Year 1** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| make, compare and classify familiar shapes; recognise familiar shapes and objects in the environment, identifying the similarities and differences between them  AC9M1SP01 | * classifying a collection of shapes, including different circles, ovals, regular and irregular shapes, triangles and quadrilaterals, saying what is the same about the shapes in a group and what is different between the groups * selecting a shape from a small collection of shapes inside a bag and describing the shape by feel, so that others can name the shape and give reasons for their choice * comparing the different objects that can be built out of the same number of blocks or centi-cubes and discussing the differences between them * exploring string games used in story telling by First Nations Australians; for example, Karda from the Yandruwandha Peoples of north-east South Australia, recognising, comparing, describing and classifying the shapes made by the string and their relationship to shapes and objects on Country/Place | |
| give and follow directions to move people and objects to different locations within a space  AC9M1SP02 | * interpreting and following directions around familiar locations, and understanding the meaning and importance of the words when giving directions; for example, using words like “forwards” and “backwards”, “straight ahead”, “left or right” to describe movement and giving instructions like “Keep going straight until you reach the end of this passage and then turn to your right” * creating and following an algorithm consisting of a set of instructions to move an object to a different location; for example, role-playing being a robot and following step-by-step instructions given by another classmate to move from one place to another, only moving as instructed * following directions to move people into different positions within a line using both ordinal and positional language to describe their position; for example, directly comparing heights and following directions using ordinal and positional language to line up in height order * describing a familiar journey across Country/Place using directional language | |

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| **Strand: Statistics** | | **Year 1** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| acquire and record data for categorical variables in various ways including using digital tools, objects, images, drawings, lists, tally marks and symbols  AC9M1ST01 | * discussing methods of collecting data to answer a question, such as “What types of rubbish are found in the playground?”, sharing ideas and trying out some of the suggested methods; reviewing the data collected and explaining how they might change the way they collect data next time * collecting and recording information on a topic of interest using lists; for example, “how many people follow a particular football team” or “what colour eyes each person has”; examining the data, to generate some questions that it could answer, then rearranging the data or collecting different data to answer the question * creating a tally to record data while observing events such as the year level of students using the bike shed; deciding on the possible categories before the observations are taken, then reviewing the data afterwards to notice whether the tally was effective * using star charts with stickers or emojis to represent class data; for example, using emojis on a personal feeling chart to represent how they are feeling each day or using emojis to represent activities on the class calendar * exploring ways of representing, sharing and communicating data through stories and symbols used by First Nations Australians | |
| represent collected data for a categorical variable using one-to-one displays and digital tools where appropriate; compare the data using frequencies and discuss the findings  AC9M1ST02 | * creating a pictograph with objects or drawings; discussing the possible categories for the pictograph, arranging the objects or drawings into the categories, then reflecting on the chosen categories and deciding whether they were helpful * translating data from a list or pictorial display into a tally chart to make counting easier; describing what the tally chart is showing, by referring to the categories; using skip counting by fives to compare the numbers within each category and explaining how the tally chart answers the question * recognising that when there is no data for a particular category you may choose whether or not to include it in your data display, and use a zero or blank for that category depending on the purpose of the data collection or presentation; for example, creating a birthday calendar for the class and discussing that there are no students born in May and therefore there are no names listed * representing data with objects and drawings where one object or drawing represents one data value; describing the displays and explaining patterns that have been created using counting strategies to determine the frequency of responses * exploring First Nations Australian children’s instructive games; for example, Kolap from Mer Island in the Torres Strait region, recording the outcomes, representing and discussing the results | |

Year 2

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| **Year level description** |
| In Year 2, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * recognise that mathematics can be used to investigate things they are curious about, to solve practical problems and model everyday situations, describing their thinking and reasoning using familiar mathematical language * partition and combine numbers flexibly, recognising and describing the relationship between addition and subtraction and employing part-part-whole reasoning and relational thinking to solve additive problems * use number sentences to formulate additive situations and represent simple multiplicative situations using equal groups and arrays * use mathematical modelling to solve practical problems involving authentic situations by representing problems with physical and virtual materials, and diagrams, and using different calculation strategies to find solutions * compare and contrast related operations and use known addition and subtraction facts to develop strategies for unfamiliar calculations * recognise types of patterns in different contexts * partition collections, shapes and objects into equal parts and build a sense of fractions as a measure, connecting this to measures of turn and representations of time * use uniform units to measure, compare and discuss the attributes of shapes and objects, and the duration of events * describe spatial relationships such as the relative position of objects represented within a two-dimensional space * build the foundations for statistical inquiry by choosing questions based on their interests as they collect, represent, and interpret data, and recognise features of different representations * develop a sense of equivalence, chance and variability when they engage in play-based and practical activities. |
| **Achievement standard** |
| By the end of Year 2, students order and represent numbers to at least 1000, apply knowledge of place value to partition, rearrange and rename two- and three-digit numbers in terms of their parts, and regroup partitioned numbers to assist in calculations. They use mathematical modelling to solve practical additive and multiplicative problems, including money transactions, representing the situation and choosing calculation strategies. Students identify and represent part-whole relationships of halves, quarters and eighths in measurement contexts. They describe and continue patterns that increase and decrease additively by a constant amount and identify missing elements in the pattern. Students recall and demonstrate proficiency with addition and subtraction facts within 20 and multiplication facts for twos.  They use uniform informal units to measure and compare shapes and objects. Students determine the number of days between events using a calendar and read time on an analog clock to the hour, half hour and quarter hour. They compare and classify shapes, describing features using formal spatial terms. Students locate and identify positions of features in two-dimensional representations and move position by following directions and pathways.  They use a range of methods to collect, record, represent and interpret categorical data in response to questions. |

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| **Strand: Number** | | **Year 2** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, represent and order numbers to at least 1000 using physical and virtual materials, numerals and number lines  AC9M2N01 | * recognising missing numbers on different number lines; for example, a number line with 1800 on one end and 220 on the other, with every decade numbered * recognising and locating the position of pieces within hundreds chart puzzles using knowledge of the order of natural numbers * reading and writing numerals, and saying and ordering two-, three- and four-digit numbers using patterns in the number system, including numbers with zeros in different places, and numbers that look and sound similar such as 808, 880, 818 and 881 * collecting large quantities of materials for recycling; for example, ring pulls, bottle tops and bread tags, and grouping them into ones, tens and hundreds; using the materials to show different representations of two- and three-digit numbers | |
| partition, rearrange, regroup and rename two- and three-digit numbers using standard and non-standard groupings; recognise the role of a zero digit in place value notation  AC9M2N02 | * comparing the digits of a number with materials grouped into hundreds, tens and ones, and explaining the meaning of each of the digits in the materials * renaming numbers in different ways using knowledge of place value; for example, renaming 245 as 24 tens and 5 ones or 2 hundreds and 45 ones | |
| recognise and describe one-half as one of 2 equal parts of a whole and connect halves, quarters and eighths through repeated halving  AC9M2N03 | * creating halves of a range of collections sets by sharing collections into 2 equal groups; for example, comparing half of a set of 12 washers with half of a set of 8 bolts to identify how they both represent one-half of their respective set * creating halves using measurement attributes; for example, explaining that “a half is one part out of 2 equal parts of a whole”; equally folding a strip of paper, dividing a lump of playdough or separating a cup of water into 2 equal parts, then selecting one of the parts and naming it “one-half”; comparing half of a collection of 10 counters with half of a shape or object and explaining how each shows one-half of their respective wholes * using repeated halving to subdivide shapes and objects in different ways to make corresponding halves, quarters and eighths; naming the parts and comparing the size of them to notice that they are all the same size, and demonstrating that a quarter is a half of a half and that an eighth is a half of a quarter * dividing a shape into equal parts and relating the number of parts to the unit fraction; for example, if there are 4 equal parts then each part is a one-quarter and if there are 8 equal parts then each is one-eighth | |
| add and subtract one- and two-digit numbers, representing problems using number sentences and solve using part-part-whole reasoning and a variety of calculation strategies  AC9M2N04 | * using the associative property of addition to assist with mental calculation by partitioning, rearranging and regrouping numbers using number knowledge, near doubles and bridging to 10 strategies; for example, calculating 7 + 8 using 7 + (7 + 1) = (7 + 7) + 1 , the associative property and near doubles; calculating 7 + 8 using the associative property and bridging to 10 7 + (3 + 5) = (7 + 3) + 5 * using strategies such as doubles, near doubles, part-part-whole knowledge to 10, bridging tens and partitioning to mentally solve problems involving two-digit numbers; for example, calculating 56 + 37 by thinking 5 tens and 3 tens is 8 tens, 6 + 7 = 6 + 4 + 3 is one 10 and 3, and so the result is 9 tens and 3, 93 * representing addition and subtraction problems using a bar model and writing a number sentence, explaining how each number in the sentence is connected to the situation * using mental strategies and informal written jottings to help keep track of the numbers when solving addition and subtraction problems involving two-digit numbers and recognising that zero added to a number leaves the number unchanged; for example, in calculating 34 + 20 = 54, 3 tens add 2 tens is 5 tens which is 50, and 4 ones add zero ones is 4 ones which is 4, so the result is 50 + 4 = 54 * using a physical or mental number line or hundreds chart to solve addition or subtraction problems, by moving along or up and down in tens and ones; for example, “I was given a $100 gift card for my birthday and spent $38 on a pair of shoes and $15 on a t-shirt. How much money do I have left on the card?” * using First Nations Australians’ stories and dances to understand the balance and connection between addition and subtraction, representing relationships as number sentences | |
| multiply and divide by one-digit numbers using repeated addition, equal grouping, arrays, and partitioning to support a variety of calculation strategies  AC9M2N05 | * making and naming arrays and using bar models to solve simple multiplication or sharing problems; for example, make different arrays to represent 12 and name them as “3 fours”, “2 sixes”, “4 threes”, “6 twos”; using physical or virtual materials to make arrays or using bar models to demonstrate that “3 fours” is equal to “4 threes” * finding the total number represented in an array by partitioning the array using subitising and number facts; for example, describing how they determined the total number of dots arranged in a “3 fives” array by saying “I saw 2 fives which is 10 and then 5 more which makes 15” * recognising problems that can be solved using division and identifying the difference between dividing a set of objects into 3 equal groups and dividing the same set of objects into groups of 3 * using a Think Board to solve partition and quotition division problems; for example, sharing a prize of $36 between 4 people, using materials, a diagram and skip counting to find the answer; explaining whether the answer 9 refers to people or dollars * using materials or diagrams, and skip counting to solve repeated equal quantity multiplication problems; for example, “Four trays of biscuits with 6 on each tray, how many biscuits are there?”; writing a repeated addition number sentence and using skip counting to solve | |
| use mathematical modelling to solve practical problems involving additive and multiplicative situations, including money transactions; represent situations and choose calculation strategies; interpret and communicate solutions in terms of the situation  AC9M2N06 | * modelling practical problems by interpreting an everyday additive or multiplicative situation; for example, making a number of purchases at a store and deciding whether to use addition or subtraction, multiplication or division to solve the problem and justifying the choice of operation; for example, “I used subtraction to solve this problem as I knew the total and one of the parts, so I needed to subtract to find the missing part” * modelling and solving simple money problems involving whole dollar amounts with addition, subtraction, multiplication or division; for example, if each member of our class contributes $5, how much money will we have in total? * modelling and solving practical problems such as deciding how many people should be in each team for a game or sports event, how many teams for a given game can be filled from a class, how to share out some food or distributing money in whole dollar amounts, including deciding what to do if there is a remainder * modelling and solving the problem “How many days are there left in this year?” by using a calendar * modelling problems involving equal grouping and sharing in First Nations Australian children’s instructive games; for example, Yangamini from the Tiwi Island Peoples, representing relationships with a number sentence and interpret and communicate solutions in terms of the context | |

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| **Strand: Algebra** | | **Year 2** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, describe and create additive patterns that increase or decrease by a constant amount, using numbers, shapes and objects, and identify missing elements in the pattern  AC9M2A01 | * creating a pattern sequence with materials, writing the associated number sequence, and then describing the sequence so someone else can replicate it with different materials; for example, using matchsticks or toothpicks to create a growing pattern of triangles using 3 for one triangle, 5 for 2 triangles, 7 for 3 triangles and describing the pattern as “Start with 3 and add 2 each time” * recognising patterns in the built environment to locate additive pattern sequences; for example, “How many windows in one train carriage, 2 train carriages, 3 train carriages …?” or “How many wheels on one car, 2 cars, 3 cars…?” and recording the results in a diagram or table * recognising the constant term being added or subtracted in an additive pattern and using it to identify missing elements in the sequence * recognising additive patterns in the environment on Country/Place and in First Nations Australians’ material culture; representing them using drawings, coloured counters and numbers | |
| recall and demonstrate proficiency with addition facts to 20; extend and apply facts to develop related subtraction facts  AC9M2A02 | * using ten-frames or materials such as connecting cubes to develop and record addition and subtraction strategies including doubles, near doubles, counting on, combinations to 10 and bridging to 10, explaining patterns and connections noticed within the facts * partitioning and rearranging collections to practice and develop fluency with addition and subtraction facts to 20 leading to the recall of these facts; for example, partitioning using materials and part-part-whole diagrams to develop subtraction facts related to addition facts, such as 8 + 7 = 15 therefore, 15 – 7 = 8 and 15 – 8 = 7 * using partitioning to develop and record facts systematically; for example, “How many ways can 10 birds be spread among 2 trees?”, 10 = 10 + 0, 10 = 9 + 1, 10 = 8 + 2, 10 = 7 + 3, …; explaining how they know they have found all possible partitions | |
| recall and demonstrate proficiency with multiplication facts for twos; extend and apply facts to develop the related division facts using doubling and halving   AC9M2A03 | * recognising and relating terms such as double, twice and multiply by 2, halve and divide by 2 using physical and virtual materials; for example, colouring numbers on a hundreds chart to represent doubles and use to recognise halves; recognising the doubling pattern and applying to find related facts such as for 8 twos think 2 eights * doubling and halving collections to practise and develop fluency with multiplication and division facts for twos leading to recall of these facts * establishing an understanding of doubles and near doubles using physical or virtual manipulatives; for example, using manipulatives to establish that doubling 5 gives you 10 then extending this doubling fact to respond to the question, “How can you use this fact to double 6 or double 4?” * develop fluency with doubling and halving numbers within 20 using physical or virtual materials and playing doubling and halving games; for example, using a physical or virtual dice and choosing whether to double or halve to reach a target number | |

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| **Strand: Measurement** | | **Year 2** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| measure and compare objects based on length, capacity and mass using appropriate uniform informal units and smaller units for accuracy when necessary  AC9M2M01 | * choosing suitable informal units to measure the length of a range of objects; justifying their choice of a longer unit to measure things that are long, such as the width of a room, and a shorter unit to measure shorter things or when more accuracy is needed * comparing the capacity of several containers using sand and units such as a spoon or cup, to say which container will hold the most and how much more it will hold; recording the results, writing an explanation of their measurement process, including using smaller units to be more accurate, and justifying the result * using balance scales to compare the mass of several objects, selecting an appropriate informal unit; counting the number of informal units to determine which object is heavier and how much heavier; explaining why the informal units chosen need to be the same mass * recognising that the same informal unit needs to be used when measuring; for example, demonstrating and discussing why using different shoe lengths to measure the same distance could result in the measures being different; discussing why a smaller sized informal unit may result in a larger number of units compared to a larger informal unit * investigating First Nations Australians’ use of body parts, such as hands, as uniform informal units of measurement used to measure and compare objects; for example, in the manufacturing of nets for a particular purpose * investigating and comparing measurable attributes that are interpreted by First Nations Australians to understand animal behaviour such as the length, width and depth of animal tracks | |
| identify common uses and represent halves, quarters and eighths in relation to shapes, objects and events  AC9M2M02 | * demonstrating how food items can be cut in halves, quarters or eighths; for example, cutting pizzas, slices, cakes or sandwiches into equal parts by halving, then halving again to form quarters and eighths, ensuring that the parts are equal * investigating cup and spoon measures used in cooking and discussing what half or quarter of a cup or tablespoon measure means, and using sand or water to compare these to the full cup and tablespoon measures * demonstrating and using halves and quarters in folding activities; for example, folding paper in half and quarters and ensuring that the pieces are the same size * recognising that halves and quarters can be used to describe lengths, positions and distances; for example, describing the halfway point in a race or instructing someone to stand halfway between the 2 chairs * discussing that halves and quarters are used to describe duration of time in sporting events, durations of time and what it means; for example, how the sirens used during an Australian Rules Football game represent quarters and half time during the game; recognising and using half or quarter of an hour to describe a duration of time | |
| identify the date and determine the number of days between events using calendars  AC9M2M03 | * using calendars to locate specific dates and identify what day it is, to determine the date 2 weeks prior to or after a given date * creating a class calendar to enter specific dates relevant to the class; for example, students’ birthdays, school assemblies, sports carnivals or class excursions * using addition and a calendar to model and solve the problem “How many days there are in left in this year?” by identifying the number days left in this month and in each of the remaining months, and using addition to model and solve the problem * identifying and locating specific days or dates on a calendar; for example, school holidays, sports days, ANZAC Day, Easter, Diwali or Ramadan | |
| recognise and read the time represented on an analog clock to the hour, half-hour and quarter-hour  AC9M2M04 | * creating an analog clock from a paper plate, showing the placement of the numbers and the 2 hands; explaining how long it takes for the 2 hands to move around the clock face and what time unit each is showing * recognising and describing the relationship between the movement of the hands on an analog clock and the duration of time it represents; for example, connecting the language of “half past” to mean when the “big hand” will be at half past the hour and recognising this position as being halfway around its full cycle * dividing a clockface into halves and quarters, and connecting the subdivisions with telling the time to the half and quarter hour; explaining the meaning of “quarter past” and “quarter to” referring to the hour | |
| identify, describe and demonstrate quarter, half, three-quarter and full measures of turn in everyday situations  AC9M2M05 | * identifying things that turn in the school environment; for example, the handle on a tap or a door, the dial or switch on a piece of equipment; identifying a half turn and a full turn, drawing a diagram and labelling it with arrows to show the direction and amount of turn * giving and following instructions to move during an activity; for example, demonstrating and describing half, quarter and full turns in a choreographed dance * investigating hands turning on a clock and relating quarter, half and full hours to angles and the language of clockwise or anti-clockwise * giving or following directions to locate an object in the room, or provide a pathway through a grid, such as programming a robot, referring to quarter, half, three-quarter and full turns | |

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| **Strand: Space** | | **Year 2** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, compare and classify shapes, referencing the number of sides and using spatial terms such as “opposite”, “parallel”, “curved” and “straight”  AC9M2SP01 | * sorting a collection of shapes in different ways based on their features such as number of sides, whether all sides are equal, whether pairs of opposite sides are parallel; for example, collections of triangles and other polygons * manipulating shapes and recognising that different orientations do not change the shape; for example, cutting out pictures of various shapes, recognising they are they are still classified as the same shape even if they are upside down or on their side * investigating the shapes of different sporting fields, describing and labelling their features including side lines, centre circles and goal squares; for example, labelling the lines on a basketball court and using spatial terms to describe them * creating regular shapes using digital tools, describing and observing what happens when you manipulate them; for example, dragging or pushing vertices to produce irregular shapes, moving or rotating a shape | |
| locate positions in two-dimensional representations of a familiar space; move positions by following directions and pathways  AC9M2SP02 | * interpreting maps of familiar places and identifying the position of key features * understanding that we use maps, to receive and give directions and to describe place and spatial relationships between places * using a classroom seating plan to locate a new seating position and giving directions to other classmates to find their seats * following and creating movement instructions that need to be carried out to move through a 4 x 4 grid mat on the classroom floor or on a computer screen; for example, one forward, 2 to the right and one backwards, and so on to reach a target square; using a robotic toy to follow a path on a street scene on a floor mat, adjusting their directions as they consider the order of their instructions, the direction and how far they want the toy to travel * moving around a two-dimensional maze using directional language to describe turns and changes in direction including saying, for example, “clockwise”, “anticlockwise”, “quarter turn to the left”, and “take the path to the right” | |

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| **Strand: Statistics** | | **Year 2** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| acquire data for categorical variables through surveys, observation, experiment and using digital tools; sort data into relevant categories and display data using lists and tables  AC9M2ST01 | * posing a question of interest about favourite things; for example, asking classmates what are their favourite types of fruit, football teams, days of the week, and recording responses using a table; using counting strategies to determine the number of different responses and the most popular and least popular responses * investigating questions, such as “How much rubbish is really rubbish?” by gathering data about objects in categories; for example, throw away, recycle and reuse; deciding whether the data answers the question * using familiar software to construct a survey to collect class data; sorting and interpreting responses; and considering the questions asked and whether they need to be modified to reuse the survey * observing events and using the observations to design a table or list to record data; for example, observing students arriving at school prior to deciding the appropriate data categories for investigating the different ways students get to school * exploring the ways First Nations Australians observe, collect, sort and record data | |
| create different graphical representations of data using software where appropriate; compare the different representations, identify and describe common and distinctive features in response to questions  AC9M2ST02 | * collecting data from a limited list of choices, creating 2 different graphical representations of the data, discussing and comparing the different representations; for example, asking the class to choose their favourite colour from a given set, then co-creating a picture graph with colours on the horizontal axis and comparing to a column graph with colours on the horizontal axis and numbers on the vertical axis * creating different data displays; for example, lists, tally charts, jointly created column graphs and picture graphs to represent a data set; describing the information that each display represents and discussing how easy or hard they are to interpret and why * using digital tools to create picture graphs to represent data using one-to-one correspondence, deciding on an appropriate title for the graph and considering whether the categories of data are appropriate for the context * comparing picture graphs with one-to-one column graphs of the same data, interpreting the data in each and saying how they are the same and how they are different; for example, collecting data on the country of birth of each student and creating different pictographs to represent classroom data * using dot plots, sticker charts, picture graphs, bar charts and column graphs to represent data | |

Year 3

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| **Year level description** |
| In Year 3, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * become increasingly aware of the usefulness of mathematics to model situations and solve practical problems * recognise that mathematics has conventions and language enabling the unambiguous communication of ideas and results * experience the power of being able to manipulate numbers using a range of strategies that are based on proficiency with single-digit addition facts and their understanding of place value in the base-10 number system, partitioning and regrouping * begin to apply their understanding of algorithms and technology to experiment with numbers and recognise patterns * develop, extend and apply their addition and multiplication facts and related facts for subtraction and division through recognising connections between operations develop automaticity for 3, 4, 5, and 10 multiplication facts through games and meaningful practice * learn to formulate, choose and use calculation strategies, communicating their solutions within a modelling context * use metric units to measure and compare objects and events * recognise the relationship between dollars and cents and learn to represent money values in different ways * determine key features of objects and spaces, and use these when they build models and spatial representations * undertake, with guidance, statistical investigations that are meaningful to them, making decisions about their use and representation of categorical and discrete numerical data, and reporting findings * develop a qualitative understanding of chance and use the language of chance to describe and compare the outcomes of familiar chance events * become increasingly able to understand that different outcomes can be the results of random processes. |
| **Achievement standard** |
| By the end of Year 3, students order and represent natural numbers beyond 10 000. They partition, rearrange and regroup two- and three-digit numbers in different ways to assist in calculations. Students extend and use single-digit addition and related subtraction facts and apply additive strategies to model and solve problems involving two- and three-digit numbers. They use mathematical modelling to solve practical problems involving single-digit multiplication and division, recalling multiplication facts for twos, threes, fours, fives and tens, and using a range of strategies. Students represent unit fractions and their multiples in different ways. They make estimates and determine the reasonableness of financial and other calculations. Students find unknown values in number sentences involving addition and subtraction. They create algorithms to investigate numbers and explore simple patterns.  Students use familiar metric units when estimating, comparing and measuring the attributes of objects and events. They identify angles as measures of turn and compare them to right angles. Students estimate and compare measures of duration using formal units of time. They represent money values in different ways. Students make, compare and classify objects using key features. They interpret and create two-dimensional representations of familiar environments.  Students conduct guided statistical investigations involving categorical and discrete numerical data and interpret their results in terms of the context. They record, represent and compare data they have collected. Students use practical activities, observation or experiment to identify and describe outcomes and the likelihood of everyday events explaining reasoning. They conduct repeated chance experiments and discuss variation in results. |

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| **Strand: Number** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise, represent and order natural numbers using naming and writing conventions for numerals beyond 10 000  AC9M3N01 | * moving materials from one place to another on a place value model to show renaming of numbers; for example, 1574 can be shown as one thousand, 5 hundreds, 7 tens and 4 ones, or as 15 hundreds, 7 tens and 4 ones * using the repeating pattern of place value names and spaces within sets of 3 digits to name and write larger numbers: ones, tens, hundreds, ones of thousands, tens of thousands, hundreds of thousands, ones of millions, tens of millions; writing, for example, four hundred and twenty-five thousand as 425 000 * predicting and naming the number that is one more than 99, 109, 199, 1009, 1099, 1999, 10 009 … 99 999 and discussing what will change when one, one ten and one hundred is added to each * comparing the Hindu-Arabic numeral system to other numeral systems; for example, investigating the Japanese numeral system, 一、十、百、千、万 * comparing, reading and writing the numbers involved in the more than 60 000 years of First Peoples of Australia’s presence on the Australian continent through time scales relating to pre-colonisation and post-colonisation | |
| recognise and represent unit fractions including , , , and and their multiples in different ways; combine fractions with the same denominator to complete the whole  AC9M3N02 | * recognising that unit fractions represent equal parts of a whole; for example, one-third is one of 3 equal parts of a whole * representing unit fractions and their multiples in different ways; for example, using a Think Board to represent three-quarters using a diagram, concrete materials, a situation and fraction notation * cutting objects such as oranges, sandwiches or playdough into halves, quarters or fifths and reassembling them to demonstrate; for example, two-halves make a whole, four-quarters make a whole, counting the fractions as they go * sharing collections of objects, such as pop sticks or counters, between 3, 4 and 5 people and connecting division with fractions; for example, sharing between 3 people gives of the collection to each and sharing between 5 people gives of the collection to each | |
| add and subtract two- and three-digit numbers using place value to partition, rearrange and regroup numbers to assist in calculations without a calculator  AC9M3N03 | * using partitioning and part-part-whole models and the inverse relationship between addition and subtraction to solve addition or subtraction problems, making informal written “jottings” to keep track of the numbers if necessary * using physical or virtual grouped materials or diagrams to make proportional models of numbers to assist in calculations; for example, to calculate 214 + 325 representing 214 as 2 groups of 100, one group of 10 and 4 ones and 325 as 3 groups of 100, 2 groups of 10 and 5 ones resulting in 5 groups of 100, 3 groups of 10 and 9 ones which is 539 * choosing between standard and non-standard place value partitions to assist with calculations; for example, to solve 485 + 365, thinking of 365 as 350 + 15, then adding the parts, 485 + 15 = 500, 500 + 350 = 850 * solving subtraction problems efficiently by adding or subtracting a constant amount to both numbers to create an easier calculation; for example, 534 – 395 adding 5 to both numbers to make 539 – 400 = 139 * justifying choices about partitioning and regrouping numbers in terms of their usefulness for particular calculations when solving problems * applying knowledge of place value to assist in calculations when solving problems involving larger numbers; for example, calculating the total crowd numbers for an agricultural show that lasts a week | |
| multiply and divide one- and two-digit numbers, representing problems using number sentences, diagrams and arrays, and using a variety of calculation strategies  AC9M3N04 | * applying knowledge of numbers and the properties of operations using a variety of ways to represent multiplication or division number sentences; for example, using a Think Board to show different ways of visualising 8 x 4, such as an array, a diagram and as a worded problem * using part-part-whole and comparative models to visually represent multiplicative relationships and choosing whether to use multiplication or division to solve problems * matching or creating a problem scenario or story that can be represented by a given number sentence involving multiplication and division; for example, using given number sentences to create worded problems for others to solve * formulating connected multiplication and division expressions by representing situations from First Nations Australians’ cultural stories and dances about how they care for Country/Place such as turtle egg gathering using number sentences | |
| estimate the quantity of objects in collections and make estimates when solving problems to determine the reasonableness of calculations  AC9M3N05 | * estimating how much space a grid paper representation of a large number such as 20 200 will take up on the wall and how much paper will be required * estimating the number of people in a large gathering; for example, school assembly, using known numbers, such as how many students per class * choosing which place value they would estimate to for different situations; for example, they would estimate to the nearest 10 when estimating how many dots on a ladybird or they would estimate to the nearest 1000 when estimating crowd sizes at a venue * checking the reasonableness of an addition calculation by using two- and three-digit numbers to the nearest 10 or hundred to estimate; for example, using 200 + 400 = 600 to estimate and check the solution to the calculation 219 + 385 | |
| use mathematical modelling to solve practical problems involving additive and multiplicative situations including financial contexts; formulate problems using number sentences and choose calculation strategies, using digital tools where appropriate; interpret and communicate solutions in terms of the situation  AC9M3N06 | * modelling practical additive situations, choosing whether to use an addition, subtraction or both when representing the problem as a number sentence, and explaining how each number in their number sentence is connected to the situation * modelling additive problems using a bar model to represent the problem; for example, “I had 75 tomatoes and then picked some more, now I have 138. How many did I pick?” * modelling practical multiplicative situations using materials or a diagram to represent the problem; for example, if 4 tomato plants each have 6 tomatoes, deciding whether to use an addition or multiplication number sentence, explaining how each number in their number sentence is connected to the situation * modelling and solving practical division problems involving unknown numbers of groups or finding how much is in each group by representing the problem with both division and multiplication number sentences; explaining how the 2 number sentences are connected to the problem * modelling the problem of deciding how to share an amount equally; for example, 48 horses into 2, 4, 6 or 8 paddocks, representing the shares with a division and a multiplication number sentence, and counting the number in each share to check the solutions | |
| follow and create algorithms involving a sequence of steps and decisions to investigate numbers; describe any emerging patterns  AC9M3N07 | * following or creating an algorithm to generate number patterns formed by doubling and halving using technology to assist where appropriate; identifying and describing emerging patterns * following or creating an algorithm that determines whether a given number is a multiple of 2, 5 or 10, identifying and discussing emerging patterns * creating an algorithm as a set of instructions that a classmate can follow to generate multiples of 3 using the rule “To multiply by 3 you double the number and add on one more of the number”; for example, for 3 threes you double 3 and add on 3 to get 9, for 3 fours you double 4 and add one more 4 to get 12 ... * creating a sorting algorithm that will sort a collection of 5 cent and 10 cent coins and providing the total value of the collection by applying knowledge of multiples of 5 and 10 | |

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| **Strand: Algebra** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise and explain the connection between addition and subtraction as inverse operations, apply to partition numbers and find unknown values in number sentences  AC9M3A01 | * partitioning numbers using materials, part-part-whole diagrams or bar models, and recording addition and subtraction facts for each representation, explaining how each fact is connected to the materials, diagrams or models; for example, 16 + 8 = 24, 24 – 8 = 16, 8 = 24 – 16 * using the inverse relationship between addition and subtraction to find unknown values with a calculator; for example, representing the problem, “Peter had some money and then spent $375, now he has $158 left. How much did Peter have to start with?” as □ – $375 = $158 and solving the problem using $375 + $158 = $533 ; solving 27 + □ = 63 using subtraction, □ = 63 – 27 or by counting on; 27, 37, 47, 57, 60, 63, so add 3 tens and 6 ones, so □ = 36 * exploring First Nations Australians’ stories and dances that show the connection between addition and subtraction, representing this as a number sentence and discussing how this conveys important information about balance in processes on Country/Place | |
| extend and apply knowledge of addition and subtraction facts to 20 to develop efficient mental strategies for computation with larger numbers without a calculator  AC9M3A02 | * partitioning using materials and part-part-whole diagrams to develop subtraction facts related to addition facts, such as 8 + 7 = 15 therefore, 15 – 7 = 8 and 15 – 8 = 7 * using partitioning to develop and record facts systematically; for example, “How many ways can 12 monkeys be spread among 2 trees?”, 12 = 12 + 0, 12 = 11 + 1, 12 = 10 + 2, 12 = 9 + 3, …; explaining how they know they have found all possible partitions * understanding basic addition and related subtraction facts and using extensions to these facts; for example, 6 + 6 = 12, 16 + 6 = 22, 6 + 7 = 13, 16 + 7 = 23, and 60 + 60 = 120, 600 + 600 = 1200 | |
| recall and demonstrate proficiency with multiplication facts for 3, 4, 5 and 10; extend and apply facts to develop the related division facts  AC9M3A03 | * using concrete or virtual materials, groups and repeated addition to recognise patterns and establish the 3, 4, 5 and 10 multiplication facts; using the language of “3 groups of 2 equals 6” to develop into “3 twos are 6” and extend to establish the 3 x 10 multiplication facts and related division facts * recognising that when they multiply a number by 5, the resulting number will either end in a 5 or a zero; using a calculator or spreadsheet to generate a list of the multiples of 5 to develop the multiplication and related division facts for fives * practising calculating and deriving multiplication facts for 3, 4, 5 and 10, explaining and recalling the patterns in them and using them to derive related division facts * systematically exploring algorithms used for repeated addition, comparing and describing what is happening, and using them to establish the multiplication facts for 3, 4, 5 and 10; for example, following the sequence of steps, the decisions being made and the resulting solution, recognising and generalising any emerging patterns | |

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| **Strand: Measurement** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| identify which metric units are used to measure everyday items; use measurements of familiar items and known units to make estimates  AC9M3M01 | * examining the packaging on supermarket items to determine the metric unit used to describe the mass or capacity of the contents * identifying items that have a mass of one kilogram or 500 grams, or a capacity of one litre or 500 millilitres and using these benchmarks to estimate the mass or capacity of other things, explaining their reasoning * estimating the height of a tree by comparing it to the height of their friend and quoting the result as “the tree is about 3 times as tall”; estimating the capacity of a fish tank by using a litre milk carton as a benchmark * choosing and using metres to estimate the dimensions of the classroom | |
| measure and compare objects using familiar metric units of length, mass and capacity, and instruments with labelled markings  AC9M3M02 | * making a measuring tape using metric units of length and using it to measure and compare things; for example, the girth of a tree; explaining that the lines on a ruler show the beginning and end of each unit * using a strip of centimetre grid paper to measure and compare the length of objects, connecting this with centimetre units on a ruler and using fractions of a graduation to give a more accurate measure * discussing how the capacity of a container or object usually refers to the amount of liquid it can hold, measured in millilitres and litres; comparing the capacity of different sizes of familiar drinks; for example, 600 millilitres, one litre, 2 litre and 3 litre milk containers * measuring and comparing the mass of objects and capacity of containers, using measuring jugs and kitchen or other scales and standard metric units of millilitres, litres, grams and kilograms; interpreting and explaining what the lines on the measuring jug or scales mean * comparing the capacity of different beakers used in science lessons and using the numbered graduations to measure out different capacities of liquid | |
| recognise and use the relationship between formal units of time including days, hours, minutes and seconds to estimate and compare the duration of events  AC9M3M03 | * estimating how long it would take to read a set passage of text, and sharing this information to demonstrate understanding of formal units of duration of time * planning a sequence of events based on estimates of the duration of each event; for example, planning a set of activities for a class party by estimating how long each game or activity will take * reading or setting the time on digital devices to the minute or second; for example, setting an online timing device to count down from a set time; or setting the time on a digital clock * using sand timers and digital timers to measure and check estimates of short durations of time, such as one minute, 3 minutes and 5 minutes * exploring how cultural accounts of First Nations Australians explain cycles of time that involve the sun, moon and stars | |
| describe the relationship between the hours and minutes on analog and digital clocks, and read the time to the nearest minute  AC9M3M04 | * representing and reading the time on an analog clock using the markings and the positions of the hands, to the nearest minute mark or five-minute interval * reading and connecting analog and digital time, interpreting times, recognising and using the language of time; for example, 12:15 as a quarter past 12, or 15 minutes past 12, 12:45 as a quarter to one or 15 minutes before one o’clock and 10:05 as 5 minutes past 10 * reading analog clocks throughout the day, and noticing and connecting the position of the hour hand and the distance the minute hand has travelled during the current hour | |
| identify angles as measures of turn and compare angles with right angles in everyday situations  AC9M3M05 | * using quarter, half and three-quarter turns and comparing them to a right angle; for example, a quarter turn is the same as a right angle; a half a turn is greater than a right angle and is the same as 2 right angles; a three-quarter turn is greater than a right angle and is the same as 3 right angles * recognising that right angles occur at the corners of many everyday objects; for example, books, windows, table tops and whiteboards * identifying angles that are bigger than, smaller than and the same as a right angle in the environment; for example, opening doors partially and fully and comparing the angles created to a right angle * exploring First Nations Australian children’s instructive games to investigate angles as measures of turn; for example, the game Waayin from the Datiwuy People in the northern part of the Northern Territory | |
| recognise the relationships between dollars and cents and represent money values in different ways  AC9M3M06 | * investigating the relationship between dollars and cents, using physical or virtual materials to make different combinations of the same amount of money * representing money amounts in different ways using knowledge of part-part-whole relationships; for example, knowing that $1 is equal to 100 cents; representing $1.85 as $1 + 50c + 20c + 10c + 5c or  50c + 50c + 50c + 10c + 10c + 10c + 5c; when calculating change from buying an item for $1.30 from $2, starting from $1.30 add 20c and 50c which gives $2 * representing money values in multiple ways when role-playing money transactions; for example, using play money to represent the coins and dollars you could use to pay for items | |

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| **Strand: Space** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| make, compare and classify objects, identifying key features and explaining why these features make them suited to their uses  AC9M3SP01 | * classifying a collection of geometric objects, including cylinders, spheres, prisms and pyramids according to key features such as the shape and number of faces and/or surfaces, edges and vertices * making and comparing objects built out of cubic blocks and discussing key features; for example, comparing the amount of space objects occupy by counting how many blocks it takes to build different rectangular prisms that have the same height but different bases * making geometric objects in solid form out of connecting cubes, in skeleton form with straws, and constructing objects using dynamic geometric software, recognising, comparing and discussing the features of the objects using the different representations * using familiar shapes and objects to build or construct models and compare the suitability of different shapes and objects for aspects of the model; for example, building rectangular towers out of connecting cubes and recognising that the taller the tower, the less stable it becomes unless the base is increased; building bridges out of straws bent into different shapes and comparing the strength of different designs * identifying, classifying and comparing common objects found on Country/Place as cubes, rectangular prisms, cylinders, cones and spheres * investigating and explaining how First Nations Australians’ dwellings are oriented in the environment to accommodate climatic conditions | |
| interpret and create two-dimensional representations of familiar environments, locating key landmarks and objects relative to each other  AC9M3SP02 | * designing the layout of a space; for example, a proposed games room or the classroom using a blank sheet of paper as the boundary and cut outs of shapes to represent furniture from a top view perspective * locating themselves within a space such as a basketball court, an oval, stage or assembly hall, guided by a simple hand-held plan indicating the different positions of the participants in the activity * sketching a map within the classroom indicating where they have hidden an object, swapping maps with partners and then providing feedback about what was helpful and what was confusing in the map * identifying differences in the representation of a place on a map, in an aerial photograph, in a street view and in a satellite image and discussing the different information the representations can give * exploring land maps or cultural maps used by First Nations Australians to locate, identify and position important landmarks such as waterholes | |

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| **Strand: Statistics** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| acquire data for categorical and discrete numerical variables to address a question of interest or purpose by observing, collecting and accessing data sets; record the data using appropriate methods including frequency tables and spreadsheets  AC9M3ST01 | * using efficient ways to collect and record data; for example, written surveys, online surveys, polling the class using interactive digital mediums, and representing and reporting the results of investigations * developing questions of interest and using surveys, observations or experiments to collect categorical, discrete numerical or qualitative data sets and discussing what kind of data can be used to help inform or answer the question in a statistical investigation * using lists, tallies, symbols and digital data tables to record and display data collected during a chance experiment for interpretation * using different online sources to access data; for example, using online query interfaces to select and retrieve data from an online database such as weather records, Google Trends or the World Health Organization * using software to sort and calculate data when solving problems; for example, sorting discrete numerical and categorical data in ascending or descending order and automating simple arithmetic calculations using nearby cells and the Sum function in spreadsheets to calculate total frequencies of collected data | |
| create and compare different graphical representations of data sets including using software where appropriate; interpret the data in terms of the context  AC9M3ST02 | * comparing various student-generated data representations and describing their similarities and differences * using digital tools and graphing software to construct graphs of data acquired through experiments or observation and interpreting the data and making inferences; for example, graphing data from a science experiment and interpreting the results * selecting appropriate formats or layout styles to present data as information, depending on the type of data and the audience; for example, lists, tables, graphs and infographics * using newspapers or magazines to find examples of different displays of data, interpreting and describing the information they present | |
| conduct guided statistical investigations involving the collection, representation and interpretation of data for categorical and discrete numerical variables with respect to questions of interest  AC9M3ST03 | * creating a poster, flowchart or infographic that describes the process of statistical investigation, and the components, the tools and the types of data that can be collected, represented and interpreted for a purpose * collaboratively working through a whole class investigation by choosing a question of interest, using an efficient collection method and recording collected data; interpreting the data in terms of the question * planning and carrying out investigations that involve collecting data; for example, narrowing the focus of a question such as, “Which is the most popular breakfast cereal?” to “Which is the most popular breakfast cereal among Year 3 students in our class?” * conducting a whole class statistical investigation into the best day to hold an open day for parents by creating a simple survey; collecting the data by asking the parents, representing and interpreting the results, and deciding as a class which day would be best * investigating seasonal calendars of First Nations Australians by collecting data and creating frequency tables and spreadsheets based on environmental indicators; creating one-to-one data displays about frequency of environmental indicators for the current season | |

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| **Strand: Probability** | | **Year 3** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| identify practical activities and everyday events involving chance; describe possible outcomes and events as ‘likely’ or ‘unlikely’ and identify some events as ‘certain’ or ‘impossible’ explaining reasoning  AC9M3P01 | * predicting what could happen next in practical activities that involve an element of chance, considering possible outcomes and using terms such as “likely” or “unlikely” to explain their predictions * classifying a list of everyday events or sorting a set of event cards according to how likely they are to happen, using the language of chance and giving reasons for classifications; discussing how impossible outcomes cannot ever happen, uncertain outcomes are affected by chance as they may or may not happen whereas certain events must always happen, so they are not affected by chance * making predictions and testing what would happen; for example, if 10 names were put in a box, and names were then drawn out one at a time and replaced after each selection, discussing how likely it would be after 10 selections that all 10 names were drawn from the box or that one name was drawn multiple times | |
| conduct repeated chance experiments; identify and describe possible outcomes, record the results, recognise and discuss the variation  AC9M3P02 | * identifying the possible outcomes of a chance experiment, creating a tally chart to record results carrying out a few trials, and tallying the results for each trial; responding to the questions: “How did your results vary for each trial?” and “How do the results vary across the class?” * conducting repeated trials of chance experiments such as tossing a coin, throwing a dice, drawing a coloured or numbered ball from a bag, using a coloured spinner with equal partitions, and identifying the variation in the number of heads/fives/reds between trials | |

Year 4

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| **Year level description** |
| In Year 4, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * draw on their proficiency with number facts, fractions and decimals to deepen their appreciation of how numbers work * develop and use strategies for multiplication that are based on their understanding of multiplication as an operation and their knowledge of laws for arithmetic operations * choose and use efficient strategies when modelling problems, communicating their solutions within the context of the situation * use algorithms to generate sets of numbers, recognising and describing any patterns that emerge * become aware of the importance of context and purpose when they make judgements and reflect on the reasonableness of measurements and the results of calculations, and how they choose to represent mathematics and mathematical information * measure and estimate common attributes of objects using conventional instruments and appropriate metric units * develop and use surveys to obtain data that is directly relevant to their statistical investigations * draw on their reasoning skills to analyse, categorise and order chance events and identify independent and dependent events * investigate variability by conducting repeated chance experiments and observing results. |
| **Achievement standard** |
| By the end of Year 4, students use their understanding of place value to represent tenths and hundredths in decimal form and to multiply natural numbers by multiples of 10. They use mathematical modelling to solve financial and other practical problems, formulating the problem using number sentences, solving the problem choosing efficient strategies and interpreting the results in terms of the situation. Students use their proficiency with addition and multiplication facts to add and subtract, multiply and divide numbers efficiently. They choose rounding and estimation strategies to determine whether results of calculations are reasonable. Students use the properties of odd and even numbers. They recognise equivalent fractions and make connections between fraction and decimal notations. Students count and represent fractions on a number line. They find unknown values in numerical equations involving addition and subtraction. Students follow and create algorithms that generate sets of numbers and identify emerging patterns.  They use scaled instruments and appropriate units to measure length, mass, capacity and temperature. Students measure and approximate perimeters and areas. They convert between units of time when solving problems involving duration. Students compare angles relative to a right angle using angle names. They represent and approximate shapes and objects in the environment. Students create and interpret grid references. They identify line and rotational symmetry in plane shapes and create symmetrical patterns.  Students create many-to-one data displays, assess the suitability of displays for representing data and discuss the shape of distributions and variation in data. They use surveys and digital tools to generate categorical or discrete numerical data in statistical investigations and communicate their findings in context. Students order events or the outcomes of chance experiments in terms of likelihood and identify whether events are independent or dependent. They conduct repeated chance experiments and describe the variation in results. |

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| **Strand: Number** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise and extend the application of place value to tenths and hundredths and use the conventions of decimal notation to name and represent decimals  AC9M4N01 | * using a bar to represent the whole, dividing it into 10 equal pieces with each piece representing 0.1 or a tenth of the whole length and understanding that 2 pieces are 0.2 or two-tenths of the whole * using materials to show the multiplicative relationship between the whole, tenths and hundredths; for example, using a bundle of 10 straws to represent the whole, one straw as the tenth and cutting the tenth into 10 parts to show the hundredths; using “Decipipes” to represent tenths * recognising that one is the same as ten-tenths and one-tenth is the same as 10 hundredths and using this relationship to rename decimals; for example, renaming 0.25 as two-tenths and five-hundredths or twenty-five-hundredths * making models of measurement attributes to show the relationship between the base unit and parts of the unit; for example, 1.5 metres is one metre and five-tenths of the next metre; 1.75 units is one unit and seventy-five hundredths of the next unit * counting large quantities of mixed notes and coins, writing the total using dollars and cents, and recognising the cents as parts of the next dollar * comparing the way money and measures are read and said, and explaining how they are the same and different; for example, $2.75 is said, “two dollars seventy-five” and 2.75 metres is said “two point seven five metres”; recognising that the 7 means seven-tenths and the 5 means five-hundredths in both | |
| explain and use the properties of odd and even numbers  AC9M4N02 | * identifying even numbers and explaining why all numbers that end in the digits 0, 2, 4, 6, and 8 are even and that numbers ending in 1, 3, 5, 7 and 9 are odd * explaining why some materials can be shared evenly between 2 people without leaving a remainder and some cannot * explaining the patterns involved in adding, subtracting and multiplying odd and even numbers; for example,  even + even = even, odd + even = odd, odd + odd = even and using this to decide whether answers to addition, subtraction and multiplication calculations are correct or not * following an algorithm consisting of a flow chart with a series of instructions and decisions to determine whether a number is even or odd; using the algorithm to identify which elements of a set of numbers are divisible by 2 | |
| find equivalent representations of fractions using related denominators and make connections between fractions and decimal notation  AC9M4N03 | * extending fraction families within collections of materials; for example, by seeing as 3 in each 4, showing this within related fractions like or seeing that means 2 in each 5 so it can be shown within * creating models of equivalent fractions by subdividing capacity measures into smaller fractions; for example,  half a cup of flour could be shown as two-quarters or four-eighths of a cup of flour * folding paper to show equivalence between different fractions; for example, folding A4 paper in half and half again, repeating to form eighths and demonstrating that ; folding paper strips into fifths and tenths, and recording as both fractions and decimals * identifying and using the connection between fractions of metres and decimals; for example, finding of a metre and connecting this to 0.25 metres or 25 centimetres, or finding of a metre and connecting this with  0.10 metres or 10 centimetres * using array diagrams to show the relationship between fractions and division and multiplication of natural numbers; for example, 3 x 4 = 12, 12 ÷ 4 = 3, of 12 is 3, of 12 is 4 | |
| count by fractions including mixed numerals; locate and represent these fractions as numbers on number lines  AC9M4N04 | * cutting objects such as oranges or sandwiches into quarters and counting by quarters to find the total number, and saying the counting sequence: one-quarter, two-quarters, three-quarters, four-quarters or one-whole,  five-quarters or one-and-one-quarter, six-quarters or one-and-two-quarters… eight-quarters or two-wholes... * subdividing the sections between whole numbers on parallel number lines so that one shows halves, another shows quarters and one other shows thirds; counting the fractions by jumping along the number lines, and noticing when the count is at the same position on the parallel lines * converting mixed numerals into improper fractions and vice versa and representing mixed numerals on a number line * using a number line to represent and count in tenths, recognising that 10 tenths is equivalent to one | |
| solve problems involving multiplying or dividing natural numbers by multiples and powers of 10 without a calculator, using the multiplicative relationship between the place value of digits  AC9M4N05 | * using physical or virtual materials to demonstrate the multiplicative relationship between the places * using materials such as place value charts, numeral expanders or sliders to recognise and explain why multiplying by 10 moves the digits one place to the left and dividing by 10 moves digits one place to the right * using a calculator or other digital tools to recognise and develop an understanding of the effect of multiplying or dividing numbers by 10s, 100s and 1,000s, recording sequences in a place value chart, in a table or spreadsheet, generalising the patterns noticed and applying them to solve multiplicative problems without a calculator | |
| develop efficient strategies and use appropriate digital tools for solving problems involving addition and subtraction, and multiplication and division where there is no remainder  AC9M4N06 | * using and choosing efficient calculation strategies for addition and subtraction problems involving larger numbers; for example, place value partitioning, inverse relationship, compatible numbers, jump strategies, bridging tens, splitting one or more numbers, extensions to basic facts, algorithms and digital tools where appropriate * using physical or virtual materials to demonstrate doubling and halving strategies for solving multiplication problems; for example, for 5 x 18, using the fact that double 5 is 10 and half of 18 is 9; or using 10 x 18 = 180 and halve 180 is 90; applying the associative property of multiplication, where 5 x 18 becomes 5 x 2 x 9, then  5 x 2 x 9 = 10 x 9 = 90 so that 5 x 18 = 90 * using an array to represent a multiplication problem, connecting the idea of how many groups and how many in each group with the rows and columns of the array, and writing an associated number sentence * using materials or a diagram to solve a multiplication or division problem, by writing a number sentence, and explaining what each of the numbers within the number sentence refers to * representing a multiplicative situation using materials, array diagrams and/or a bar model, and writing multiplication and/or division number sentences, based on whether the number of groups, the number per group or the total is missing, and explaining how each number in their number sentence is connected to the situation * using place value partitioning, basic facts and an area or region model to represent and solve multiplication problems, such as 16 × 4, thinking 10 × 4 and 6 × 4, 40 + 24 = 64 or a double, double strategy where double 16 is 32, double this is 64, so 16 x 4 is 64 * using materials or diagrams to develop and explain division strategies; for example, finding thirds, using the inverse relationship to turn division into a multiplication | |
| choose and use estimation and rounding to check and explain the reasonableness of calculations including the results of financial transactions  AC9M4N07 | * using proficiency with basic facts to estimate the result of a calculation and say what amounts the answer will be between; for example, 5 packets of biscuits at $2.60 each will cost between $10 and $15 as 5 x $2 = $10 and 5 x $3 = $15 * using rounded amounts to complete an estimated budget for a shopping trip or an excursion, explaining why overestimating the amounts is appropriate * recognising the effect of rounding in addition and multiplication calculations; rounding both numbers up, both numbers down and one number up and one number down, and explaining which is the best approximation and why | |
| use mathematical modelling to solve practical problems involving additive and multiplicative situations including financial contexts; formulate the problems using number sentences and choose efficient calculation strategies, using digital tools where appropriate; interpret and communicate solutions in terms of the situation  AC9M4N08 | * modelling and solving a range of practical additive problems using materials, part-part-whole diagrams and/or a bar model, and writing addition and/or subtraction number sentences, based on whether a part or the whole is missing; explaining how each number in their number sentence is connected to the situation * modelling practical problems with division, interpreting and representing the situation using a diagram or array to represent what is unknown (the number of groups, or the number per group); writing a division number sentence to represent the situation and choosing an efficient calculation strategy * modelling practical problems involving money, such as a budget for a large event, as requiring either addition, subtraction, multiplication or division and justifying the choice of operation in relation to the situation * modelling and solving multiplication problems involving money, such as buying 5 toy scooters for $96 each, using efficient mental strategies and written jottings to keep track if needed; for example, rounding $96 up to $100 and subtracting 5 x $4 = $20, so 5 x $96 is the same as 5 x $100 less $20, giving the answer $500 – $20 = $480 * modelling situations by formulating comparison problems using number sentences, comparison models and arrays; for example, “Ariana read 16 books for the readathon; Maryam read 4 times as many books. How many books did Maryam read?” using the expression 4 x 16 and using place value partitioning, basic facts and an array, thinking 4 x 10 = 40 and 4 x 6 = 24, so 4 x 16 can be written as 40 + 24 = 64 | |
| follow and create algorithms involving a sequence of steps and decisions that use addition or multiplication to generate sets of numbers; identify and describe any emerging patterns  AC9M4N09 | * creating an algorithm that will generate number sequences involving multiples of one to 10 using digital tools to assist, identifying and explaining emerging patterns, recognising that number sequences can be extended indefinitely * creating a basic flow chart that represents an algorithm that will generate a sequence of numbers using multiplication by a constant term; using a calculator to model and follow the algorithm, and record the sequence of numbers generated; checking results and describing any emerging patterns * using a multiplication formula in a spreadsheet and the “fill down” function to generate a sequence of numbers; for example, entering the number one in the cell A1, using “fill down” to cell A100, entering the formula “ = A1\*4 “ in the cell B1 and using the “fill down” function to generate a sequence of 100 numbers; describing emerging patterns * creating an algorithm that will generate number sequences involving multiples of one to 10 using digital tools to assist, identifying and explaining emerging patterns, recognising that number sequences can be extended indefinitely | |

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| **Strand: Algebra** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| find unknown values in numerical equations involving addition and subtraction, using the properties of numbers and operations  AC9M4A01 | * demonstrating the commutative properties of addition using materials, diagrams and number lines; for example, using number lines to demonstrate that 5 + 2 = 2 + 5, demonstrating that 2 + 2 + 3 = 7 and 2 + 3 + 2 = 7 and  3 + 2 + 2 = 7 * using balance scales and informal uniform units to create addition or subtraction number sentences showing equivalence, such as 7 + 8 = 6 + 9, and to find unknowns in equivalent number sentences, such as 6 + 8 = □ + 10 * using relational thinking and knowledge of equivalent number sentences to explain whether equations involving addition or subtraction are true; for example, explaining that 27 – 14 = 17 – 4 is true and using a number line to show the common difference is 13 * using part-part-whole diagrams or bar models to recognise and explain the inverse relationship between addition and subtraction, using this to make calculations easier; for example, solving 27 + □ = 63 using subtraction,  □ = 63 – 27 | |
| recall and demonstrate proficiency with multiplication facts up to 10 x 10 and related division facts; extend and apply facts to develop efficient mental strategies for computation with larger numbers without a calculator  AC9M4A02 | * using arrays on grid paper or created with blocks or counters to develop, represent and explain patterns in the  10 x 10 multiplication facts; using the arrays to explain the related division facts * using materials or diagrams to develop and record multiplication strategies such as doubling, halving, commutativity, and adding one more or subtracting from a group to reach a known fact; for example, creating multiples of 3 on grid paper and doubling to find multiples of 6; recording and explaining the connections to the x3 and x6 multiplication facts: 3, 6, 9, … doubled is 6, 12, 18, … * using known multiplication facts for 2, 3, 5 and 10 to establish multiplication facts for 4, 6, 7, 8 and 9 in different ways; for example, using multiples of 10 to establish the multiples of 9 as “to multiply a number by 9 you multiply by 10 then take the number away”; 9 x 4 = 10 x 4 – 4, so 9 x 4 is 40 – 4 = 36; using multiple of 3 as “to multiply a number by 9 you multiply by 3, and then multiply the result by 3 again” * using arrays and known multiplication facts for twos and fives to develop the multiplication facts for sevens, applying the distributive property of multiplication; for example, when finding 6 x 7, knowing that 7 is made up  of 2 and 5, and using an array to show that 6 x 7 is the same as 6 x 2 + 6 x 5 = 12 + 30 which is 42 * using known multiplication facts up to 10 x 10 and the inverse relationship of multiplication and division to establish corresponding division facts * designing, creating and playing instructive card games that involve the recall, recognition and explanation of the 10 x 10 multiplication facts and related division facts | |

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| **Strand: Measurement** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| interpret unmarked and partial units when measuring and comparing attributes of length, mass, capacity, duration and temperature, using scaled and digital instruments and appropriate units  AC9M4M01 | * reading the mass of objects measured with digital and analog kitchen scales and explaining what unit of mass the lines on the analog scales refer to * deciding on which attribute, unit and measuring instrument to use to compare the length and mass of various things, such as the distance travelled by an object in a science investigation; explaining the use of units such as grams or millimetres to give accurate measures when needed * using scaled instruments such as tape measures, measuring jugs, kitchen scales and thermometers, recording measures using whole units; for example, 560 millimetres, or whole and part units; for example, 5.25 metres,  1.75 litres, 2.5 kilograms, 28.5° Celsius * reading and interpreting the scale of an analog clock without marked minutes to estimate the time to the nearest minute and to determine the duration of time between events * using the timer or alarm function of a clock to alert when a specified duration has elapsed from a given starting time; for example, the different activities of an exercise routine * making a scaled measuring instrument such as a tape measure, ruler, sand timer, sun dial or measuring cup using scaled instruments and direct comparisons * exploring the different types of scaled instruments used by First Nations Ranger Groups and other groups to make decisions about caring for Country/Place, and modelling these in local contexts | |
| recognise ways of measuring and approximating the perimeter and area of shapes and enclosed spaces, using appropriate formal and informal units  AC9M4M02 | * recognising that perimeter is the sum of the lengths that form the boundary of a shape or enclosed space; choosing suitable units from a range of objects to measure around the boundary of a shape such as a garden bed; comparing the results to say which unit was an appropriate choice for the context; using a piece of string or rope to measure the perimeter of irregular shapes and enclosed spaces, including those that have curved sections * creating a range of rectangles representing “paddocks” on grid paper and establishing different methods of working out the length of the boundary fences; explaining that the more efficient methods involve adding the side lengths rather than counting squares * recognising that area is the space enclosed by the boundary of a shape or the surface of an object; measuring and comparing the area of shapes, using an array of paper tiles or mosaic squares, including part units to fill gaps at the edge of the shapes; comparing the total areas by combining the fractional parts to make whole units * demonstrating how to use one unit repeatedly to measure the area of a shape; for example, using one paper square to measure and compare the area of a rectangle and a triangle; recording and explaining how they used part units to give a more accurate measure, and why they needed to ensure there were no gaps or overlaps * investigating the ways First Nations Ranger Groups and other groups measure areas of land to make decisions about fire burns to care for Country/Place | |
| solve problems involving the duration of time including situations involving “am” and “pm” and conversions between units of time  AC9M4M03 | * calculating the amount of time between 2 events, such as the start and finish of a movie, a bus journey or a flight, including cases where the starting and finishing times are written using “am” and “pm” notation * converting units of time using relationships between units, such as 60 minutes in an hour and 60 seconds in a minute, to solve problems; for example, creating a daily timetable for an activity such as an athletics carnival or planning an exercise routine with activities and rests * exploring First Nations Australians’ explanations of the passing of time through cultural accounts about cyclic phenomena involving sun, moon and stars | |
| estimate and compare angles using angle names including acute, obtuse, straight angle, reflex and revolution, and recognise their relationship to a right angle  AC9M4M04 | * classifying the interior angles of a range of shapes, using examples of angles to identify acute, obtuse, right and reflex angles * identifying angles within the environment and estimating whether they are acute, obtuse right or reflex * creating a right-angle template using cardboard or a double-folded piece of paper and using it to compare angles in the environment, commenting on whether they are smaller than or greater than a right angle * using different measuring tools such as a spirit level or set squares to determine whether lines or objects are straight, square or perpendicular (at right angles) | |

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| **Strand: Space** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| represent and approximate composite shapes and objects in the environment, using combinations of familiar shapes and objects  AC9M4SP01 | * identifying common shapes that form part of a composite shape by re-creating these shapes using physical or virtual materials * physically or virtually using cubes to make three-dimensional models that approximate real objects; for example, building a virtual environment by using a computer software program to construct objects out of cubes * approximating complex shapes and objects in the environment with familiar shapes and objects; for example, drawing cartoon animals by combining familiar shapes * recognising how familiar shapes and objects are used in logos and other graphics to represent more complex shapes and creating logos using graphic design software | |
| create and interpret grid reference systems using grid references and directions to locate and describe positions and pathways  AC9M4SP02 | * interpreting a grid reference map of a familiar location of interest, such as a map of the showgrounds, a food festival, botanical garden, a park in the local area or a train station, and writing instructions using grid references for a friend to find them at a specified location * recognising that a spreadsheet uses a grid reference system, locating and entering data in cells and using a spreadsheet to record data collected through observations or experiments * comparing and contrasting, describing and locating landmarks, people or things in a bird’s eye picture of a busy scene, such as people in a park, initially without a transparent grid reference system overlaid on the picture, and then with the grid overlaid; noticing how the grid helps to pinpoint things quickly and easily * using different sized grids as a tool to enlarge an image or artwork | |
| recognise line and rotational symmetry of shapes and create symmetrical patterns and pictures, using dynamic geometric software where appropriate  AC9M4SP03 | * identifying rotational symmetry of shapes by tracing around various shapes and objects to create an image, and using the image to test and record which different rotations result in the same image * using dynamic geometric software to manipulate shapes and create symmetrical patterns; for example, creating tessellation patterns that are symmetrical * using stimulus materials such as the motifs in Central Asian textiles, Tibetan artefacts, Indian lotus designs and Islamic artwork to investigate and discuss line and rotational symmetry * exploring the natural environment on Country/Place to investigate and discuss patterns and symmetry of shapes and objects such as in flowers, plants and landscapes | |

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| **Strand: Statistics** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| acquire data for categorical and discrete numerical variables to address a question of interest or purpose using digital tools; represent data using many-to-one pictographs, column graphs and other displays or visualisations; interpret and discuss the information that has been created  AC9M4ST01 | * investigating many-to-one data displays using digital tools and graphical software, interpreting and discussing key features * understanding that data can be represented with one symbol representing more than one piece of data, and that it is important to read all information about a representation before making judgements * constructing graphs of data collected through observation during science experiments, recording, interpreting and discussing the results in terms of the scientific study * acquiring samples of data using practical activities, observations or repeated chance experiments, recording data using tally charts, digital tables or spread sheets, graphing, discussing and comparing the results using a column graph * using secondary data of fire burns to construct data displays that assist First Nations Ranger Groups and other groups to care for Country/Place | |
| analyse the effectiveness of different displays or visualisations in illustrating and comparing data distributions, then discuss the shape of distributions and the variation in the data  AC9M4ST02 | * suggesting questions that can be answered by a given data display and using the display to answer these questions * interpreting data representations in the media and other forums where symbols represent one-to-many relationships and how this can be challenging when the representations use part-whole representations * comparing different student generated diagrams, tables and graphs, describing their similarities and differences and commenting on the usefulness of each representation for interpreting the data | |
| conduct statistical investigations, collecting data through survey responses and other methods; record and display data using digital tools; interpret the data and communicate the results  AC9M4ST03 | * creating a survey to collect class responses to a preferred movie choice, and recording data responses using spreadsheets; graphing data using a column graph or other appropriate representations and interpreting the results of the survey reporting findings back to the class * conducting a statistical investigation and acquiring data from different online sources; for example, using online query interfaces to select and retrieve data from an online database such as weather records, Google Trends or the World Health Organization * investigating different contexts in which statistical investigations can take place and the types of questions to ask to collect data relevant to the context; for example, investigating supermarket customer complaints that breakfast cereals with the most sugar are positioned at children’s eye level, discussing what questions they would need to ask and answer | |

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| **Strand: Probability** | | **Year 4** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| describe possible everyday events and the possible outcomes of chance experiments and order outcomes or events based on their likelihood of occurring; identify independent or dependent events  AC9M4P01 | * using lists of events familiar to students and ordering them from “least likely” to “most likely” to occur; considering and discussing why the order of some events might be different for different students * predicting the outcome of a coin toss after 5 heads have been flipped in a row, discussing the assertion that because so many heads came up, it is more likely that a tail rather than a head will come up next; discussing with reasons why the assumption is correct or incorrect * predicting how likely , from least likely to most likely, of selecting a red ball from a bag containing 10 red balls and 5 white balls, a bag containing 20 of each, or one that has 25 red balls and 20 white balls, justifying their decision * identifying school activities where the chance of them taking place is affected by the chance of other events occurring; for example, given that there is a high chance of a storm on Friday, there is only a small chance that the coastal dune planting project will go ahead * listing the outcomes of everyday chance situations and identifying where one cannot happen if the other happens; for example, discussing that it cannot be hot and cold at the same time; selecting a card from a deck and discussing if it is red it cannot be a spade or a club * identifying different dependent events where the chance of one outcome occurring will be affected by the occurrence of other outcomes and different independent events where the chance of one outcome occurring will not be affected by the occurrence of other outcome(s) | |
| conduct repeated chance experiments to observe relationships between outcomes; identify and describe the variation in results  AC9M4P02 | * playing games such as Noughts and Crosses or First to 20 and deciding if it makes a difference who goes first and whether you can use a particular strategy to increase your chances of winning * recording and ordering the outcomes of experiments using different physical or virtual random generators such as coins, dice and a variety of spinners * experimenting with tossing 2 coins at the same time, recording and commenting on the chance of outcomes after a number of tosses * shuffling a set of cards, drawing a card at random, and recording whether it was a spade, club, diamond or heart, picture card or numbered; repeating the experiment a number of times and discussing the results | |

Year 5

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| **Year level description** |
| In Year 5, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * apply their understanding of relationships to convert between forms of numbers, units and spatial representations * use mathematical modelling to solve practical problems with guidance, using natural numbers and operations, and report on insights and conclusions they reach about the context * use common percentages to make proportional comparisons of quantities * use appropriate instruments and digital tools to construct and measure angles in degrees * use appropriate metric units to directly measure the area and perimeter of regular and irregular spaces * locate and move positions within a grid coordinate system * recognise what stays the same and what changes when shapes undergo transformations * experiment with factors and multiples using algorithms and digital tools * plan, conduct and report findings from statistical investigations that involve an increasing range of types of data and means for representing data * develop their reasoning skills when they consider relationships between events and connect long-term frequency over many trials to the likelihood of an event occurring. |
| **Achievement standard** |
| By the end of Year 5, students use place value to write and order decimals including decimals greater than one. They express natural numbers as products of factors and identify multiples. Students order and represent add and subtract fractions with the same or related denominators. They represent common percentages and connect them to their fraction and decimal equivalents. Students use their proficiency with multiplication facts and efficient calculation strategies to multiply large numbers by one- and two-digit numbers and divide by single-digit numbers. They check the reasonableness of their calculations using estimation. Students use mathematical modelling to solve financial and other practical problems, formulating and solving problems, choosing arithmetic operations and interpreting results in terms of the situation. They apply properties of numbers and operations to find unknown values in numerical equations involving multiplication and division. Students create and use algorithms to identify and explain patterns in the factors and multiples of numbers.  They choose and use appropriate metric units to measure the attributes of length, mass and capacity, and to solve problems involving perimeter and area. Students convert between 12- and 24-hour time. They estimate, construct and measure angles in degrees. Students use grid coordinates to locate and move positions. They connect objects to their two-dimensional nets. Students perform and describe the results of transformations and identify any symmetries.  They plan and conduct statistical investigations that collect nominal and ordinal categorical and discrete numerical data using digital tools. Students identify the mode and interpret the shape of distributions of data in context. They interpret and compare data represented in line graphs. Students conduct repeated chance experiments, list the possible outcomes, estimate likelihoods and make comparisons between those with and without equally likely outcomes. |

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| **Strand: Number** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| interpret, compare and order numbers with more than 2 decimal places, including numbers greater than one, using place value understanding; represent these on a number line  AC9M5N01 | * making models of decimals including tenths, hundredths and thousandths by subdividing materials or grids, and explaining the multiplicative relationship between consecutive places; for example, thousandths are 10 times smaller than hundredths; writing numbers into a place value chart to compare and order them * renaming decimals to assist with mental computation; for example, when asked to solve 0.6 ÷ 10 they rename 6 tenths as 60 hundredths and say, “if I divide 60 hundredths by 10, I get 6 hundredths” and write 0.6 ÷ 10 = 0.06 * using a number line or number track to represent and locate decimals with varying numbers of decimal places and numbers greater than one and justifying the placement; for example, 2.335 is halfway between 2.33 and 2.34; that is, 2.33 < 2.335 < 2.34 and 5.283 is between 5.28 and 5.29, but closer to 5.28 * interpreting and comparing the digits in decimal measures; for example, the length or mass of animals or plants, such as a baby echidna weighing 1.78 kilograms and a platypus weighing 1.708 kilograms * interpreting plans or diagrams showing length measures as decimals, placing the numbers into a decimal place value chart to connect the digits to their value | |
| express natural numbers as products of their factors, recognise multiples and determine if one number is divisible by another  AC9M5N02 | * using a certain number of blocks to form different rectangles and using these to list all possible factors for that number; for example, 12 blocks can form the following rectangles: 1 x 12, 2 x 6, and 3 x 4 * researching divisibility tests and explaining each rule using materials; for example, using base-10 blocks to test if numbers are divisible by 2, 5 and 10 * using divisibility tests to determine if larger numbers are multiples of one-digit numbers; for example, testing if 89472 is divisible by 3 using 8 + 9 + 4 + 7 + 2 = 30 as 30 is divisible by 3 then 89472 is a multiple of 3 * demonstrating and reasoning that all multiples can be formed by combining or regrouping; for example, multiples of 7 can be formed by combining a multiple of 2 with the corresponding multiple of 5; 3 x 7 = 3 x 2 + 3 x 5, and 4 x 7 = 4 x 2 + 4 x 5 | |
| compare and order fractions with the same and related denominators including mixed numerals, applying knowledge of factors and multiples; represent these fractions on a number line  AC9M5N03 | * using pattern blocks to represent equivalent fractions; selecting one block or a combination of blocks to represent one whole, and making a design with shapes; recording the fractions to justify the total * creating a fraction wall from paper tape to model and compare a range of different fractions with related denominators; using the model to play fraction wall games * connecting a fraction wall model and a number line model of fractions to say how they are the same and how they are different; for example, explaining on a fraction wall represents the area of one-quarter of the whole while on the number line is identified as a point that is one-quarter of the distance between zero and one * using an understanding of factors and multiples as well as equivalence to recognise efficient methods for the location of fractions with related denominators on parallel number lines; for example, explaining on parallel number lines that is located at the same position on a parallel number line as because is equivalent to * converting between mixed numerals and improper fractions to assist with locating them on a number line | |
| recognise that 100% represents the complete whole and use percentages to describe, represent and compare relative size; connect familiar percentages to their decimal and fraction equivalents  AC9M5N04 | * recognising applications of percentages used in everyday contexts; for example, the bar model used for charging devices indicating the percentage of power remaining; advertising in retail contexts relating to discounts or sales * creating a model by subdividing a whole; for example, using 10 x 10 grids to represent various percentage amounts and recognising complementary percentages, such as 30% and 70% combine to make 100% * creating a model by subdividing a collection of materials, such as blocks or money, to connect decimals and percentage equivalents of tenths and commonly used fractions , and; for example, one-tenth or 0.1 represents 10% and one half or 0.5 represents 50%; recognising that 60% is 10% more than 50% * using physical and virtual materials to represent the relationship between decimal notation and percentages; for example, 0.3 is 3 out of every 10, which is 30 out of every 100, which is 30% | |
| solve problems involving addition and subtraction of fractions with the same or related denominators, using different strategies  AC9M5N05 | * using different ways to add and subtract fractional amounts by subdividing different models of measurement attributes; for example, adding half an hour and three-quarters of an hour using a clock face, adding a cup of flour and a cup of flour, subtracting of a metre from 2 metres * representing and solving addition and subtraction problems involving fractions by using jumps on a number line, bar models or making diagrams of fractions as parts of shapes * using materials, diagrams, number lines or arrays to show and explain that fraction number sentences can be rewritten in equivalent forms without changing the quantity; for example, is the same as | |
| solve problems involving multiplication of larger numbers by one- or two-digit numbers, choosing efficient calculation strategies and using digital tools where appropriate; check the reasonableness of answers  AC9M5N06 | * solving multiplication problems such as 253 x 4 using a doubling strategy; for example, 2 x 253 = 506 and  2 x 506 = 1012 * solving multiplication problems like 15 x 16 by thinking of factors of both numbers, 15 = 3 x 5, 16 = 2 x 8; rearranging the factors to make the calculation easier, 5 x 2 = 10, 3 x 8 = 24 and 10 x 24 = 240 * using an array to show place value partitioning to solve multiplication, such as 324 x 8, thinking  300 x 8 = 2400, 20 x 8 = 160, 4 x 8 = 32 then adding the parts, 2400 + 160 + 32 = 2592; connecting the parts of the array to a standard written algorithm * using different strategies used to multiply numbers, explaining how they work and if they have any limitations; for example, discussing how the Japanese visual method for multiplication is not effective for multiplying larger numbers | |
| solve problems involving division, choosing efficient strategies and using digital tools where appropriate; interpret any remainder according to the context and express results as a whole number, decimal or fraction  AC9M5N07 | * interpreting and solving everyday division problems such as, “How many buses are needed if there are 436 passengers, and each bus carries 50 people?”, deciding whether to round up or down in order to accommodate the remainder and justifying choices * solving division problems mentally like 72 divided by 9, 72 ÷ 9, by thinking, “how many 9s make 72”, ? x 9 = 72 or “share 72 equally 9 ways” * using the fact that equivalent division calculations result if both numbers are divided by the same factor | |
| check and explain the reasonableness of solutions to problems including financial contexts using estimation strategies appropriate to the context  AC9M5N08 | * interpreting a series of contextual problems to decide whether an exact answer or an approximate calculation is appropriate; explaining their reasoning in relation to the context and the numbers involved * recognising the effect of rounding addition, subtraction, multiplication and division calculations, rounding both numbers up, both numbers down, and one number up and one number down; explaining which estimation is the best approximation and why * considering the type of rounding that is appropriate when estimating the amount of money required; for example, rounding up or rounding down when buying one item from a store using cash, compared to rounding up the cost of every item when buying groceries to estimate the total cost and not rounding when the financial transactions are digital | |
| use mathematical modelling to solve practical problems involving additive and multiplicative situations including financial contexts; formulate the problems, choosing operations and efficient calculation strategies, using digital tools where appropriate; interpret and communicate solutions in terms of the situation  AC9M5N09 | * modelling an everyday situation and determining which operations can be used to solve it using materials, diagrams, arrays and/or bar models to represent the problem ; formulating the situation as a number sentence and justifying their choice of operations in relation to the situation * modelling a series of contextual problems, deciding whether an exact answer or an approximate calculation is appropriate; explaining their reasoning in relation to the context and the numbers involved * modelling financial situations such as creating financial plans; for example, creating a budget for a class fundraising event, using a spreadsheet to tabulate data and perform calculations * investigating how mathematical models involving combinations of operations can be used to represent songs, stories and/or dances of First Nations Australians | |
| create and use algorithms involving a sequence of steps and decisions and digital tools to experiment with factors, multiples and divisibility; identify, interpret and describe emerging patterns  AC9M5N10 | * creating algorithms that use multiplication and division facts to determine if a number is a multiple or factor of another number; for example, using a flow chart that determines whether numbers are factors or multiples of other numbers using branching, such as yes/no decisions * identifying lowest common multiples and highest common factors of pairs or triples of natural numbers; for example, the lowest common multiple of {6, 9} is 18, and the highest common factor is 3; the lowest common multiple of {3, 4, 5} is 60 and the highest common factor is one * using the “fill down” function of a spreadsheet and a multiplication formula to generate a sequence of numbers that represent the multiples of any number you enter into the cell; describing and explaining the emerging patterns | |

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| **Strand: Algebra** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise and explain the connection between multiplication and division as inverse operations and use this to develop families of number facts  AC9M5A01 | * using materials or diagrams to develop and explain division strategies, such as halving, using the inverse relationship to turn division into a multiplication * using arrays, multiplication tables, and physical and virtual materials to develop families of facts; for example,  3 x 4 = 12, 4 x 3 = 12, 12 ÷ 3 = 4 and 12 ÷ 4 = 3 * demonstrating multiplicative partitioning using materials, diagrams or arrays and recording 2 multiplication and  2 division facts for each grouping; 4 x 6 = 24, 6 x 4 = 24, 24 ÷ 4 = 6 and 24 ÷ 6 = 4; explaining how each is different from and connected to groups in the materials, diagrams or arrays * using materials, diagrams or arrays to recognise and explain the inverse relationship between multiplication and division; for example, solving 240 ÷ 20 = □ by thinking 20 x □ = 240; using the inverse to make calculations easier; for example, solving 17 x □ = 221 using division, □ = 221 ÷ 17 | |
| find unknown values in numerical equations involving multiplication and division using the properties of numbers and operations  AC9M5A02 | * using knowledge of equivalent number sentences to form and find unknown values in numerical equations; for example, given that 3 x 5 = 15 and 30 ÷ 2 = 15 then 3 x 5 = 30 ÷ 2 therefore the solution to 3 x 5 = 30 ÷ □ is 2 * using relational thinking, an understanding of equivalence and number properties to determine and reason about numerical equations; for example, explaining whether an equation involving equivalent multiplication number sentences is true, such as 15 ÷ 3 = 30 ÷ 6 * using materials, diagrams and arrays to demonstrate that multiplication is associative and commutative but division is not; for example, using arrays to demonstrate that 2 x 3 = 3 x 2 but 6 ÷ 3 does not equal 3 ÷ 6; demonstrating that 2 x 2 x 3 = 12 and 2 x 3 x 2 = 12 and 3 x 2 x 2 = 12; understanding that  8 ÷ 2 ÷ 2 = (8 ÷ 2) ÷ 2 = 2 but 8 ÷ (2 ÷ 2) = 8 ÷ 1 = 8 * using materials, diagrams or arrays to recognise and explain the distributive property; for example, where 4 x 13 = 4 x 10 + 4 x 3 * constructing equivalent number sentences involving multiplication to form a numerical equation, and applying knowledge of factors, multiples and the associative property to find unknown values in numerical equations; for example, considering 3 x 4 = 12 and knowing 2 x 2 = 4 then 3 x 4 can be written as 3 x (2 x 2) and using the associative property (3 x 2) x 2 so 3 x 4 = 6 x 2 and so 6 is the solution to 3 x 4 = □ x 2 | |

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| **Strand: Measurement** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| choose appropriate metric units when measuring the length, mass and capacity of objects; use smaller units or a combination of units to obtain a more accurate measure  AC9M5M01 | * ordering metric units from the largest unit to the smallest; for example, kilometre, metre, centimetre, millimetre * recognising that some units of measurement are better suited to some tasks than others; for example, kilometres are more appropriate than metres to measure the distance between 2 towns * deciding on the unit required to estimate the amount of paint or carpet for a room or a whole building; justifying the choice of unit in relation to the context and the degree of accuracy required * measuring and comparing distances, such as jumps or throws using a metre length of string; for example, then measuring the part metre with centimetres and/or millimetres; explaining which unit of measure is most accurate * researching how the base units are derived for the International System of Units (SI), commonly known as the metric system of units, recognising that the metric unit names for the attributes, length and mass are international standards for measurement | |
| solve practical problems involving the perimeter and area of regular and irregular shapes using appropriate metric units  AC9M5M02 | * investigating problem situations involving perimeter; for example, “How many metres of fencing are required around a paddock, or around a festival event?” * using efficient ways to calculate the perimeters of rectangles, such as adding the length and width together and doubling the result * solving measurement problems, such as “How much carpet would be needed to cover the entire floor of the classroom”, using square metre templates to directly measure the floor space * creating a model of a permaculture garden, dividing the area up to provide the most efficient use of space for gardens and walkways, labelling the measure of each area, and calculating the amount of resources needed; for example, compost to cover the vegetable garden * using a physical or a virtual “geoboard app” to recognise the relationship between area and perimeter and solve problems; for example, investigating what is the largest and what is the smallest area that has the same perimeter * exploring the designs of fishing nets and dwellings of First Nations Australians, investigating the perimeter, area and purpose of the shapes within the designs | |
| compare 12- and 24-hour time systems and solve practical problems involving the conversion between them  AC9M5M03 | * using timetables written in 24-hour time, such as flight schedules, to plan an overseas or interstate trip, converting between 24- and 12-hour time * converting between the digital and analog representation of 24-hour time, matching the same times represented in both systems; setting the time on an analog watch using a digital alarm clock | |
| estimate, construct and measure angles in degrees, using appropriate tools including a protractor, and relate these measures to angle names  AC9M5M04 | * using a protractor to measure angles in degrees and classifying these angles using angle names; for example, an acute angle is less than 90°, an obtuse angle is more than 90° and less than 180°, a right angle is equal to 90° and a reflex angle is more than 180° and less than 360° * estimating the size of angles in the environment using a clinometer and describing the angles using angle names * using a ruler and protractor to construct triangles, given the angle measures and side lengths * using a protractor to measure angles when creating a pattern or string design within a circle * recognising the size of angles within shapes that do and do not tesselate, measuring the angles and using the sum of angles to explain why some shapes will tesselate and other shapes do not | |

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| **Strand: Space** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| connect objects to their nets and build objects from their nets using spatial and geometric reasoning  AC9M5SP01 | * designing and constructing exact nets for packaging particular shaped items or collections of interest, taking into consideration how the faces will be joined and how the package will be opened * visualising folding some possible nets for a range of prisms and pyramids, predicating which will work and which cannot work, and justifying their choices, based on the number, size and position of particular shapes in each diagram * sketching nets for a range of prisms and pyramids considering the number, shape and placement of the faces, and test by cutting and folding * investigating objects designed and developed by First Nations Australians, such as those used in fish traps and instructive toys, identifying the shape and relative position of each face to determine the net of the object | |
| construct a grid coordinate system that uses coordinates to locate positions within a space; use coordinates and directional language to describe position and movement  AC9M5SP02 | * understanding how the numbers on the axes on a grid coordinate system are numbers on a number line and are used to pinpoint locations * discussing the conventions of indicating a point in a grid coordinate system; for example, writing the horizontal axis number first and the vertical axis number second, using brackets and commas * comparing a grid reference system to a grid coordinate system (first quadrant only) by using both to play strategy games involving location; for example, “Quadrant Commander”, deducing that in a grid coordinate system the lines are numbered (starting from zero), not the spaces * placing a coordinate grid over a contour line, drawing and listing the coordinates of each point in the picture, asking a peer to re-create the drawing using only the list of coordinates, and discussing the reasons for the potential similarities and differences between the 2 drawings | |
| describe and perform translations, reflections and rotations of shapes, using dynamic geometric software where appropriate; recognise what changes and what remains the same, and identify any symmetries  AC9M5SP03 | * understanding and explaining that translations, rotations and reflections can change the position and orientation of a shape but not the shape or size * using pattern blocks and paper tracing around a shape and conducting a series of a one-step transformations; continuing to trace each resulting image, then copying the original position and end position on a new sheet of paper * demonstrating how different combinations of transformations can produce the same resulting image * challenging classmates to select a combination of transformations to move from an original image to the final image, noting the different combinations by using different colours to trace images * investigating how animal tracks can be interpreted by First Nations Australians using the transformation of their shapes to help determine and understand animal behaviour | |

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| **Strand: Statistics** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| acquire, validate and represent data for nominal and ordinal categorical and discrete numerical variables to address a question of interest or purpose using software including spreadsheets; discuss and report on data distributions in terms of highest frequency (mode) and shape, in the context of the data  AC9M5ST01 | * recognising that ordinal data is a form of categorical data even though the data being collected might be numbers; for example, a rating scale using numbers 1 – 5 to represent the categories people can choose from when asked, “What rating would you give this film out of 5?” * determining the mode for a set of data and discussing that there may be more than one mode * identifying the best methods of presenting data to illustrate the results of investigations and justifying the choice of representations * acquiring data through chance experiments, discussing and reporting on the distribution of outcomes and how this relates to equal and unequal outcomes * using digital systems to validate data; for example, recognising the difference between numerical, text and date formats in spreadsheets; setting data types in a spreadsheet to make sure a date is input correctly * investigating data relating to Australia’s reconciliation process with First Nations Australians, posing questions, discussing and reporting on findings | |
| interpret line graphs representing change over time; discuss the relationships that are represented and conclusions that can be made  AC9M5ST02 | * reading and interpreting different line graphs, discussing how the horizontal axis represents measures of time such as days of the week or times of the day, and the vertical axis represents numerical quantities or ordinal categorical variables such as percentages, money, measurements or ratings such as fire hazard ratings * interpreting real-life data represented as a line graph showing how measurements change over a period of time and make simple inferences * matching unlabelled line graphs to the context they represent based on the stories of the different contexts * interpreting the data represented in a line graph making inferences; for example, reading line graphs that show the varying temperatures or UV rates over a period of a day and discussing when would be the best time to hold an outdoor assembly | |
| plan and conduct statistical investigations by posing questions or identifying a problem and collecting relevant data; choose appropriate displays and interpret the data; communicate findings within the context of the investigation  AC9M5ST03 | * posing questions about insect diversity in the playground, collecting data by taping a one-metre-square piece of paper to the playground, and observing the type and number of insects on it over time * posing a question or identifying a problem of interest, collecting, interpreting and analysing the data and discussing if the data generated provides the information necessary to answer the question * developing survey questions that are objective, without opinion and have a balanced set of answer choices without bias * exploring First Nations Ranger Groups’ and other groups’ biodiversity detection techniques to care for Country/Place, posing investigative questions, collecting and interpreting related data to represent and communicate findings | |

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| **Strand: Probability** | | **Year 5** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| list the possible outcomes of chance experiments involving equally likely outcomes and compare to those which are not equally likely  AC9M5P01 | * discussing what it means for outcomes to be equally likely and comparing the number of possible and equally likely outcomes of chance events; for example, when drawing a card from a standard deck of cards there are 4 possible outcomes if you are interested in the suit, 2 possible outcomes if you are interested in the colour or 52 outcomes if you are interested in the exact card * discussing how chance experiments that have equally likely outcomes can be referred to as random chance events; for example, if all the names of students in a class are placed in a hat and one is drawn at random, each person has an equally likely chance of being drawn * commenting on the chance of winning games by considering the number of possible outcomes and the consequent chance of winning * investigating why some games are fair and others are not; for example, drawing a track game to resemble a running race and taking it in turns to roll 2 dice, where the first runner moves a square if the difference between the 2 dice is zero, one or 2 and the second runner moves a square if the difference is 3, 4 or 5; responding to the questions, “Is this game fair?”, “Are some differences more likely to come up than others?” and “How can you work that out?” * comparing the chance of a head or a tail when a coin is tossed, whether some numbers on a dice are more likely to be facing up when the dice is rolled, or the chance of getting a 1, 2 or 3 on a spinner with uneven regions for the numbers * discussing supermarket promotions such as collecting stickers or objects and whether there is an equal chance of getting each of them | |
| conduct repeated chance experiments including those with and without equally likely outcomes, observe and record the results ; use frequency to compare outcomes and estimate their likelihoods  AC9M5P02 | * discussing and listing all the possible outcomes of an activity and conducting experiments to estimate the probabilities; for example, using coloured cards in a card game and experimenting with shuffling the deck and turning over one card at a time, recording and discussing the results * conducting experiments, recording the outcomes and the number of times the outcomes occur, describing the relative frequency of each outcome; for example, using “I threw the coin 10 times, and the results were 3 times for a head, so that is 3 out of 10, and 7 times for a tail, so that is 7 out of 10” * experimenting with and comparing the outcomes of spinners with equal-coloured regions compared to unequal regions; responding to questions such as “How does this spinner differ to one where each of the colours has an equal chance of occurring?”, giving reasons * comparing the results of experiments using a fair dice and one that has numbers represented on faces more than once, explaining how this affects the likelihood of outcomes * using spreadsheets to record the outcomes of an activity and calculate the total frequencies of different outcomes, representing these as a fraction; for example, using coloured balls in a bag, drawing one out at a time and recording the colour, replacing them in the bag after each draw * investigating First Nations Australian children’s instructive games; for example, Diyari koolchee from the Diyari Peoples near Lake Eyre in South Australia, to conduct repeated trials and explore predictable patterns, using digital tools where appropriate | |

Year 6

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| **Year level description** |
| In Year 6, learning in Mathematics builds on each student’s prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.  Students further develop proficiency and positive dispositions towards mathematics and its use as they:   * expand the repertoire of numbers they work with to include rational numbers and the use of integers in practical contexts such as locating points in the 4 quadrants of a Cartesian plane * extend their knowledge of factors and multiples to understand the properties of prime, composite and square numbers * solve arithmetic problems involving all 4 operations with natural numbers of any size * use mathematical modelling to solve practical problems, choosing models, representations and calculation strategies and justify solutions * apply computational approaches to develop algorithms that use rules to generate numbers * develop a range of written and digital means for representing objects and three-dimensional spaces in 2 dimensions * apply their understanding of area and use multiplicative thinking to establish the formula for the areas of a rectangle * begin to formally use deductive reasoning in spatial contexts involving lines and angles * describe and compare probabilities numerically * determine the mode and range and discuss the shape of distributions in their reports of findings from their statistical investigations * observe and compare long-run frequencies in repeated chance experiments and simulations. |
| **Achievement standard** |
| By the end of Year 6, students use integers to represent points on a number line and in the Cartesian plane. They solve problems using the properties of prime, composite and square numbers. Students order common fractions, giving reasons, and add and subtract fractions with related denominators. They use all 4 operations with decimals and connect decimal representations of measurements to the metric system. Students solve problems involving finding a fraction, decimal or percentage of a quantity and use estimation to find approximate solutions to problems involving rational numbers and percentages. They use mathematical modelling to solve financial and other practical problems involving percentages and rational numbers, formulating and solving the problem, and justifying choices. Students find unknown values in numerical equations involving combinations of arithmetic operations. They identify and explain rules used to create growing patterns. Students create and use algorithms to generate sets of numbers, using a rule.  They interpret and use timetables. Students convert between common units of length, mass and capacity. They use the formula for the area of a rectangle and angle properties to solve problems. Students identify the parallel cross-section for right prisms. They create tessellating patterns using combinations of transformations. Students locate an ordered pair in any one of the 4 quadrants on the Cartesian plane.  They compare distributions of discrete and continuous numerical and ordinal categorical data sets as part of their statistical investigations, using digital tools. Students critique arguments presented in the media based on statistics. They assign probabilities using common fractions, decimal and percentages. Students conduct simulations using digital tools, to generate and record the outcomes from many trials of a chance experiment. They compare observed frequencies to the expected frequencies of the outcomes of chance experiments. |

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| **Strand: Number** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise situations, including financial contexts, that use integers; locate and represent integers on a number line and as coordinates on the Cartesian plane  AC9M6N01 | * extending the number line in the negative direction to locate and represent integers, recognising the difference in location between (2) and (2) and their relationship to zero as 2< 0< 2 * using integers to represent quantities in financial contexts, including the concept of profit and loss for a planned event * using horizontal and vertical number lines to represent and find solutions to everyday problems involving locating and ordering integers around zero; for example, elevators, above and below sea level; distinguishing a location by referencing to the 4 quadrants of the Cartesian plane * recognising that the sign (positive or negative) indicates a direction in relation to zero; for example, 30 metres left of the admin block is (30) and 20 metres right of the admin block is (20);programming robots to move along a number line which is either horizontal or vertical but not both at the same time * representing the temperatures of the different planets in the solar system, using a diagram of a thermometer that models a vertical number line | |
| identify and describe the properties of prime, composite and square numbers and use these properties to solve problems and simplify calculations  AC9M6N02 | * using the definition of a prime number to explain why one is not a prime number * testing numbers by using division to distinguish between prime and composite numbers, recording the results on a number chart to identify any patterns * representing composite numbers as a product of their factors, including prime factors when necessary and using this form to simplify calculations involving multiplication such as 15 x 16 as 5 x 3 x 4 x 4 which can be rearranged to simplify calculation to 5 x 4 x 3 x 4 = 20 x 12 * identifying and describing the product of a number with itself as square; for example, 3 x 3 is the same as 32 * using spreadsheets to list all the numbers that have up to 3 factors, using combinations of only the first 3 prime numbers, recognise any emerging patterns, making conjectures and experimenting with other combinations | |
| apply knowledge of equivalence to compare, order and represent common fractions including halves, thirds and quarters on the same number line and justify their order  AC9M6N03 | * applying factors and multiples to fraction denominators, such as halves with quarters, eighths and twelfths, and thirds with sixths, ninths and twelfths to determine equivalent representations of fractions in order to make comparisons * representing fractions on the same number line, paying attention to relative position, and using this to explain relationships between denominators * explaining equivalence and order between fractions using number lines, drawings and models * comparing and ordering fractions by placing cards on a string line across the room and referring to benchmark fractions to justify their position; for example, is greater than can be written as > , because half of 8 is 4; is less than , because 6 >4 and can be written as < | |
| apply knowledge of place value to add and subtract decimals, using digital tools where appropriate; use estimation and rounding to check the reasonableness of answers  AC9M6N04 | * applying estimation strategies to addition and subtraction of decimals to at least thousandths before calculating answers or when a situation requires just an estimation * applying whole-number strategies; for example, using basic facts, place value, partitioning and the inverse relationship between addition and subtraction, and properties of operations to develop meaningful mental strategies for addition and subtraction of decimal numbers to at least hundredths * working additively with linear measurements expressed as decimals up to 2 and 3 decimal places; for example, calculating how far off the world record the athletes were at the last Olympic games in the women’s long jump or shot-put and comparing school records to the Olympic records * deciding to use a calculator as a calculation strategy for solving additive problems involving decimals that vary in their number of decimal places beyond hundredths; for example, 1.0 - 0.0035 or 2.345 + 1.4999 | |
| solve problems involving addition and subtraction of fractions using knowledge of equivalent fractions  AC9M6N05 | * representing addition and subtraction of fractions, using an understanding of equivalent fractions and methods such as jumps on a number line, or diagrams of fractions as parts of shapes * determining the lowest common denominator using an understanding of prime and composite numbers to find equivalent representation of fractions when solving addition and subtraction problems * calculating the addition or subtraction of fractions in the context of realistic problems; for example, using part cups or spoons in a recipe; using the understanding of equivalent fractions * understanding the processes for adding and subtracting fractions with related denominators and fractions as an operator, in preparation for calculating with all fractions; for example, using fraction overlays and number lines to give meaning to adding and subtracting fractions with related and unrelated denominators | |
| multiply and divide decimals by multiples of powers of 10 without a calculator, applying knowledge of place value and proficiency with multiplication facts; using estimation and rounding to check the reasonableness of answers  AC9M6N06 | * applying place value knowledge, including that the value of the digit is 10 times smaller each time a place is moved to the right, and known multiplication facts, to multiply and divide a decimal by powers of 10 * applying and explaining estimation strategies in multiplicative situations involving a decimal greater than one that is multiplied by a two- or three-digit number, using a multiple of 10 or 100 when the situation requires just an estimation * explaining the effect of multiplying or dividing a decimal by 10, 100, 1000 … in terms of place value and not the decimal point shifting | |
| solve problems that require finding a familiar fraction, decimal or percentage of a quantity, including percentage discounts, choosing efficient calculation strategies and using digital tools where appropriate  AC9M6N07 | * explaining how of a quantity can be achieved by dividing by 3, and how knowledge of of a quantity can be used to find or of the same quantity using situations involving money, length, duration, mass or capacity * investigating percentage discounts of 15%, 30% and 45% in an online toy sale, using their equivalent decimal representations of 0.15, 0.3 and 0.45 to calculate the amount of discount on sale items, with and without digital tools * linking percentages to their decimal equivalent of tenths and hundredths and using these to determine percentage discounts; for example, finding 30% discount by using its equivalence to 0.3, dividing by 10 and multiplying the result by 3 to give 30% * explaining the equivalence between percentages and fractions; for example, and ; keeping to percentages that are equivalent to fractions with small denominators such as and * representing a situation with a mathematical expression; for example, numbers and symbols such as x 24, that involve finding a familiar fraction or percentage of a quantity; using mental strategies or a calculator and explaining the result in terms of the situation in question | |
| approximate numerical solutions to problems involving rational numbers and percentages, including financial contexts, using appropriate estimation strategies  AC9M6N08 | * using familiar fractions, decimals and percentages to approximate calculations, such as, 0.3 of 180 is about  a of 180 or 52% is about a * choosing appropriate estimation strategies including rounding to the nearest whole number, knowledge of multiples of 2, 5 or 10 and partitioning numbers in contexts such as measuring or cost per unit * recognising the effect of rounding on calculations involving fractions or decimals and saying what numbers the answer will be between * recognising the usefulness of estimation to check calculations for contexts such as dividing wood into a number of lengths, calculating cost per unit, reducing a recipe or dividing the cost of dinner for a group into individual amounts * verifying solutions by estimating percentages in suitable contexts such as discounts using common percentages of 10%, 25%, 30%, 50% and 1% * investigating estimation strategies to make decisions about steam cooking in ground ovens by First Nations Australians, including catering for different numbers of people and resources needed for cooking | |
| use mathematical modelling to solve practical problems, involving rational numbers and percentages, including in financial contexts; formulate the problems, choosing operations and efficient calculation strategies, and using digital tools where appropriate; interpret and communicate solutions in terms of the situation, justifying the choices made  AC9M6N09 | * modelling practical situations involving percentages using efficient calculation strategies to find solutions, such as mental calculations, spreadsheets, calculators or a variety of informal jottings, and interpreting the results in terms of the situation; for example, purchasing items during a sale * modelling situations involving earning money and budgeting, asking questions such as, “Can I afford it?”, “Do I need it?”, “How much do I need to save for it?”, and developing a savings plan or budget for an upcoming event or personal purchase * modelling and solving the problem of creating a budget for a class excursion or family holiday, using the internet to research costs and expenses, and representing the budget in a spreadsheet, creating and using formulas to calculate totals | |

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| **Strand: Algebra** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise and use rules that generate visually growing patterns and number patterns involving rational numbers  AC9M6A01 | * investigating 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 * using a calculator or spreadsheet to experiment with number patterns that result from multiplying or dividing; for example, 1 ÷ 9, 2 ÷ 9, 3 ÷ 9…, 210 x 11, 211 x 11, 212 x 11…, 111 x 11, 222 x 11, 333 x 11…,  or 100 ÷ 99, 101 ÷ 99, 102 ÷ 99… * creating an extended number sequence that represents an additive pattern using decimals; for example, representing the additive pattern formed as students pay their $2.50 for an incursion as 2.50, 5.00, 7.50, 10.00, 12.50, 15.00, 17.50 … * investigating the number of regions created by successive folds of a sheet of paper: one fold, 2 regions; 2 folds,  4 regions; 3 folds, 8 regions, and describing the pattern using everyday language * creating a pattern sequence with materials, writing the associated number sequence and then describing the sequence with a rule so someone else can replicate it with different materials; for example, using matchsticks or toothpicks to create a growing pattern of triangles using 3 for one triangle, 5 for 2 triangles, 7 for 3 triangles and describing the pattern as, “Multiply the number of triangles by 2 and then add one for the extra toothpick in the first triangle” | |
| find unknown values in numerical equations involving brackets and combinations of arithmetic operations, using the properties of numbers and operations  AC9M6A02 | * using brackets and the order of operations to write number sentences and appreciating the need for an agreed set of rules to complete multiple operations within the same number sentence; for example,  for 40 ÷ 2 x (4 + 6) = □, you solve what is in the brackets first then complete the number sentence from left to right as there is no hierarchy between division and multiplication * constructing equivalent number sentences involving brackets and combinations of the 4 operations; explaining the need to have shared agreement on the order of operations when solving problems involving more than one operation to have unique solutions * finding pairs of unknown values in numerical equations that make the equation hold true; for example, listing possible combinations of natural numbers that make this statement true: 6 + 4 x 8 = 6 x Δ + □ * applying knowledge of inverse operations and number properties to create equivalent number sentences; removing one of the numbers and replacing it with a symbol, then swapping with a classmate to find the unknown values | |
| create and use algorithms involving a sequence of steps and decisions that use rules to generate sets of numbers; identify, interpret and explain emerging patterns  AC9M6A03 | * using an algorithm to create extended number sequences involving rational numbers, using a rule and digital tools, explaining any emerging patterns * designing an algorithm to model operations, using the concept of input and output, describing and explaining relationships and any emerging patterns*; for example, using function machines to model operations and* recognising and comparing additive and multiplicative relationships * designing an algorithm or writing a simple program to generate a sequence of numbers based on the user’s input and a chosen operation, discussing any emerging patterns; for example, generating a sequence of numbers and comparing how quickly the sequences are growing in comparison to each other using the rule adding 2 to the input number compared to multiplying the input number by 2 | |

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| **Strand: Measurement** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| convert between common metric units of length, mass and capacity; choose and use decimal representations of metric measurements relevant to the context of a problem  AC9M6M01 | * recognising the significance of the prefixes in units of measurement * identifying and using the correct operations when converting between units including millimetres, centimetres, metres, kilometres, milligrams, grams, kilograms, tonnes, millilitres, litres, kilolitres and megalitres * recognising the equivalence of measurements, such as 1.25 metres is the same as 125 centimetres | |
| establish the formula for the area of a rectangle and use it to solve practical problems  AC9M6M02 | * using the relationship between the length and area of square units and the array structure to derive a formula for calculating the area of a rectangle from the lengths of its sides * using one centimetre grid paper to construct a variety of rectangles, recording the side lengths and the related areas of the rectangles in a table to establish the formula for the area of a rectangle by recognising the relationship between the length of the sides and its calculated area * solving problems involving the comparison of lengths and areas using appropriate units * investigating the connection between the perimeters of different rectangles with the same area and between the areas of rectangles with the same perimeter | |
| interpret and use timetables and itineraries to plan activities and determine the duration of events and journeys  AC9M6M03 | * planning a trip involving one or more modes of public transport * developing a timetable of daily activities for a planned event; for example, a sports carnival * investigating different ways duration is represented in timetables and using different timetables to plan a journey | |
| identify the relationships between angles on a straight line, angles at a point and vertically opposite angles; use these to determine unknown angles, communicating reasoning  AC9M6M04 | * using protractors or dynamic geometry software to measure and generalise about the size of angles formed when lines are crossed, and combinations of angles that meet at a point, including combinations that form right or straight angles * demonstrating the meaning of language associated with properties of angles, including right, complementary, complement, straight, supplement, vertically opposite, and angles at a point * using the properties of supplementary and complementary angles to represent spatial situations with number sentences and solving to find the size of unknown angles | |

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| **Strand: Space** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| compare the parallel cross-sections of objects and recognise their relationships to right prisms  AC9M6SP01 | * using objects made of foam or polystyrene, slice along different cross-sections, and record the different shapes of faces that result; comparing cross-sections of different objects * using different pieces of fruit, slicing across different cross-sections, drawing the cross-section; reporting back to the class the results of the investigation * observing and drawing the shapes resulting from different ways of slicing through familiar objects; for example, slicing carrots at different angles or cutting through playdough models of objects; using playdough models, fruit or similar to establish which objects can be cut in such a way that the cross-section will always be the same shape * understanding that right prisms are objects where parallel cross-sections perpendicular to the base of the prism are the same shape and size * connecting different right prisms to the shape of their parallel cross-sections, such as a triangular prism which can be described as a stack of the same sized triangles, and a cube or square prism, which can be described as a stack of the same sized squares * investigating the design of First Nations Australians’ dwellings, exploring the relationship between the cross-sections and the dwellings’ construction | |
| locate points in the 4 quadrants of a Cartesian plane; describe changes to the coordinates when a point is moved to a different position in the plane  AC9M6SP02 | * understanding that the Cartesian plane provides a graphical or visual way of describing location with respect to a fixed origin * understanding that the axes are number lines that can have different scales, including fractions and decimals, depending on purpose * understanding that the horizontal coordinate is written first and is changed if there is a move to the left or right, whereas a move up or down will change the vertical coordinate * using the Cartesian plane to draw lines and polygons, listing co-ordinates in the correct order to complete a polygon * investigating and connecting land or star maps used by First Nations Australians with the Cartesian plane through a graphical or visual way of describing location | |
| recognise and use combinations of transformations to create tessellations and other geometric patterns, using dynamic geometric software where appropriate  AC9M6SP03 | * using digital tools to create tessellations of shapes, including paver and tiling patterns, describing the transformations used and discussing why these shapes tessellate; identifying shapes or combinations of shapes that will or will not tessellate, answering questions such as, “Do all triangles tessellate?” * designing a school or brand logo using the transformation of one or more shapes and describing the transformations used * using dynamic geometric software and digital tools to experiment with transformations; for example, to demonstrate when the order of transformations produces different results; experimenting with transformations and their application to fractals * designing an algorithm as set of instructions to transform a shape, including getting back to where you started from; for example, programming a robot to move around the plane using instructions for movements, such as 2 down, 3 to the right, and combinations of these to transform shapes * investigating symmetry, transformation and tessellation in different shapes on Country/Place, including rock formations, insects, and land and sea animals, discussing the purpose or role symmetry plays in their physical structure | |

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| **Strand: Statistics** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| interpret and compare data sets for ordinal and nominal categorical, discrete and continuous numerical variables using comparative displays or visualisations and digital tools; compare distributions in terms of mode, range and shape  AC9M6ST01 | * determining the range for a numerical data set by finding the difference between the highest and the lowest value in the set and comparing the range for different data sets * representing acquired numerical data sets using side-by-side column graphs, comparing the spread of each data set using the range, the highest frequency for each data set using the mode, and discussing the shape * representing ordinal data collected through surveys, using visualisation tools including dot plots and bar charts, and discussing the distribution of data in terms of shape * using technology to access data sets and graphing software to construct side-by-side column graphs or stacked line graphs; comparing data sets that are grouped by gender, year level, age group or other variables and discussing findings | |
| identify statistically informed arguments presented in traditional and digital media; discuss and critique methods, data representations and conclusions  AC9M6ST02 | * investigating data representations in the media and discussing what they illustrate and the messages the people who created them might want to convey * evaluating reports and secondary data relating to the distribution and use of non-renewable resources around the world * identifying potentially misleading data representations in the media; for example, graphs with broken axes or non-linear 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 * investigating both traditional and digital media relating to First Nations Australians, identifying and critiquing statistically informed arguments | |
| plan and conduct statistical investigations by posing and refining questions or identifying a problem and collecting relevant data; analyse and interpret the data and communicate findings within the context of the investigation  AC9M6ST03 | * selecting and using appropriate peripherals; for example, using a scientific probe to collect data about changing soil moisture for plants, interpreting the data and sharing the results as a digital chart * using a spreadsheet to record and analyse data, recognising the difference between cell formats in spreadsheets; for example, changing the default general format to numerical, text or date as needed * investigating the daily water usage by a student in the home compared to the World Health Organization claim of 50 litres of clean water allocated per person per day * collecting sample sets of “discrete numerical data”; for example, the number of cars or pets in a household, where the class is surveyed, then other classes are surveyed, and data is analysed and compared, discussing findings * collecting ordinal categorical data through the use of a survey; for example, surveying each member of the class where they are asked to indicate their preference on a five-point scale for a particular graphic and colour combination of a proposed school logo * collecting ordinal data for ranking nominees for school captain with respect to several criteria, contrasting the use of a five-point scale compared with using a four-point scale | |

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| **Strand: Probability** | | **Year 6** |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise that probabilities lie on numerical scales of 0 – 1 or 0% – 100% and use estimation to assign probabilities that events occur in a given context, using common fractions, percentages and decimals  AC9M6P01 | * recognising that the probability of an event occurring can be represented numerically as either a number ranging from zero to one or a percentage from 0% to 100% where zero or 0% means it won’t happen and one or 100% means it is certain to happen * using a scale of zero to one or 0% to 100% to estimate chances of events * listing the different possible outcomes for rolling a dice and using a scale to locate the relative probability by considering the chance of more or less than for each possible event ; for example, the probability of getting a number greater than 4 * recognising the language used to describe situations involving uncertainty, such as what it means to be lucky, a 75% chance of rain or a 1-in-100 years flood * exploring First Nations Australian children’s instructive games, such as Weme from the Warlpiri Peoples of Central Australia, to investigate and assign probabilities that events will occur, indicating their estimated likelihood | |
| conduct repeated chance experiments and run simulations with an increasing number of trials using digital tools; compare observations with expected results and discuss the effect on variation of increasing the number of trials  AC9M6P02 | * using digital tools to simulate multiple tosses of a coin or dice and comparing the relative frequency of an outcome as the number of trials increases; identifying the variation between trials and realising that the results tend to the prediction with larger numbers of trials * using online simulations of repeated random events to recognise emerging patterns, discussing and comparing expected results to the actual results * investigating the relative frequencies of all outcomes for a chance experiment and verifying that their sum equals one * systematically recording the outcome of large numbers of spins on a spinner and analysing the relative frequencies of outcomes, representing these as percentages | |