Mathletics
3P Learning Progressions
Understanding Practice and Fluency (UPF)

Levels 7 – 8 | Australia

June, 2021

Mathletics

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Contents

Part I

Level 7

1 Number and algebra

Integers			
Working with integers			
Learning Journey	Steps	Spine Nodes	Subnodes
Compare, order, add and subtract integers	1	Describing the direction and magnitude of integers	• describe the direction and magnitude of integers when applied to the number line
	2	Comparing the relative value of integers, including recording the comparison by using the symbols < and >	• compare the relative value of integers, including recording the comparison by using the symbols and < and > including negative integers
		Ordering integers	• order integers of any size in ascending and descending order including negative numbers
	3	Understanding addition and subtraction of integers pictorially	• understand addition and subtraction of integers pictorially
		Understanding addition and subtraction of integers symbolically	• understand addition and subtraction of integers symbolically
	4	Representing addition and subtraction on a horizontal or vertical number line diagram	• represent addition and subtraction on a horizontal or vertical number line diagram
	5	Adding and subtracting negative integers	• add and subtract negative integers
Laws of multiplication and division			
Laws of multiplication and division	1	Using factors of a number to aid mental computation involving multiplication and division	• use factors of a number to aid mental computation involving multiplication
	2	Showing the connection between division and multiplication, including where there is a remainder	• show the connection between division and multiplication, including where there is a remainder
	3	Applying the distributive law to aid in mental computation to expand expressions containing 2 terms within the grouping symbols	• apply the distributive law to aid in mental computation to expand expressions containing 2 terms within the grouping symbols
		Applying the commutative law of multiplication to aid mental computation	• apply the commutative law to aid mental computation
		Applying the associative law of multiplication to aid in mental computation	• apply the associative law of multiplication to aid in mental computation

Learning Journey	Step	Spine Nodes	Subnodes
	4	Applying the distributive law to aid in mental computation to expand expressions containing 3 or more terms within the grouping symbols	• apply the distributive law to aid in mental computation to expand expressions containing 3 or more terms within the grouping symbols
	5	Solving problems within a given context by applying the distributive law	• solve problems within a given context by applying the distributive law

Number Theory			
Square and cube roots			
Learning Journey	Steps	Spine Nodes	Subnodes
Working with square roots	1	Finding square roots of perfect square whole numbers only	• find the square roots of perfect square whole numbers up to 100
	2	Finding square roots of non-perfect squares using a calculator	• find the square roots of non-perfect squares using a calculator
	3	Determining between which 2 whole numbers lies the square root of a non-perfect square number up to 100	• determine mentally, between which 2 whole numbers lies the square root of a non-perfect square number up to 100
		Estimating the square root of non-square numbers	• estimate the square root of a non-square number up to 100
			• estimate the square root of a non-square number up to 100 using a number line to estimate
Working with cube roots	3	Determining mentally, between which 2 whole numbers lies the cube root of a non-perfect cube number up to 125	• determine mentally, between which 2 whole numbers lies the cube root of a non-perfect cube number up to 125
		Estimating the cube root of a non-perfect cube number up to 125	• estimate the cube root of a non-perfect cube number up to 125
	1	Finding cube roots of perfect cube whole numbers	• find the cube roots of perfect cube whole numbers up to 125
	2	Finding cube roots of non-perfect cubes using a calculator	• find cube roots of non-perfect cubes using a calculator
Solving problems with square and cube roots	1	Finding square roots of large perfect square whole numbers from prime factors	• find square roots of large perfect square whole numbers from prime factors
	2	Applying the order of operations to evaluate expressions involving square roots and cube roots, with and without a calculator	• apply the order of operations to evaluate expressions involving square roots and cube roots, with and without a calculator

Fractions, decimals and percentages			
Expressing and comparing fractions			
Learning Journey	Steps	Spine Nodes	Subnodes
Fractions: improper and proper fractions	1	Generating equivalent fractions with denominators (denominators 1–100, 1000)	• generate equivalent fractions
	2	Expressing a fraction in its simplest form	• determine the highest common factor of a pair of integers
			• express a fraction in its simplest form
	3	Expressing improper fractions as mixed numerals	• express improper fractions as mixed numerals that do not require simplification of the proper fraction
			• express improper fractions as mixed numerals that require simplification of the proper fraction
	4	Expressing mixed numerals as improper fractions	• express mixed numerals as improper fractions
Fractions: comparing and ordering	1	Comparing and ordering proper fractions	• compare and order proper fractions where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
	2	Comparing and ordering improper fractions	• compare and order improper fractions where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
	3	Comparing and ordering proper fractions, improper fractions, and mixed numbers	• compare and order proper fractions, improper fractions, and mixed numbers where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
	4	Placing positive and negative fractions, decimals and mixed numbers on a number line in order to compare	• place positive and negative fractions, decimals and mixed numbers on a number line in order to compare
Adding and subtracting fractions			
Fractions: adding fractions	1	Adding proper fractions with common denominators	• add proper fractions with common denominators
		Adding improper fractions with common denominators	• add improper fractions with common denominators
			• add improper fractions with common denominators expressing answers as a mixed numeral
	2	Adding proper fractions with unlike denominators	• add proper fractions with unlike denominators
	3	Adding improper fractions with unlike denominators	• add improper fractions with unlike denominators

Learning Journey	Step	Spine Nodes	Subnodes
			• add improper fractions with unlike denominators expressing answers as a mixed numeral
Fractions: subtracting fractions	1	Subtracting proper fractions with common denominators	• subtract proper fractions with common denominators
	2	Subtracting improper fractions with common denominators	• subtract improper fractions with common denominators
			• subtract improper fractions with common denominators, expressing answers as a mixed numeral
	3	Subtracting mixed numbers with common denominators	• subtract mixed numbers with common denominators
	4	Subtracting proper fractions with unlike denominators	• subtract proper fractions with unlike denominators
	5	Subtracting improper fractions with unlike denominators	• subtract improper fractions with unlike denominators
			• subtract improper fractions with unlike denominators expressing answers as a mixed numeral
		Subtracting mixed numbers with unlike denominators	• subtract mixed numbers with unlike denominators
Fractions: adding and subtracting fractions	1	Performing addition or subtraction with fractions where fractions can be in different forms	• perform addition or subtraction with fractions where fractions can be in different forms
	2	Subtracting a fraction from an integer	• subtract a fraction from a whole number using written methods
	3	Demonstrating an understanding of adding and subtracting positive fractions and mixed numerals, with like and unlike denominators, concretely, pictorially and symbolically	• demonstrate an understanding of adding and subtracting positive fractions and mixed numerals, with like and unlike denominators, concretely, pictorially and symbolically
	4	Recognising and explaining incorrect operations with fractions	• recognise and explain incorrect operations with fractions
Multiplying & dividing fractions/decimals			
Multiplying decimals & finding quantities	1	Multiplying decimals using a calculator	• multiply decimals using a calculator
	2	Multiplying decimals using written/mental methods	• multiply decimals using mental/written methods
	3	Calculating decimals of quantities using a calculator	• calculate decimals of quantities using a calculator
	4	Calculating decimals of quantities using mental/written methods	• calculate decimals of quantities using mental, written and calculator methods

Learning Journey	Step	Spine Nodes	Subnodes
Multiplying fractions & finding quantities	1	Multiplying proper fractions by a whole number greater than 1	• multiply proper fractions by a whole number greater than 1
		Multiplying improper fractions by a whole number greater than 1	• multiply improper fractions by a whole number greater than 1
		Multiplying improper fractions by a whole number greater than 1, expressing answer as a mixed numeral	• multiply improper fractions, expressing answer as a mixed numeral
	2	Multiplying 2 proper fractions	• multiply 2 proper fractions using written methods
	3	Multiplying 2 improper fractions	• multiply improper fractions using written methods
		Multiplying 2 improper fractions, expressing the answer as a mixed numeral	• multiply 2 improper fractions expressing the answer as a mixed numeral
	4	Multiplying 2 mixed numerals	• multiply mixed numerals using written methods
		Multiplying mixed numerals by a whole number greater than 1	• multiply mixed numerals by a whole number greater than 1
	5	Multiplying proper fractions, improper fractions and mixed numerals using written methods	• multiply proper fractions, improper fractions and mixed numerals using written methods
		Calculating fractions of quantities using mental or written strategies	• calculate fractions of quantities using mental or written strategies
Dividing integers, fractions and decimals	1	Dividing positive integers by unit fractions	• divide positive integers by unit fractions
	2	Dividing fractions and decimals using a calculator	• divide fractions and decimals using a calculator
	3	Dividing decimals by powers of 10	• divide decimals by powers of 10
Dividing fractions by fractions and integers	1	Dividing a unit fraction by a positive integer	• divide unit fractions by whole numbers, eg $\frac{1}{3} \div 2 = \frac{1}{6}$
	2	Dividing a positive integer by a proper fraction	• divide a positive integer by a proper fraction
		Dividing a proper fraction by a positive integer	• divide a non-unit proper fraction by a whole number (where the divisor is a factor of the numerator). Use diagrams for support
			• divide a non-unit proper fraction by any whole number
	3	Dividing a proper fraction by a proper fraction	• divide a proper fraction by a proper fraction

Learning Journey	Step	Spine Nodes	Subnodes
	4	Dividing a positive integer by an improper fraction	• divide a positive integer by an improper fraction and mixed numeral
		Dividing an improper fraction by a positive integer	• divide an improper fraction by a positive integer
	5	Dividing improper fractions by proper fractions and vice versa	• divide improper fractions by proper fractions and vice versa
		Dividing an improper fraction by an improper fraction	• divide an improper fraction by an improper fraction
One quantity as a fraction of another			
Expressing one quantity as a fraction of another	1	Expressing 1 quantity as a fraction (proper/improper/mixed) of another	• express 1 quantity as a fraction of another
	2	Expressing 1 quantity as a fraction of another (using digital technology)	• express 1 quantity as a fraction of another with the use of digital technology
Rounding decimals			
Rounding decimals	1	Rounding decimals to a specified number of decimal places (simple rounding)	• round decimals to a given number of decimal places when rounding decimals up/down to the next decimal place value
	2	Rounding decimals to a specified number of decimal places (complex rounding)	• round decimals to a given number of decimal places when rounding decimals requires places to be filled with zeroes
Explore terminating & recurring decimals			
Explore terminating & recurring decimals	1	Converting fractions to terminating decimals by manipulating the denominator to be a power of 10	• convert fractions to terminating decimals by manipulating the denominator to be a power of 10
			• convert improper fractions to terminating decimals by manipulating the denominator to be a power of 10
			• convert mixed numerals to terminating decimals by manipulating the denominator to be a power of 10
Fractions, decimals and percentages			
Converting decimals	1	Demonstrating that the decimal expansion of a rational number either repeats or terminates	• demonstrate that the decimal expansion of a rational number either repeats or terminates
	2	Converting decimals to percentages	• convert decimals with up to 2 decimal places to percentages containing whole numbers only
			• convert decimals with more than 2 decimal places to percentages, writing answers as a percentage with decimal parts
			• convert decimals with 3–4 decimal places to percentages, writing answers in fraction form

Learning Journey	Step	Spine Nodes	Subnodes
			• convert decimals with 5 or more decimal places to percentages, writing answers in decimal form rounded to an appropriate degree of accuracy
Converting percentages	1	Converting percentages less than or equal to 100% into fractions	• convert percentages less than or equal to 100% into fractions
		Converting terminating percentages less than 100% into a decimal	• convert terminating percentages less than 100% into a decimal
	2	Converting percentages greater than 100% to mixed numerals	• convert percentages greater than 100% to mixed numerals
		Converting percentages greater than 100% to improper fractions	• convert percentages greater than 100% to improper fractions
		Converting terminating percentages greater than or equal to 100% into a decimal	• convert terminating percentages greater than or equal to 100% into a decimal
	3	Converting recurring percentages less than 100% into a decimal	• convert recurring percentages less than 100% into a decimal
		Converting recurring percentages greater than or equal to 100% into a decimal	• convert recurring percentages greater than or equal to 100% into a decimal
Converting fractions to decimals	1	Converting fractions to decimals using a calculator	• convert fractions to decimals using a calculator
	2	Converting fractions to terminating decimals using division	• convert fractions to terminating decimals using division
			• convert improper fractions to terminating decimals using division
			• convert mixed numerals to terminating decimals using division
	3	Converting fractions to recurring decimals using division	• convert fractions to recurring decimals using division
			• convert improper fractions to recurring decimals using division
			• convert mixed numerals to recurring decimals using division
Converting fractions to percentages	1	Converting fractions to percentages using a calculator	• convert fractions to percentages using a calculator
	2	Converting fractions to terminating percentages by manipulating the denominator to 100	• convert unit fractions to terminating percentages by manipulating the denominator to be 100
			• convert improper fractions to terminating percentages by manipulating the denominator to be 100
			• convert mixed numerals to terminating percentages by manipulating the denominator to be 100

Learning Journey	Step	Spine Nodes	Subnodes
	3	Converting fractions to terminating percentages using division	• convert fractions to terminating percentages using division
			• convert improper fractions to terminating percentages using division
			• convert mixed numerals to terminating percentages using division
	4	Converting fractions to recurring percentages using division	• convert fractions to recurring percentages using division
			• convert improper fractions to recurring percentages using division
			• convert mixed numerals to recurring percentages using division
Ordering fractions, decimals and percentages	1	Ordering fractions, decimals and percentages	• order fractions, decimals and percentages
Percentages of quantities			
Percentages of quantities	1	Determining percentages of quantities (written and mental methods)	• determine percentages of quantities using written and mental strategies
	2	Determining percentages of quantities (calculator method)	• determine percentages of quantities using a calculator
	3	Expressing a smaller quantity/value as a percentage amount of another larger quantity/value	• express a smaller quantity/value as a percentage amount of another larger quantity/value in the same units
			• express a smaller quantity/value as a percentage amount of another larger quantity/value in different units
	4	Expressing a larger quantity/value as a percentage amount of another smaller quantity/value	• express a larger quantity/value as a percentage amount of another smaller quantity/value in the same units
			• express a larger quantity/value as a percentage amount of another smaller quantity/value in different units

Financial Maths			
Best buys and discounts			
Learning Journey	Steps	Spine Nodes	Subnodes
Best buys and discounts	1	Calculating 'best buys' by comparing price per unit, or quantity per monetary unit, with the use of digital technologies	• calculate 'best buys' by comparing price per unit, or quantity per monetary unit, with the use of digital technologies, eg 500 g for $4.50 compared with 300 g for $2.75
	2	Calculating discounts given the original price	• calculate a discount amount given the original price and the percentage discount
			• calculate the final price of an item given the discount percentage and original price

Learning Journey	Step	Spine Nodes	Subnodes
	3	Calculating 'best buys' by comparing price per unit, or quantity per monetary unit, without the use of digital technology	• calculate 'best buys' by comparing price per unit, or quantity per monetary unit without the use of digital technology, eg 500 g for $4.50 compared with 300 g for $2.76
	4	Calculating discounts starting with the final price	• calculate a discount amount given the final price and the percentage discount
			• calculate the original price given the final price and the percentage discount

Rates and Ratios			
Ratios			
Learning Journey	Steps	Spine Nodes	Subnodes
Using simple ratios	1	Comparing quantities measured in the same units using ratios	• compare quantities measured in the same units using ratios
		Dividing an interval into a given ratio on a number line	• divide an interval into a given ratio on a number line
	2	Expressing 1 part of a ratio as a fraction of the whole	• express 1 part of a ratio as a fraction of the whole
	3	Identifying terms of a ratio as 'parts' of the ratio	• identify terms of a ratio as 'parts' of the ratio
Simplifying ratios	1	Simplifying ratios using highest common factors	• simplify ratios using highest common factors
	2	Simplifying ratios with fractions involved	• simplify ratios containing one or more fraction parts using the HCF to re-write as a pair of fractions with a common denominator first
	3	Simplifying ratios with decimals involved	• simplify ratios containing one or more decimal parts multiplying both parts by a common power of 10 that removes the decimal. Write the resultant ratio in simplest form
	4	Identifying equivalent ratios	• identify equivalent ratios
Solve simple problems involving ratios	1	Applying the unitary method to ratio problems	• apply the unitary method to ratio problems
	2	Dividing a quantity into a given ratio	• divide a quantity into a given ratio
			• express the division of a quantity into 2 parts as a ratio using original amounts
Investigating graphs			
Distance/time graphs	1	Matching a distance/time graph to a description of a particular journey and explaining the reasons for the choice	• match a distance/time graph to a description of a particular journey and explain the reasons for the choice

Learning Journey	Step	Spine Nodes	Subnodes
	2	Recognising concepts such as change of speed and direction in distance/time graphs	• recognise concepts such as change of speed and direction in distance/time graphs
		Understanding the meaning of straight line segments with different gradients in the graph of a particular journey	• understand the meaning of straight-line segments with different gradients in the graph of a particular journey
		Recognising the significance of horizontal line segments in distance/time graphs	• recognise the significance of horizontal line segments in distance/time graphs
		Understanding which variables go on the horizontal and vertical axis	• understand which variables go on the horizontal and vertical axis
	3	Comparing distance/time graphs of the same situation to decide which one is the most appropriate	• compare distance/time graphs of the same situation to decide which one is the most appropriate
	4	Solving problems involving distance/time rates	• solve a variety of real-life problems involving rate of travel problems
		Calculating speeds for straight line segments of given distance/time graphs	• calculate speeds for straight-line segments of given distance/time graphs
	5	Constructing distance/time graphs	• construct distance/time graphs
Graphs and rates extension	1	Interpreting information using the relative positions of 2 points on a line graph, rather than a detailed scale	• interpret information using the relative positions of 2 points on a line graph, rather than a detailed scale
	2	Calculating unit rates associated with ratios of fractions	• calculate unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units

Algebraic Expressions			
Equivalent algebraic expressions			
Learning Journey	Steps	Spine Nodes	Subnodes
Equivalent algebraic expressions	2	Using equivalent algebraic expressions involving multiplication to indices	• recognise and use equivalent algebraic expressions using algebraic symbols and words involving multiplication
		Using equivalent algebraic expressions involving division	• recognise and use equivalent algebraic expressions using algebraic symbols and words using division
	1	Using equivalent algebraic expressions involving addition	• recognise and use equivalent algebraic expressions using algebraic symbols and words involving addition

Learning Journey	Step	Spine Nodes	Subnodes
		Using equivalent algebraic expressions involving multiplication	• recognise and use equivalent algebraic expressions using algebraic symbols and words involving multiplication
	3	Using algebraic symbols to represent mathematical operations written in words and vice versa	• use algebraic symbols to represent mathematical operations written in words and vice versa, eg the product of x and y is xy, x + y is the sum of x and y
Simplifying algebraic expressions			
Simplifying algebraic expressions	1	Simplifying algebraic expressions that involve addition and subtraction involving properties of commutativity, associativity and grouping symbols	• extend and apply the laws and properties of arithmetic to algebraic terms and expressions
			• recognise like terms and add and subtract them to simplify algebraic expressions
	2	Simplifying algebraic expressions that involve multiplication	• simplify algebraic expressions that involve multiplication
			• recognise the equivalence of algebraic expressions involving multiplication, eg 3bc = 3cb
	3	Simplifying algebraic expressions that involve division	• simplify algebraic expressions that involve division
			• recognise whether particular algebraic expressions involving division are equivalent or not
	4	Connecting algebra with the commutative and associative properties of arithmetic to determine that a + b = b + a and (a + b) + c = a + (b + c)	• connect algebra with the commutative and associative properties of arithmetic to determine that a + b = b + a and (a + b) + c = a + (b + c)
		Recognising the role of grouping symbols and the different meanings of expressions, such as 2a + 1 and 2(a + 1)	• recognise the role of grouping symbols and the different meanings of expressions, such as 2a + 1 and 2(a + 1)
Algebraic patterns and expressions			
Number patterns	1	Using objects to build a geometric pattern, record the results in a table of values, describe the pattern in words and algebraic symbols, and represent the relationship on a number grid	• use objects to build a geometric pattern, record the results in a table of values, describe the pattern in words and algebraic symbols, and represent the relationship on a number grid
	2	Checking pattern descriptions by substituting further values	• check pattern descriptions by substituting further values
	3	Replacing written statements describing patterns with equations written in algebraic symbols	• replace written statements describing patterns with equations written in algebraic symbols

Learning Journey	Step	Spine Nodes	Subnodes
Evaluating formulae	1	Substituting known values in for pronumerals	• substitute known values in for pronumerals to find the value of an expression, eg if x = 2 and y = 3, find the value of 2x + 3y
	2	Using simple formulas to solve problems involving substituting in known variables to solve a problem	• use simple formulas to solve problems involving substituting in known variables to solve a problem
	3	Using authentic formulas to solve problems involving substituting in known variables to solve a problem	• use authentic formulas to solve problems involving substituting in known variables to solve a problem
	4	Determining whether a particular pattern can be described using algebraic symbols	• describe patterns using algebraic symbols
Creating algebraic expressions	1	Creating algebraic expressions	• create algebraic expressions and evaluate them by substituting a given value for each variable
	2	Substituting into algebraic expressions and evaluating the result	• substitute into algebraic expressions and evaluate the result
			• substitute numerical values into formulas and expressions, including scientific formulas

Indices/exponents			
Indices/exponents			
Learning Journey	Steps	Spine Nodes	Subnodes
Introducing indices/exponents	1	Describing numbers written in 'index form' using terms such as 'base', 'power', 'index', 'exponent', 'to the power of', 'squared', 'cubed'	• describe numbers written in 'index form' using terms such as 'base', 'power', 'index', 'exponent', 'to the power of', 'squared', 'cubed'
			• use index notation to express powers of numbers (positive indices only)
	2	Evaluating numbers expressed as powers of integers	• evaluate numbers expressed as powers of integers
	3	Evaluating expressions involving indices without using a calculator	• evaluate expressions involving indices without using a calculator
			• apply the order of operations to evaluate expressions involving indices
	4	Evaluating expressions involving indices using a calculator	• evaluate expressions involving indices using a calculator
			• apply the order of operations to evaluate expressions involving indices
	5	Using index laws to simplify equations with numerical bases	• use index laws to simplify equations with numerical bases
Divisibility and factors	1	Determining and applying tests of divisibility for 2, 3, 4, 5, 6 and 10	• determine and apply tests of divisibility for 2, 3, 4, 5, 6 and 10

Learning Journey	Step	Spine Nodes	Subnodes
	2	Using index notation to express prime factors	• use factor trees to express a number as a product of its prime factors, using index notation where appropriate
			• use the ladder method to express a number as a product of its prime factors, using index notation where appropriate
	3	Finding the highest common factor of large numbers by first expressing the numbers as products of prime factors	• find the highest common factor of large numbers by first expressing the numbers as products of prime factors

Equations			
Solving equations			
Learning Journey	Steps	Spine Nodes	Subnodes
Equations introduction	1	Demonstrating an understanding of equivalence and the preservation of equality or 'balance'	• model preservation of equality pictorially
			• model preservation of equality symbolically
	2	Finding pairs of numbers that satisfy an equation with 2 unknowns	• find pairs of numbers that satisfy an equation with 2 unknowns
	3	Solving simple linear equations using concrete materials	• solve simple linear equations using concrete materials, such as the balance model or cups and counters, stressing the notion of performing the same operation on both sides of an equation
Solving 1-step equations: addition/subtraction	1	Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers) with integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers) with integer solutions
	2	Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers or decimals) with integer and non-integer solutions
	3	Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers or fractions) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers or fractions) with integer and non-integer solutions
Solving 1-step equations: multiplication	1	Solving linear equations using inverse operations involving 1 step of multiplication with integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication with integer solutions
	2	Solving linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions

Learning Journey	Step	Spine Nodes	Subnodes
	3	Solving linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions
Solving 1-step equations: division	1	Solving linear equations using inverse operations involving 1 step of division (integers) with integer solutions	• solve linear equations using inverse operations involving 1 step of division (integers) with integer solutions
	2	Solving linear equations using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)	• solve linear equations using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)
	3	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)
Solving 1-step equations: mixed operations	1	Solving linear equations using inverse operations involving 1 step with mixed operations with integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer solutions
	2	Solving linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions
	3	Solving linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients integer and non-integer solutions
Solving 2-step equations: variable in numerator	1	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral always in numerator position)
	2	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)

Learning Journey	Step	Spine Nodes	Subnodes
	3	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)
Solving 2-step equations: variable in denominator	1	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral in numerator or denominator position)
	2	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral in numerator or denominator position)
	3	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral in numerator or denominator position)

Coordinate Geometry			
Using the coordinate system			
Learning Journey	Steps	Spine Nodes	Subnodes
Using the coordinate system	1	Locating points on the Cartesian plane	• plot and label points, given coordinates, in all 4 quadrants of the number plane
			• identify and label each quadrant on a number plane
			• identify and record the coordinates of given points in all 4 quadrants of the number plane
	2	Plotting coordinates on the Cartesian plane (not whole numbers)	• plot and label points on the Cartesian plane, given coordinates, including those with coordinates that are not whole numbers
			• identify and record the coordinates of given points on the Cartesian plane, including those with coordinates that are not whole numbers
Transformations and symmetry			
Transformations on a set of axes	1	Plotting translations of points on the Cartesian plane	• plot and state the coordinates of the image of a point on the Cartesian plane resulting from 1 or more translations
	2	Plotting and stating the coordinates of the image of a given point on the Cartesian plane resulting from reflection in either the x-axis or y-axis	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from reflection in either the x-axis or y-axis

Learning Journey	Step	Spine Nodes	Subnodes
	3	Plotting and stating the coordinates of the image of a given point on the Cartesian plane resulting from rotation of multiples of 90° about the origin	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation of 90° about the origin
			• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation of 270° about the origin
Line and rotational symmetry	1	Identifying line symmetry	• identify, draw and determine the total number of lines of symmetry on designs and shapes, including special triangles, quadrilaterals and polygons
			• complete symmetrical designs and shapes given their line of symmetry
	2	Determining rotational symmetry (review concept and order of rotational symmetry)	• determine whether or not given shapes and designs have rotational symmetry
			• determine the order of rotational symmetry for given shapes and designs
	3	Determining lines (axes) of symmetry and the order of rotational symmetry of polygons, including the special quadrilaterals	• determine if particular triangles and quadrilaterals have line and/or rotational symmetry
	4	Investigating the line and rotational symmetries of circles and of diagrams involving circles, such as a sector or a circle with a marked chord or tangent	• investigate if a particular circle with a marked chord or tangent, sector of a circle or a regular circle has a line and/or rotational symmetry
	5	Identifying line and rotational symmetries in pictures and diagrams	• identify if a picture or diagram has a line and/or rotational symmetry

2 Measurement

Temperature			
Temperature			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving temperature problems	1	Measuring temperature scales	• interpret scales on thermometers to accurately read temperatures
	2	Calculating change in temperature	• calculate the difference in temperature between all ranges including between 0 and a negative or positive, both positive, both negative, 1 positive and 1 negative
	3	Solving problems within a given context involving a change in temperature	• solve problems within a given context involving a change in temperature
			• solve problems within a given context involving a change in temperature using temperature specific terminology, eg warmer
	4	Describing the difference between a given minimum and maximum temperature using terms such as 'temperature range'	• describe the difference between a given minimum and maximum temperature using terms such as 'temperature range'

Area			
Solve area problems			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving area problems involving rectangles	1	Applying the formula for the area of a rectangle	• apply the formula for area of a rectangle to find the area of rectangles given 2 side lengths measured in the same or different units
			• apply the formula for area of a rectangle to find the area of composite rectilinear figures, such as an L-shape, U-shape
			• apply the formula to real life contexts
	2	Investigating and comparing the areas of rectangles that have the same perimeter	• investigate and compare the areas of rectangles that have the same perimeter, eg compare the areas of all possible rectangles with whole-number dimensions and a perimeter of 20 centimetres
	3	Finding the dimensions of rectangles and squares given their areas	• find the possible dimensions of rectangles and squares given their areas
Solving area problems involving triangles	1	Applying the formula to find the areas of right-angled triangles	• apply the formula to find the areas of right-angled triangles
	2	Applying the formula to find the areas of non right-angled triangles	• apply the formula to find the areas of triangles in which the perpendicular height meets the base within the length of the base

Learning Journey	Step	Spine Nodes	Subnodes
			• apply the formula to find the areas of triangles in which the perpendicular height meets the base outside the length of the base
	3	Finding the dimensions of a right-angled triangle given its area	• find the dimensions of a right-angled triangle given its area and either its base or height by using the formula for the area of a triangle
	4	Finding the dimensions of a non right-angled triangle given its area	• find the dimensions of non right-angled triangles given its area and either its base or height using the formula for the area of a triangle
			• find the dimensions of non right-angled triangles in which the perpendicular height meets the base outside the length of the base given its area and either its base or height by using the formula for the area of a triangle
	5	Solving real-life problems involving calculating the area of triangles	• solve real-life problems involving calculating the area of triangles
Solving area problems involving parallelograms	1	Finding the area of a parallelogram using a formula	• apply the formula to find the area of parallelograms in different orientations
			• apply the formula to find the area of parallelograms in different orientations which include more dimensions than are necessary to calculate the area
	2	Finding the dimensions of a parallelogram given its area	• find the dimensions of a parallelogram given its area and either its length or width by using the formula for the area of a parallelogram
			• find the dimensions of a parallelogram in different orientations given its area and either its length or width by using the formula for the area of a parallelogram
	3	Solving real-life problems involving calculating the area of parallelograms	• solve real-life problems involving calculating the area of parallelograms
Solving area problems: simple composite figures	1	Calculating the area of composite shapes constructed from triangles and special quadrilaterals	• apply area formulas for a variety of composite shapes to calculate their area

Volume			
Volume of rectangular prisms			
Learning Journey	Steps	Spine Nodes	Subnodes
Volume of rectangular prisms	1	Calculating the volumes of rectangular prisms using additive and multiplicative strategies	• describe rectangular prisms in terms of layers
			• use repeated addition to find the volumes of rectangular prisms

Learning Journey	Step	Spine Nodes	Subnodes
			• calculate the volumes of rectangular prisms in cubic centimetres and cubic metres including calculating the volume given the net for the shape
			• record calculations used to find the volumes of rectangular prisms
Explore different views of prisms/solids			
Explore different views of prisms/solids	1	Drawing (in two dimensions) prisms from different views by connecting cubes, including top, side, front and back views	• draw from connecting cubes (in two dimensions) prisms from different views, including top, side, front and back views
	2	Drawing (in two dimensions) solids formed from combinations of prisms by connecting cubes, from different views, including top, side, front and back views	• draw from connecting cubes (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
	3	Drawing (in two dimensions) prisms from different views, including top, side, front and back views	• draw (in two dimensions) prisms from different views, including top, side, front and back views
		Drawing (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views	• draw (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
	4	Identifying prisms from their cross-section	• identify the cross-sections of different prisms
		Drawing the cross-sections of prisms	• draw the cross-sections of prisms

3 Geometry

Shape			
Geometry conventions			
Learning Journey	Steps	Spine Nodes	Subnodes
Labels and naming conventions	1	Labelling common shapes	• label and name triangles (eg triangle ABC or ΔABC) and quadrilaterals (eg ABCD) in text and on diagrams
			• use the common conventions to mark equal intervals on diagrams
Geometry conventions	1	Using the language and conventions of geometry	• define, name, label and draw points using capital letters
			• define, name, label and draw lines using capital letters
			• define, name, label and draw rays using capital letters
			• define, name, label and draw line segments using capital letters
			• define, name, label and draw angles using capital letters
			• name, label and draw triangles using capital letters
			• name, label and draw quadrilaterals and other polygons using capital letters
			• use common conventions to label right angles and equal angles on diagrams
			• use common conventions to label equal line segments on diagrams
Describing cross sections of 3D figures	1	Describing the two-dimensional figures that result from slicing three-dimensional figures	• describe the two-dimensional figures that result from slicing three-dimensional figures, ie plane sections of right rectangular prisms and right rectangular pyramids
Triangles			
Properties of triangles	1	Classifying types of triangles	• recognise and classify types of triangles on the basis of their properties (acute-angled, right-angled, obtuse-angled, equilateral, isosceles and scalene triangles)
			• recognise that a given triangle may belong to more than 1 class
	2	Sketching and labelling triangles from a worded or verbal description	• determine whether the triangle exists according to its physical description
Triangle Inequality Theorem	1	Verifying the Triangle Inequality theorem using constructions and apply the theorem to solve problems	• verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems

Learning Journey	Step	Spine Nodes	Subnodes
Constructing triangles with given conditions	1	Constructing triangles with given conditions	• construct triangles from 3 measures of angles or sides, noticing when the conditions determine a unique triangle, more than 1 triangle, or no triangle
			• identify, through investigation, the minimum side and angle information needed to describe a unique triangle, eg side-side-side, side-angle-side, angle-angle-side
Quadrilaterals			
Convex and non-convex quadrilaterals	1	Distinguishing between convex and non-convex quadrilaterals	• distinguish between convex and non-convex quadrilaterals using the fact that the diagonals of a convex quadrilateral lie inside the figure
			• distinguish between convex and non-convex quadrilaterals using the fact that a non-convex quadrilateral that has an interior angle greater than 180 degrees
Properties of quadrilaterals	1	Investigating properties of special quadrilaterals: rectangles	• investigate the properties of rectangles
		Investigating properties of special quadrilaterals: squares	• prove a quadrilateral is a square using properties
	2	Investigating properties of special quadrilaterals: parallelograms	• prove a quadrilateral is a parallelogram using properties
	3	Investigating properties of special quadrilaterals: rhombuses	• prove a quadrilateral is a rhombus using properties
	4	Investigating properties of special quadrilaterals: trapeziums/trapezoids	• prove a quadrilateral is a trapezium using properties
	5	Investigating properties of special quadrilaterals: kites	• prove a quadrilateral is a kite using properties
Reasoning, sketching and describing quadrilaterals	1	Reasoning about special quadrilaterals on the basis of their properties	• classify a set of quadrilaterals based on their properties
			• identify a given quadrilateral from its description
			• identify a given quadrilateral from a diagram
	2	Describing special quadrilaterals	• describe a quadrilateral in sufficient detail for it to be sketched
	3	Reasoning about triangles and special quadrilaterals	• use the properties of special triangles and quadrilaterals to solve simple numerical problems with appropriate reasoning
			• recognise special types of triangles and quadrilaterals embedded in composite figures or drawn in various orientations

Learning Journey	Step	Spine Nodes	Subnodes
Triangles and quadrilaterals			
Using properties of triangles & quadrilaterals	1	Reasoning about triangles and special quadrilaterals	• use the properties of special triangles and quadrilaterals to solve simple numerical problems with appropriate reasoning
		Reasoning about triangles and special quadrilaterals	• recognise special types of triangles and quadrilaterals embedded in composite figures or drawn in various orientations
	2	Determining unknown sides and angles embedded in diagrams, using the properties of special triangles and quadrilaterals, giving reasons	• determine unknown sides and angles embedded in diagrams, using the properties of special triangles and quadrilaterals, giving reasons

Angles			
Sums of interior angles			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving sums of interior angles	1	Exploring and proving the interior angle sum of a triangle	• calculate an unknown angle represented by a variable within a triangle, given the other 2 angles
	2	Finding the interior angle sum of a quadrilateral	• calculate an unknown angle/s represented by a variable/s within quadrilaterals, given the appropriate angles
Angle relationships and parallel lines			
Angles at a point	1	Investigating and defining complementary angles	• define complementary angles and identify them in diagrams
		Calculating complementary angles	• calculate the size of an unknown angle in a diagram and explain how this is done (using complementary angles)
		Investigating and defining supplementary angles	• define supplementary angles and identify them in diagrams
		Calculating supplementary angles	• calculate the size of an unknown angle in a diagram and explain how this is done (using supplementary angles)
	2	Investigating and identifying adjacent angles	• identify adjacent angles within a diagram
	3	Calculating where angles form a revolution	• calculate the size of an unknown angle in a diagram and explain how this is done (using knowledge of angles that add to 360°)
	4	Identifying and naming right angles, straight angles, vertically opposite angles and angles of complete revolution embedded in diagrams	• identify and name right angles, straight angles, vertically opposite angles and angles of complete revolution embedded in diagrams
	5	Applying geometric reasoning for adjacent angle relationships	• apply theorems of complementary angles, supplementary angles, vertically opposite and adjacent angles, calculating unknown angles

Learning Journey	Step	Spine Nodes	Subnodes
			• apply theorems for adjacent angles represented by variables in multi-step problems, writing equations to solve for an unknown angle, checking the reasonableness of the answer
			• apply theorems of complementary angles, supplementary angles, vertically opposite and adjacent angles in multi-step problems, calculating unknown angles and stating all relationships used
Parallel and perpendicular line conventions	1	Identifying perpendicular and parallel lines	• name and record perpendicular lines using the conventional notation
			• define parallel lines and identify them in pictures, designs, diagrams and the environment, using conventional notation to mark them
			• name and record parallel lines using the conventional notation
Angle relationships on parallel lines	1	Exploring special pairs of angles on parallel lines	• define, identify and draw transversals on sets of 2 or more parallel lines
			• define and identify pairs of equal corresponding angles when 2 or more parallel lines are cut by a transversal
			• define and identify pairs of equal alternate angles when 2 or more parallel lines are cut by a transversal
			• define and identify pairs of supplementary cointerior angles when 2 or more parallel lines are cut by a transversal
	2	Applying geometric reasoning with corresponding angles on parallel lines	• use corresponding angles on parallel lines to calculate unknown angles represented by variables
	3	Applying geometric reasoning with alternate angles on parallel lines	• use alternate angles on parallel lines to calculate unknown angles represented by variables
	4	Applying geometric reasoning with co-interior angles on parallel lines	• use cointerior angles on parallel lines to calculate unknown angles represented by variables
	5	Applying geometric reasoning with angles on parallel lines by choosing the appropriate angle relationship	• choose and apply the appropriate angle property to calculate unknown angles on parallel lines represented by variables
Parallel lines and geometric reasoning			
Proving parallel lines	2	Proving lines are parallel	• prove or disprove that a pair of lines are parallel using the relationships between corresponding angles, alternate angles, and cointerior angles

Learning Journey	Step	Spine Nodes	Subnodes
Geometric reasoning using angle properties	1	Applying geometric reasoning with angles at a point and angles on parallel lines	• apply theorems of angles at a point and angles on parallel lines to solve numerical geometric problems involving up to 3 theorems/steps, giving a reason for each step of the solution

4 Data

Data			
Collecting and interpreting data			
Learning Journey	Steps	Spine Nodes	Subnodes
Issues with data from primary & secondary sources	1	Identifying and investigating issues involving numerical data collected from primary and secondary sources	• identify the difference between data collected from primary and secondary sources, eg data collected in the classroom compared with data drawn from a media source
	2	Exploring issues involved in constructing and conducting surveys, such as sample size, bias, type of data required, and ethics	• detect and discuss bias, if any, in the selection of a sample
Collecting and interpreting data	1	Constructing appropriate survey questions and a related recording sheet in order to collect both numerical and categorical data about a matter of interest	• construct a recording sheet that allows efficient collection of the different types of data expected
			• decide whether a census or a sample is more appropriate to collect the data required to investigate the matter of interest
	2	Collecting and interpreting information from secondary sources, presented as tables and/or graphs, about a matter of interest	• collect and interpret information from secondary sources, presented as tables and/or graphs, about a matter of interest, eg sporting data, information about the relationship between wealth or education and the health of populations of different countries
			• interpret and use scales on graphs, including those where abbreviated measurements are used, eg '50' on a vertical axis representing thousands is interpreted as '50 000'
			• identify features on graphical displays that may mislead and result in incorrect interpretation, eg displaced zeros, the absence of labelling on 1 or both axes, potentially misleading units of measurement
	3	Using spreadsheets or statistical software packages to tabulate and graph data	• use spreadsheets or statistical software packages to tabulate and graph data
	4	Discussing ethical issues that may arise from collecting and representing data	• discuss ethical issues that may arise from collecting and representing data
Representing data			
Tallies and frequency distribution tables	1	Using a tally to organise data into a frequency distribution table	• use a tally to organise data into a frequency distribution table
Histograms and polygons	1	Interpreting a discrete data set from its histogram and polygon	• interpret a discrete data set from its histogram and polygon

Learning Journey	Step	Spine Nodes	Subnodes
	2	Constructing and interpreting frequency histograms and polygons	• construct and interpret frequency histograms and polygons
Histograms and polygons: grouped data	1	Interpreting a discrete data set from its histogram and polygon where grouping is required	• interpret a discrete data set from its histogram and polygon where grouping is required
	2	Constructing histograms for discrete data sets where grouping is required	• construct histograms for discrete data sets where grouping is required
	3	Constructing combined histograms and polygons for discrete data sets where grouping is required	• construct combined histograms and polygons for discrete data sets where grouping is required
Dot plots	1	Interpreting dot plots	• interpret dot plots
	2	Constructing dot plots	• construct dot plots
Ordered stem-and-leaf plots	1	Interpreting ordered stem-and-leaf plots with whole numbers and simple decimal values	• interpret ordered stem-and-leaf plots with whole numbers and simple decimal values
	2	Constructing ordered stem-and-leaf plots with whole numbers	• construct ordered stem-and-leaf plots with whole numbers only
	3	Constructing ordered stem-and-leaf plots with whole numbers and simple decimal values	• construct ordered stem-and-leaf plots with whole numbers and simple decimal values
Divided bar graphs	1	Interpreting divided bar graphs	• interpret divided bar graphs
	2	Constructing divided bar graphs with the use of digital technology	• construct divided bar graphs with the use of digital technology
	3	Constructing divided bar graphs without the use of digital technology	• calculate the length of the bar required for each section of divided bar graphs
Sector/pie graphs	1	Interpreting sector graphs	• interpret sector graphs
	2	Constructing sector graphs with the use of digital technology	• construct sector graphs with the use of digital technology
	3	Constructing sector graphs without the use of digital technology	• calculate the angle at the centre required for each sector of sector graphs
Line graphs	1	Interpreting line graphs	• interpret line graphs
	2	Constructing line graphs with the use of digital technology	• construct line graphs with the use of digital technology
Interpreting a variety of different graphs	1	Interpreting a variety of graphs, including dot plots, stem-and-leaf plots, divided bar graphs, sector graphs and line graphs	• interpret a variety of graphs, including dot plots, stem-and-leaf plots, divided bar graphs, sector graphs and line graphs

Learning Journey	Step	Spine Nodes	Subnodes
			• calculate the percentage of the whole represented by different categories in a divided bar graph or sector graph
			• draw conclusions from data displayed in a graph, eg 'The graph shows that the majority of Year 8 students who play a musical instrument play a string instrument'
			• critique ways in which data is presented in sector graphs, line graphs, bar graphs and pictographs
Mean, Median, Mode and Range			
Calculating the mean	1	Calculating the mean of a set of data using mean = sum of data values/number of data values	• calculate the mean of a set of data using mean = sum of data values/number of data values
	2	Using the statistical functions of a spreadsheet to determine the mean for large sets of data	• use the statistical functions of a spreadsheet to determine the mean for large sets of data
Median mode and range	1	Determining the median for sets of data without the use of digital technology	• determine the median for sets of data without the use of digital technology and containing an odd number of scores
			• determine the median for sets of data without the use of digital technology and containing an even number of scores
	2	Determining the mode for sets of data without the use of digital technology	• determine the mode for sets of data without the use of digital technology
	3	Determining the range for sets of data without the use of digital technology	• determine the range for sets of data without the use of digital technology
	4	Determining the median, mode and range for sets of data using digital technology	• determine the median, mode and range for sets of data using digital technology
			• use the statistical functions of a spreadsheet to determine the median, mode and range for large sets of data
Using mean, median, mode to interpret data displays			
Using mean/median/mode to interpret data	1	Calculating measures of location (mean, median and mode) and the range for data represented in a variety of statistical displays, including frequency distribution tables, frequency histograms, stem-and-leaf plots and dot plots	• calculate measures of location (mean, median and mode) and the range for data represented in a variety of statistical displays, including frequency distribution tables, frequency histograms, stem-and-leaf plots and dot plots

Learning Journey	Step	Spine Nodes	Subnodes
	2	Drawing conclusions based on the analysis of data displays using the mean, median and/or mode, and range	• draw conclusions based on the analysis of data displays using the mean, median and/or mode, and range

5 Chance and Probability

Chance and probability			
Chance experiments and sample spaces			
Learning Journey	Steps	Spine Nodes	Subnodes
Language of chance experiments	1	Understanding the language around chance	• understand that the term 'chance experiment' is used when referring to actions such as tossing a coin, rolling a dice or randomly selecting an object from a bag
			• understand that the term 'outcome' is used to describe a possible result of a chance experiment and list all of the possible outcomes for a single-step experiment
			• understand that the term 'sample space' is used to describe a list of all of the possible outcomes for a chance experiment
			• use the term 'probability' to describe the numerical value that represents the likelihood of an outcome of a chance experiment
			• arrange the likelihood of chance experiment outcomes in order from least likely to most likely (and vice versa)
Sample spaces	1	Identifying equally likely outcomes in single-step chance experiments	• identify equally likely outcomes in single-step chance experiments
	2	Identifying the sample space for a probability experiment involving 1 event	• identify the sample space for a probability experiment involving 1 event
	3	Identifying the sample space for a probability experiment involving 2 independent events	• identify the sample space (where the combined sample space has 36 or fewer elements) for a probability experiment involving 2 independent events
	4	Listing the outcomes for chance experiments where the outcomes are not equally likely to occur and assign probabilities to the outcomes using fractions	• list the outcomes for chance experiments where the outcomes are not equally likely to occur and assign probabilities to the outcomes using fractions
Chance experiments	1	Describing single-step chance experiments in which the outcomes are equally likely	• describe single-step chance experiments in which the outcomes are equally likely
	2	Describing single-step chance experiments in which the outcomes are equally and not equally likely	• describe single-step chance experiments in which the outcomes are equally and not equally likely

Learning Journey	Step	Spine Nodes	Subnodes
	3	Creating and conducting a chance experiment given equally probable events	• determine the theoretical probability of a series of events using tree diagrams
			• compare the expected probabilities with the observed probabilities after both small and large numbers of trials for the chance experiment given equally probable events
	4	Creating and conducting a chance experiment given unequally probable events	• create a chance experiment given unequally probable events
			• determine the theoretical probability of a series of unequally probable events using tree diagrams
Probability			
Language of probability	1	Recognising that a probability of 0 is for events that are impossible and a probability of 1 for events that are certain to occur	• recognise that a probability of 0 is for events that are impossible and a probability of 1 for events that are certain to occur
	2	Relating calculated probabilities with the language of chance and the likelihood number line	• relate calculated probabilities with the language of chance and the likelihood number line
	3	Assigning numerical probabilities with their associated language	• assign language such as impossible, highly unlikely, unlikely, even chance, likely, highly likely and certain to the known probabilities of outcomes occurring
			• allocate words such as impossible, highly unlikely, unlikely, even chance, likely, highly likely and certain along a number line from 0 to 1 representing their respective probabilities
Understanding basic probability	1	Explaining the meaning of 0, $\frac{1}{2}$ and 1 in a given chance situation, using the language of chance	• explain the meaning of 0, $\frac{1}{2}$ and 1 in a given chance situation, using the language of chance
	2	Applying probabilities to simple events by reasoning about equally likely outcomes	• apply probabilities to simple events by reasoning about equally likely outcomes
	3	Expressing the theoretical probability of an event formally	• express the theoretical probability of an event, given a number of equally likely outcomes in the sample space, as P(event) = number of favourable outcomes ÷ total number of outcomes
	4	Expressing probabilities as decimals, fractions and percentages	• express probabilities as decimals, fractions and percentages
		Interpreting probabilities expressed as fractions, percentages or decimals	• interpret probabilities expressed as fractions, percentages or decimals

Learning Journey	Step	Spine Nodes	Subnodes
	5	Calculating the probability of an event of a single-step experiment using cards, dice, spinners, etc	• calculate the probability of an event of a single-step experiment using cards, dice, spinners, etc

Part II

Level 8

6 Number and Algebra

Integers			
Applying the four operations to integers			
Learning Journey	Steps	Spine Nodes	Subnodes
Applying the four operations to integers	1	Using the 4 operations with integers	• use the 4 operations to solve problems involving integers
	2	Applying the order of operations to evaluate expressions involving integers with no indices or radicals	• apply the order of operations to evaluate expressions involving integers with no indices or radicals
	3	Applying the order of operations to evaluate expressions involving integers where the operator is contained within the numerator or denominator of a fraction	• apply the order of operations to evaluate expressions involving integers, where an operator is contained within the numerator or denominator of a fraction and the result is a whole number
			• apply the order of operations to evaluate expressions involving integers where the operator is contained within the numerator or denominator of a fraction

Fractions, Decimals and Percentages			
Working with percentages			
Learning Journey	Steps	Spine Nodes	Subnodes
Increasing and decreasing amounts	1	Increasing and decreasing amounts by percentages (calculator method)	• increase and decrease a quantity by a given percentage using the calculator method
	2	Increasing and decreasing amounts by percentages (written and mental methods)	• increase an amount by first calculating the percentage increase value of the original amount, and then adding that result to the original amount
			• decrease an amount by first calculating the percentage decrease value of the original amount, and then subtracting that result from the original amount
	3	Recognising and using equivalences when calculating percentage increases and decreases	• increase an amount by a percentage by multiplying the original amount by 1 + the percentage increase expressed as a decimal
			• decrease an amount by a percentage by multiplying the original amount by 1 - the percentage decrease expressed as a decimal

Learning Journey	Step	Spine Nodes	Subnodes
Problem solving involving percentages	1	Using the unitary method to solve problems involving percentages (written method)	• use the unitary method to find the original quantity/value following a percentage increase/decrease, eg find the original value, given the value after an increase of 20%
			• find original value after a percentage increase/decrease
	2	Using the unitary method to solve problems involving percentages (calculator method)	• use the unitary method with a calculator to solve problems involving percentages, eg find the original value given the value after an increase of 20%
			• find the original value after a percentage increase/ decrease
	3	Interpreting and using nutritional information panels on product packaging where percentages are involved	• interpret and use nutritional information panels on product packaging where percentages are involved
		Interpreting and using statements about the environment involving percentages, eg energy use for different purposes such as lighting	• interpret and use statements about the environment involving percentages, eg energy use for different purposes, such as lighting
	4	Solving real-life problems involving percentages	• solve a variety of real-life problems involving percentages, including percentage composition problems and problems involving money

Financial Maths			
Solving problems involving profit & loss			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving problems involving profit and loss	1	Understanding the financial terms 'profit' and 'loss'	• understand the meaning of the terms 'cost price', 'sale price', 'profit and loss' and the relationships between them
	2	Solving problems involving profit and loss with the use of digital technology	• calculate the selling price, given the percentage profit/loss on the cost price with the use of digital technology
			• express profit/loss as a percentage of the cost price with the use of digital technology
			• calculate the cost price, given the selling price and percentage profit/loss with the use of digital technology
	3	Solving problems involving profit and loss without the use of digital technology	• calculate the selling price, given the percentage profit/loss on the cost price without the use of digital technology
			• express profit/loss as a percentage of the cost price without the use of digital technology

Learning Journey	Step	Spine Nodes	Subnodes
			• calculate the cost price, given the selling price and percentage profit/loss without the use of digital technology
	4	Solving complex problems involving multiple steps	• solve complex problems involving multiple steps

Rates and Ratios			
Rates and ratios			
Learning Journey	Steps	Spine Nodes	Subnodes
Solve problems involving ratios	1	Dividing a given quantity into 2 parts in a given part:whole ratio	• divide a given quantity into 2 parts in a given part:whole ratio
	2	Solving a variety of real-life problems involving dividing quatities into a given ratio	• solve a variety of real-life problems involving dividing quantities into a given ratio
Ratios involving more than two parts	1	Simplifying ratios using highest common factors (ratio composed of 3 or more numbers)	• simplify ratios using highest common factors
	2	Dividing a quantity into a given ratio (ratio composed of 3 or more numbers)	• divide a quantity in a given ratio
	3	Applying the unitary method to ratio problems (ratio composed of 3 or more numbers)	• apply the unitary method to ratio problems
Converting ratios	1	Converting units in a ratio into the same unit then simplifying	• convert units of a ratio into the same unit
			• simplify ratios
	2	Converting between units of measurement using ratios	• convert between units of measurement using ratios
Using rates	1	Introducing rates	• use rates to compare quantities measured in different units
	2	Converting given information into a simplified rate	• convert given information into a simplified rate
	3	Comparing rates	• compare 2 quantities of different rates
	4	Determining an amount for a given time period given a rate	• determine an amount for a given time period given a unit rate
			• determine an amount for a given time period given a rate
	5	Solving problems comparing 2 given rates by simplifying	• solve problems comparing 2 given rates by simplifying
Solving unit rate problems involving fractions	5	Applying the unitary method to ratio problems involving fractions (customary and metric units)	• apply the unitary method to ratio problems involving fractions (customary and metric units)
			• solve a variety of real-life problems involving ratios of fractions (customary and metric units)

Algebraic expressions			
Working with algebraic expressions			
Learning Journey	Steps	Spine Nodes	Subnodes
Simplfying algebraic expressions using mixed operations	1	Simplifying algebraic expressions involving the 4 operations	• simplify a range of algebraic expressions, including those involving mixed operations
			• apply the order of operations to simplify algebraic expressions
Extending and applying the distributive law	1	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive integers and b is a variable with coefficient of 1	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive integers and b is a variable with coefficient of 1
	2	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive or negative integers and b is a variable with coefficient of 1	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive or negative integers and b is a variable with coefficient of 1
	3	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b, and c can be positive numbers or variables (coefficients are 1)	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b, and c can be positive numbers or variables (coefficients are 1)
	4	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients 1 or -1)	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients 1 or -1)
	5	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients integers not limited to 1)	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients integers not limited to 1)
Factorising algebraic expressions			
Factorising algebraic expressions	1	Decomposing (factorising) algebraic expressions by identifying numerical and algebraic factors	• decompose (factorise) algebraic expressions by identifying numerical and algebraic factors and writing it as a product of these
	2	Factorising algebraic expressions by identifying numerical factors	• factorise algebraic expressions by finding a common numerical factor and bringing it out the front of the brackets with its product inside the brackets
	3	Factorising algebraic expressions by identifying negative numerical factors	• factorise algebraic expressions by finding a common negative numerical factor and bringing it out the front of the brackets with its product inside the brackets

Learning Journey	Step	Spine Nodes	Subnodes
Factorising algebraic expressions 2	1	Factorising algebraic expressions by identifying only algebraic factors	• factorise algebraic expressions by finding a common algebraic factor and bringing it out the front of the brackets with its product inside the brackets
	3	Factorising algebraic expressions by identifying algebraic and numerical factors	• factorise algebraic expressions by finding a common algebraic and numerical factor and bringing it out the front of the brackets with its product inside the brackets

Index laws			
Investigating index laws			
Learning Journey	Steps	Spine Nodes	Subnodes
Investigating index laws	1	Multiplying 2 or more terms with the same numerical base and a positive-integer power, leaving the solution in index form	• multiply 2 or more terms with the same numerical base and a positive-integer power, leaving the solution in index form
	2	Dividing 2 or more terms with the same numerical base and a positive-integer power, leaving the solution in index form	• divide 2 or more terms with the same numerical base and a positive-integer power, leaving the solution in index form
	3	Calculating an expression in which a number in index form is raised by a positive-integer power	• calculate an expression in which a number in index form is raised by a positive-integer power
	4	Using the zero index rule to simplify expressions involving numbers to the power of zero	• use the zero index rule to simplify expressions involving numbers to the power of zero

Equations			
Solving equations			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving 3-step equations	1	Solving linear equations (integer coefficients) using inverse operations involving 3 steps with mixed operations with integer solutions	• solve linear equations (integer coefficients) using inverse operations involving 3 steps with mixed operations with integer solutions
	2	Solving linear equations (integer coefficients) using inverse operations involving 3 steps with mixed operations with integer and non-integer solutions	• solve linear equations (integer coefficients) using inverse operations involving 3 steps with mixed operations with integer and non-integer solutions
	3	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving 3 steps with mixed operations with integer and non-integer solutions	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving 3 steps with mixed operations with integer and non-integer solutions

Learning Journey	Step	Spine Nodes	Subnodes
Solving equations with variable on both sides	1	Solving linear equations (integer coefficients) using inverse operations involving pronumerals on both sides of the equation	• solve linear equations (integer coefficients) using inverse operations involving pronumerals on both sides of the equation
	2	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving pronumerals on both sides of the equation	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving pronumerals on both sides of the equation
Solving equations involving brackets	1	Solving linear equations (integer coefficients) using inverse operations involving expanding brackets	• solve linear equations (integer coefficients) using inverse operations involving expanding brackets
	2	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving expanding brackets	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving expanding brackets
Solving basic quadratic equations	1	Solving simple quadratic equations with integer answers	• solve simple quadratic equations of the form $x^2 = c$
		Solving simple quadratic equations with non-integer answers left as decimals	• solve simple quadratic equations with non-integer answers left as decimals
		Solving simple quadratic equations with non-integer answers left in exact form	• solve simple quadratic equations with non-integer answers left in exact form

Number Theory			
Irrational numbers			
Learning Journey	Steps	Spine Nodes	Subnodes
Investigating irrational numbers	1	Describing, informally, the properties of irrational numbers	• describe, informally, the properties of irrational numbers
Exploring irrational numbers (surds)	1	Describing, informally, the properties of irrational numbers	• describe, informally, the properties of irrational numbers
	2	Using rational approximations of irrational numbers to compare the size of irrational numbers	• use rational approximations of irrational numbers to compare the size of irrational numbers
	3	Approximating the location of irrational numbers on a number line	• approximate the location of irrational numbers on a number line

Coordinate Geometry			
Linear relationships			
Learning Journey	Steps	Spine Nodes	Subnodes
Table of values	1	Investigating linear relationships on Cartesian plane (number plane) for number and geometric (spatial) patterns	• identify a table of values matching a linear relationship plotted on the number plane (with and without digital technology)
			• identify the table of values for a given number pattern that matches the points plotted on a number plane
			• describe the linear relationship and the rules (term-to-term and also position-to-term)
Solving linear equations graphically	1	Solving linear equations using graphical techniques	• use graphs of linear relationships to solve a corresponding linear equation, with and without the use of digital technologies
	2	Graph 2 intersecting lines on the same set of axes and read off the point of intersection	• use tables of values to plot 2 straight lines on a single Cartesian plane
			• read the point of intersection of 2 plotted straight lines on a single Cartesian plane

Patterns			
Number patterns and sequences			
Learning Journey	Steps	Spine Nodes	Subnodes
Working with Linear Sequences	2	Finding the nth term of linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with integer coefficients of n	• find the nth term of increasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with integer coefficients of n
			• find the nth term of decreasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with integer coefficients of n
	1	Investigating and extending numeric and geometric patterns represented in a table	• investigate and extend numeric patterns represented in a table
			• investigate and extend geometric patterns represented in a table
	3	Finding the nth term of linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with decimal coefficients of n	• find the nth term of increasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with decimal coefficients of n
			• find the nth term of decreasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with decimal coefficients of n

Learning Journey	Step	Spine Nodes	Subnodes
		Finding the nth term of linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with fractional coefficients of n	• find the nth term of increasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with fractional coefficients of n
			• find the nth term of a decreasing linear sequences arising from a given set of numbers or sequences generated from concrete/visual representations with fractional coefficients of n
	4	Using the nth term rule for a linear series	• use the nth term rule to find missing terms of the sequence, eg 100th term
			• use the nth term rule to determine whether a number exists in a sequence
	5	Solving problems involving the use of the nth term formula for a linear sequence	• solve problems involving the use of the nth term formula for a linear sequence

7 Measurement

Perimeter			
Perimeter of quadrilaterals			
Learning Journey	Steps	Spine Nodes	Subnodes
Finding the perimeter	1	Finding perimeters of special quadrilaterals	• find the perimeter of parallelograms, trapeziums, rhombuses and kites
			• apply knowledge of geometric markings to find the perimeters of special quadrilaterals
	2	Solving problems involving perimeters of regular polygons	• solve problems involving the perimeters of regular polygons
			• solve problems involving perimeters of regular polygons with dimensions given in different units
	3	Solving problems involving perimeters of composite polygons	• solve problems involving perimeters of composite polygons formed using only triangles, squares, rectangles or parallelograms
			• solve problems involving perimeters of composite polygons formed using regular polygons
			• solve problems involving perimeters of composite polygons formed using only triangles, squares, rectangles or parallelograms with dimensions given in different units
			• solve problems involving perimeters of composite polygons formed using regular polygons with dimensions given in different units

Area			
Area of quadrilaterals			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving area problems involving trapeziums	1	Finding the area of a trapezium using the formula	• apply the formula to find the areas of trapeziums of different orientations and shapes, including 4 unequal sides with no right angles, 2 right angles and isosceles trapezium
			• apply the formula to find the area of trapeziums in different orientations which include dimensions that are not necessary to calculate the area
	2	Finding the dimensions of a trapezium given its area	• find the dimensions of a trapezium given its area and 2 of either its height, roof or base by using the formula for the area of a trapezium
			• find the dimensions of a trapezium in different orientations given its area and 2 of either its height, roof or base by using the formula for the area of a trapezium

Learning Journey	Step	Spine Nodes	Subnodes
	3	Solving real-life problems involving calculating the area of trapeziums	• solve real-life problems involving calculating the area of trapeziums
Solving area problems involving rhombuses	1	Finding the area of a rhombus using the formula	• apply the formula to find the area of rhombuses in different orientations
			• apply the formula to find the area of rhombuses in different orientations which include dimensions that are not necessary to calculate the area
	2	Finding the dimensions of a rhombus given its area	• find the dimensions of a rhombus given its area by using the formula for the area of a rhombus
			• find the dimensions of a rhombus in different orientations given its area by using the formula for the area of a rhombus
	3	Solving real-life problems involving calculating the area of rhombus'	• solve real-life problems involving calculating the area of rhombus'
Solving area problems involving kites	1	Finding the area of a kite using the formula	• apply the formula to find the area of kites in different orientations
			• apply the formula to find the area of kites in different orientations which include dimensions that are not necessary to calculate the area
	2	Finding the dimensions of a kite given its area	• find the dimensions of a kite given its area and either its length or width by using the formula for the area of a kite
			• find the dimensions of a kite in different orientations given its area and either its length or width by using the formula for the area of a kite
	3	Solving real-life problems involving calculating the area of kites	• solve real-life problems involving calculating the area of kites

Circles			
Working with circles			
Learning Journey	Steps	Spine Nodes	Subnodes
Identifying parts of circles	1	Identifying parts of a circle	• identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
Working with circumferences of circles	1	Finding circumferences	• develop and use the formulas to find the circumferences of circles in terms of the diameter d or radius r
	2	Finding the diameter and/or radius of a circle given its circumference	• find the diameter and/or radius of a circle given its circumference
Finding perimeters of parts of circles	1	Finding the perimeters of quadrants and semicircles	• find the perimeters of quadrants and semicircles given the appropriate information

Learning Journey	Step	Spine Nodes	Subnodes
			• find the diameter and/or radius of a semicircle/quadrant given the perimeter
	2	Finding the perimeters of simple composite figures	• find the perimeters of simple composite figures consisting of 2 shapes, including quadrants and semicircles
	3	Finding the perimeters of composite figures	• find the perimeters of composite figures containing 3 or more shapes consisting of 3 or more shapes, including quadrants and semicircles
Finding arc lengths and perimeters of sectors	1	Finding arc lengths and the perimeters of sectors	• find the arc length of a sector
			• solve problems which apply the proportional relationship between the circumference and an arc length measure of the same circle, giving an exact answer in terms of π
	2	Solving problems involving perimeters of sectors	• find the diameter and/or radius of a sector given the perimeter
			• find the perimeters of complex composite figures
			• solve problems involving arcs and sectors
	3	Solving problems involving circles with exact answers	• solve a variety of practical problems involving circles and parts of circles, giving an exact answer in terms of π
		Solving problems involving circles with approximate answers	• solve a variety of practical problems involving circles and parts of circles, giving an approximate answer using a calculator's π function
Solving area problems involving circles	1	Finding the area of a circle using the formula	• apply the formula to find the areas of circles given the radius
			• apply the formula to find the areas of circles given the diameter
	2	Finding the dimensions of a circle given its area	• find the radius of a circle given its area using the formula for the area of a circle
			• find the diameter of a circle given its area using the formula for the area of circle
	3	Solving real-life problems involving calculating the area of circles	• solve real-life problems involving calculating the area of circles
Solving area problems involving parts of circles	1	Finding the area of a semicircle or quadrant of a circle	• find the area of a semicircle or quadrant of a circle
			• find the diameter or radius of a semicircle or quadrant given its area
			• find the diameter or radius of a semicircle or quadrant given its area within the context of a problem
	2	Applying the area of a sector formula with angle given in degrees:$A=\frac{\theta}{360}\pi r^2$	• find the area of a sector using the formula where radius is given and angle is given in degrees

Learning Journey	Step	Spine Nodes	Subnodes
			• find the radius of a sector using the formula where the area is given and angle is given in degrees
			• find the angle of a sector in degrees using the formula where the area and radius are given
			• find the unknown variable using the area of a sector formula in the context of a problem in degrees
	3	Finding the area of composite shapes involving circles, semicircles and quadrants	• find the area of composite shapes involving circles, semicircles and quadrants
			• find the area of composite shapes involving circles, semicircles and quadrants within the context of a problem
	4	Finding the area of composite shapes involving circles, semicircles and quadrants giving an exact answer in terms of pi	• find the area of composite shapes involving circles, semicircles and quadrants giving an exact answer in terms of pi
			• find the area of composite shapes involving circles, semicircles and quadrants within the context of a problem giving an exact answer in terms of pi

Volume			
Units of area and volume			
Learning Journey	Steps	Spine Nodes	Subnodes
Units of area and volume	1	Choosing an appropriate unit to measure the areas of different shapes and surfaces	• choose an appropriate unit to measure the areas of different shapes and surfaces, eg floor space, fields
	2	Converting between different metric units of area (square millimetres, square centimetres, square metres, square kilometres, hectares)	• convert between square millimetres and square centimetres and vice versa
			• convert between square centimetres and square metres and vice versa
			• convert between square metres and hectares and vice versa
			• convert between square metres and square kilometres and vice versa
Choosing and converting units of volume	1	Choosing appropriate units to measure the capacities of a variety of containers	• choose appropriate units to measure the capacities of a variety of containers, eg millilitres for a drinking glass, litres for a water urn
	2	Converting between metric units of volume and capacity (mL, L, kL and ML)	• convert between metric units of volume: $1km^3 = 1000000m^3$, $1m^3 = 10000cm^3$, $1cm^3 = 1000mm^3$
			• convert between metric units of capacity: 1ML = 1000000L, 1kL = 1000L, 1L = 1000mL

Learning Journey	Step	Spine Nodes	Subnodes
			• convert between metric units of volume and capacity: 1cm3 = 1mL, 1m³ = 1000L
Volume of prisms			
Finding the volume of prisms	1	Developing methods and formulas to find the volume of any prism	• recognise the area of the 'base' of a prism as being identical to the area of its uniform cross-section
	2	Finding the volume of prism with a composite/irregular polygon uniform cross-section, given their perpendicular heights and area of their cross-sections all in the same units	• find the volume of prism with a composite/irregular polygon uniform cross-section, given their perpendicular heights and area of their cross-sections all in the same units
	3	Finding the volume of prism with a composite/irregular polygon with uniform cross-section, given their perpendicular heights and dimensions of the cross-sections all in the same units	• find the volume of prism with a composite/irregular polygon with uniform cross-section, given their perpendicular heights and dimensions of the cross-sections all in the same units
	4	Finding the volume of prism with a composite/irregular polygon uniform cross-section, given their perpendicular heights and area of their cross-sections all in different units	• find the volume of prism with a composite/irregular polygon uniform cross-section, given their perpendicular heights and area of their cross-sections all in different units
	5	Finding the volume of prism with a composite/irregular polygon with uniform cross-section, given their perpendicular heights and dimensions of the cross-sections all in different units	• find the volume of prism with a composite/irregular polygon with uniform cross-section, given their perpendicular heights and dimensions of the cross-sections all in different units
Finding the volume of rectangular prisms	1	Finding the volumes of rectangular prisms, given their perpendicular heights and the dimensions of their uniform cross-sections	• find the volumes of rectangular prisms, given their perpendicular heights and the dimensions of their uniform cross-sections
		Finding the volume of a rectangular prism given the area of the uniform cross-section and perpendicular height in the same units	• find the volume of a rectangular prism given the area of the uniform cross-section and perpendicular height in the same units
	2	Finding the volume of a rectangular prism given the area of the uniform cross-section and perpendicular height in different units	• find the volume of a rectangular prism given the area of the uniform cross-section and perpendicular height in different units
	3	Finding the height or area of the rectangular prism uniform cross-section given the volume in the same units	• find the height or area of the rectangular prism uniform cross-section given the volume in the same units

Learning Journey	Step	Spine Nodes	Subnodes
	4	Finding the height/area of the rectangular prism uniform cross-section given the volume in different units	• find the height/area of the rectangular prism niform cross-section given the volume in different units
		Finding a missing dimension of a rectangular prism given the volume in different units	• find a missing dimension of a rectangular prism given the volume in different units
Finding the volume of triangular prisms	4	Finding a missing dimension of a triangular prism given the volume in the same units	• find a missing dimension of a triangular prism given the volume in the same units
		Finding a missing dimension of a triangular prism given the volume in different units	• find a missing dimension of a triangular prism given the volume in different units
	1	Finding the volume of a triangular prism given the area of the uniform cross-section and perpendicular height in the same units	• find the volume of a triangular prism given the area of the uniform cross-section and perpendicular height in the same units
		Finding the volume of triangular prisms, given their perpendicular heights and dimensions of their uniform cross-sections all in the same units	• find the volume of triangular prisms, given their perpendicular heights and dimensions of their uniform cross-sections all in the same units
	2	Finding the volume of a triangular prism given the area of the uniform cross-section and perpendicular height in different units	• find the volume of a triangular prism given the area of the uniform cross-section and perpendicular height in different units
		Finding the volume of triangular prisms, given their perpendicular heights and dimensions of their uniform cross-sections all in different units	• find the volume of triangular prisms, given their perpendicular heights and dimensions of their uniform cross-sections all in different units
	3	Finding the volume of triangular prisms, given their perpendicular heights, dimensions of their uniform cross-sections and additional measurements not required for the calculation in the same/different units	• find the volume of triangular prisms, given their perpendicular heights, dimensions of their uniform cross-sections and additional measurements not required for the calculation in the same/different units
Solving problems involving prisms	1	Solving a variety of practical problems involving the volumes and capacities of right prisms	• solve a variety of practical problems involving the volumes and capacities of right prisms
			• find the height or area of a prism with a composite/irregular polygon with uniform cross-section given the volume in the same units
Volume of cylinders			
solving problems involving cylinders	1	Using the formula to find the volumes of cylinders	• find the volume of a right cylinder given the area of the circle cross-section and perpendicular height in the same units

Learning Journey	Step	Spine Nodes	Subnodes
			• find the volume of a right cylinder given the area of the circle cross-section and perpendicular height in different units
	2	Finding the height or area of the circle cross-section for a right cylinder given the volume in the same units	• find the height or area of the circle cross-section for a right cylinder given the volume in the same units
			• find the height or area of the circle cross-section for a right cylinder given the volume in different units
	3	Finding the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross-sections all in the same units	• find the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross sections all in the same units
			• find the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross sections all in different units
	4	Finding the radius, diameter or height of right cylinders, given their volume all in the same units	• find the radius, diameter or height of right cylinders, given their volume all in the same units
			• find the radius, diameter or height of right cylinders, given their volume all in different units
	5	Solving a variety of practical problems involving the volume and capacity of right prisms and cylinders	• solve a variety of practical problems involving the volumes and capacities of right prisms and cylinders

Time			
Solve problems involving time			
Learning Journey	Steps	Spine Nodes	Subnodes
Solving problems involving time	1	Ordering a series of events according to the time taken to complete each one	• order a series of events according to the time taken to complete each one
	2	Calculating the elapsed time of events using start and finish times using only 12-hour time	• calculate the elapsed time of events using start and finish times using only 12-hour time
		Calculating the elapsed time of events using start and finish times using 12-hour and 24-hour time	• calculate the elapsed time of events using start and finish times using 12-hour and 24-hour time
	3	Calculating the starting time of events given the elapsed time and the finishing time using only 12-hour time	• calculate the starting time of events given the elapsed time and the finishing time using only 12-hour time
		Calculating the starting time of events given the elapsed time and the finishing time using 12-hour and 24-hour time	• calculate the starting time of events given the elapsed time and the finishing time using 12-hour and 24-hour time

Learning Journey	Step	Spine Nodes	Subnodes
	4	Calculating the finishing time of events given the elapsed time and the finish times using only 12-hour time	• calculate the finishing time of events given the elapsed time and the finish times using only 12-hour time
		Calculating the finishing time of events given the elapsed time and the finish times using only 12-hour and 24-hour time	• calculate the finishing time of events given the elapsed time and the finish times using 12-hour and 24-hour time
	5	Solving problems within a given context involving starting and finishing times of events and elapsed time using only 12-hour time	• solve problems within a given context involving starting and finishing times of events and elapsed time using only 12-hour time
		Solving problems within a given context involving starting and finishing times of events and elapsed time using 12-hour and 24-hour time	• solve problems within a given context involving starting and finishing times of events and elapsed time using 12-hour and 24-hour time
Rounding and converting time	1	Introducing the calculator button degrees, minutes, seconds	• add and subtract time using the 'degrees-minutes-seconds' button on the calculator
	2	Rounding time measurements to the nearest hour, minute or second	• round time measurements to the nearest hour, minute or second
	3	Converting time given in decimal form into hours, minutes and seconds	• convert time given in decimal form into hours, minutes and seconds
	4	Converting time given in hours, minutes and seconds into decimal form	• convert time given in hours, minutes and seconds into decimal form
Solving problems involving time zones	1	Calculating different time zones using a map	• use a map of the world showing different time zones to calculate the time difference between 2 different time zones of the world (ignoring seasonal time shifts)
			• use a map of the world showing different time zones to calculate the time in another part of the world (ignoring seasonal time shifts) given a time in a particular place (12-hour and 24-hour time)
	2	Comparing the local times in various time zones, including during daylight saving	• compare the local times in various time zones, including during daylight saving
	3	Solving problems involving time duration between different time zones on the same date	• solve problems involving time duration between different time zones on the same date
	4	Solving problems involving time duration between different time zones on different dates	• solve problems involving time duration between different time zones on the different dates

8 Geometry

Triangles with right angles			
Pythagoras' Theorem			
Learning Journey	Steps	Spine Nodes	Subnodes
Identifying sides on right-angled triangles	1	Identifying the hypotenuse as the longest side in any right-angled triangle and also as the side opposite the right angle	• identify the hypotenuse as the longest side in any right-angled triangle and also as the side opposite the right angle
	2	Identifying and labelling sides of a right-angled triangle without any angle measures given	• identify and label the hypotenuse and the 2 shorter sides of a right-angled triangle
			• label the hypotenuse c and the shorter sides a and b in a right-angled triangle
			• label the hypotenuse c and the shorter sides a and b in a right-angled triangle within a given context
Finding a shorter side using Pythagoras' Theorem	2	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem rounding answers	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem rounding answers
	1	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem
	3	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
Finding the hypotenuse using Pythagoras' Theorem	1	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem
	2	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem rounding answers	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem rounding answers
	3	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
Solving problems involving Pythagoras' Theorem	1	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem

Learning Journey	Step	Spine Nodes	Subnodes
		Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem rounding answers	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem rounding answers
	2	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
	3	Solving a variety of practical problems involving Pythagoras' theorem within given contexts involving finding missing sides and calculating perimeters with and without diagrams given	• solve a variety of practical problems within given contexts involving finding missing sides
			• solve a variety of practical problems within given contexts involving calculating perimeters
			• solve a variety of practical problems within given contexts including when sides have different units
	4	Solving a variety of problems involving unknown lengths in two-dimensional shapes that contain right-angled triangles within them	• solve a variety of problems involving unknown lengths in two-dimensional shapes that contain right-angled triangles within them
Exploring Pythagorean Triads	1	Identifying a Pythagorean triad as a set of 3 numbers that satisfy Pythagoras' theorem	• identify a Pythagorean triad as a set of 3 numbers that satisfy Pythagoras' theorem
			• establish new Pythagorean triads by starting with another
Using the Converse of Pythagoras' Theorem	1	Using the converse of Pythagoras' theorem to solve problems	• use the converse of Pythagoras' theorem to establish whether a triangle is a right-angled triangle
			• use the converse of Pythagoras' theorem to establish whether a triangle is a right-angled triangle for a practical problem within a given context
Solving Pythagoras' Theorem problems: exact values	1	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem leaving answers in surd form (exact form)
	2	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem leaving answers in surd form (exact form)
	3	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem leaving answers in surd form (exact form)

Learning Journey	Step	Spine Nodes	Subnodes
	4	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given, with answers given in surd form	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given, with answers given in surd form

Congruence			
Defining and working with congruence			
Learning Journey	Steps	Spine Nodes	Subnodes
Defining and working with congruence	1	Identifying congruent figures by superimposing them through a combination of rotations, reflections and translations	• identify congruent figures by superimposing them through a combination of rotations, reflections and translations
	2	Matching sides and angles of 2 congruent polygons	• determine which angles and sides of a polygon are matched to another polygon's sides and angles
	3	Determining the condition for 2 circles or parts of circles to be congruent	• determine when 2 circles are congruent according to their radii/diameters
			• determine when 2 semi-circles are congruent according to their radii/diameters
			• determine when 2 sectors are congruent according to equal internal angles at the centre and radii/diameters
Determining congruence in triangles			
Determining congruence in triangles	1	Determining if 2 triangles are congruent using the SSS test	• use the SSS test to determine if 2 or more triangles are congruent
	2	Determining if 2 triangles are congruent using the SAS test	• use the SAS test to determine if 2 or more triangles are congruent
	3	Determining if 2 triangles are congruent using the AAS test	• use the AAS test to determine if 2 or more triangles are congruent
	4	Determining if 2 triangles are congruent using the RHS test	• use the RHS test to determine if 2 or more triangles are congruent
	5	Determining if 2 triangles are congruent using the SSS, SAS, AAS and RHS test	• identify which test to use to determine congruence of triangles
		Using the congruency tests to identify a pair of congruent triangles from a selection of 3 or more triangles or from triangles embedded in a diagram	• use the congruency tests (SSS, SAS, AAS, RHS) to identify a pair of congruent triangles from a selection of 3 or more triangles or from triangles embedded in a diagram
Using properties of congruent triangles			
Using properties of congruent triangles	1	Applying the properties of congruent triangles to find an unknown side and/or angle in a diagram, giving a reason	• apply the properties of congruent triangles to determine a missing angle or length by observing a congruent triangle that has the matching length or angle

9 Data

Data			
Collecting data			
Learning Journey	Steps	Spine Nodes	Subnodes
Collecting data	1	Classifying data/recognising variables as categorical (qualitative) or numerical (quantitative) - either discrete or continuous	• identify examples of categorical variables (eg, colour, gender) discrete numerical variables (eg number of students, shoe size) and continuous numerical variables (eg height, weight)
	2	Recognising and explaining the difference between a 'population' and a 'sample' selected from a population when collecting data	• recognise and explain the difference between a 'population' and a 'sample' selected from a population when collecting data
	3	Investigating and determine the differences between collecting data by observation, census and sampling	• identify examples of variables for which data could be collected by observation, eg direction travelled by vehicles arriving at an intersection, native animals in a local area
			• identify examples of variables for which data could be collected by a census or by a sample, eg a census to collect data about the income of Australians, a sample for TV ratings
Data sampling and populations			
The relationship between a sample & the population	1	Using samples to make predictions about a larger 'population' from which the sample comes	• use samples to make predictions about a larger 'population' from which the sample comes
	2	Inferring properties of populations or distributions from a sample, whilst knowing the limitations of sampling	• infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling
Clusters, gaps and outliers in data			
Clusters, gaps and outliers in data	1	Identifying any clusters, gaps and outliers in sets of data	• identify any clusters, gaps and outliers in sets of data
			• identify any clusters, gaps and outliers in sets of data when represented in different displays
	2	Investigating the effect of outliers on the mean, median, mode and range by considering a small set of data and calculating each measure, with and without the inclusion of an outlier	• investigate the effect of outliers on the mean, median, mode and range by considering a small set of data and calculating each measure, with and without the inclusion of an outlier

10 Chance and Probability

Chance and Probability			
Complementary events			
Learning Journey	Steps	Spine Nodes	Subnodes
Complementary events	1	Understanding the term 'complement' to describe events that are mutually exclusive and add to 1	• understand the term 'complement' to describe events that are mutually exclusive and add to 1
	2	Finding the complement of an event	• find the probability of the complement of an event by using the fact that the sum of the probabilities of an event and its complement is 1
	3	Identifying the complementary event for a given event, and calculating the theoretical probability that a given event will not occur	• identify the complementary event for given event, and calculate the theoretical probability that a given event will not occur
			• describe in words the complement of an event
Probability language to describe events			
Probability language to describe events	1	Describing events using language of 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) and 'and' (both A and B)	• describe events using language of 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) and 'and' (both A and B)
			• recognise the difference between mutually exclusive and non-mutually exclusive events
	2	Describing compound events using the terms 'at least', 'at most', 'not' and 'and'	• describe compound events using the terms 'at least', 'at most', 'not' and 'and'
	3	Posing problems that involve the use of the terms 'at least', 'at most', 'not', 'and' and solving problems posed by others	• solve problems posed by others that involve the use of the terms 'at least', 'at most', 'not', 'and'
	4	Classifying compound events	• classify compound events using inclusive 'or' and exclusive 'or'
Venn diagrams and Two-Way tables			
Understanding and constructing Venn diagrams	1	Interpreting Venn diagrams involving 2 or 3 mutually exclusive attributes	• interpret Venn diagrams involving 2 or 3 mutually exclusive attributes
			• describe regions in Venn diagrams representing mutually exclusive attributes
	2	Interpreting Venn diagrams involving 2 or 3 non- mutually exclusive attributes	• interpret Venn diagrams involving 2 or 3 non- mutually exclusive attributes
			• describe individual regions or combinations of regions in Venn diagrams representing non-mutually exclusive attributes, using the language 'and', exclusive 'or', inclusive 'or', 'neither' and 'not'
	3	Representing events in Venn diagrams	• represent events of 2 or 3 attributes using Venn diagrams

Learning Journey	Step	Spine Nodes	Subnodes
		Constructing Venn diagrams to represent all possible combinations of 2 attributes from given or collected data	• construct Venn diagrams to represent all possible combinations of 2 attributes from given or collected data
Using Venn diagrams to solve problems	1	Using data presented in Venn diagrams to answer problems, including probability questions	• use data presented in Venn diagrams to answer problems, including probability questions
	2	Using given data to calculate missing values in a Venn diagram	• use given data to calculate missing values in a Venn diagram
	3	Using data presented in Venn diagrams to answer problems where missing values must first be found, including probability questions	• use data presented in Venn diagrams to answer problems where missing values must first be found, including probability questions
Interpreting and constructing two-way tables	1	Interpreting given two-way tables representing non-mutually exclusive attributes	• interpret given two-way tables representing non-mutually exclusive attributes
			• describe relationships displayed in two-way tables using the language 'and', exclusive 'or', inclusive 'or', 'neither' and 'not'
	2	Constructing two-way tables to represent the relationships between attributes	• construct two-way tables to represent the relationships between attributes
	3	Using data presented in two-way tables to answer problems, including probability questions	• use data presented in a two-way table to answer problems, including probability questions
	4	Using given data to calculate missing values in a two-way table	• use given data to calculate missing values in a two-way table
	5	Using data presented in two-way tables to answer problems where missing values must first be found, including probability questions	• use data presented in two-way tables to answer problems where missing values must first be found, including probability questions
Two-way tables and Venn diagrams	1	Converting between representations of the relationships between 2 attributes in Venn diagrams and two-way tables	• convert between representations of the relationships between 2 attributes in Venn diagrams and two-way tables

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