Mathletics

England Programme of Studies

Understanding Practice and Fluency (UPF)

Stage 3

September, 2021

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Contents

Part I

Key Stage 3

1 Number

N.1 understand and use place value for decimals, measures and integers of any size			
Quest: Use place value			
Learning Journey	Steps	Content	Description
Understanding and using place value	1	Identifying the place value of numbers of any size	• state the place value of digits in numbers of any size
			• pose and answer questions that extend place value understanding of numbers, eg, 'What happens if I rearrange the digits in the number 2,312,345?', 'How can I rearrange the digits to make the largest number?'
			• recognise different abbreviations of numbers used in everyday contexts, eg, £35 M represents £35,000,000
			• understand the role of zero as a placeholder
			• use place value understanding to count by 10,000 and 100,000
	2	Identifying the place value of decimals of any size	• identify the place value of decimals of any size
	3	Rounding numbers to a specified place value	• round numbers to a specified place value, eg round 5,461,883 to the nearest million
Partitioning using place value	1	Using place value to partition numbers of any size	• use place value understanding and models to partition numbers of any size
	2	Using non-standard partitioning with numbers of any size	• partition numbers of any size in non-standard forms
	3	Using place value to partition numbers of any size with additive decomposition	• use place value to partition numbers of any size using additive decomposition
		Using place value to partition decimals of any size with additive decomposition	• use place value to partition decimals of any size with additive decomposition
	4	Using place value to partition numbers of any size with multiplicative decomposition	• use place value to partition numbers of any size using multiplicative decomposition
		Using place value to partition decimals of any size with multiplicative decomposition	• use place value to partition decimals of any size with multiplicative decomposition

N.2 order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥			
Quest: Order and compare numbers			
Learning Journey	Steps	Content	Description
Ordering integers	1	Placing integers on a number line	• place integers on a 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
	3	Ordering integers	• order integers of any size in ascending and descending order including negative numbers
Ordering decimals	1	Locating decimals on a number line	• locate decimals on a number line
	2	Ordering repeating decimals	• order repeating decimals
	3	Ordering decimals, terminating and repeating	• order decimals, terminating and repeating
Comparing and ordering proper fractions	1	Comparing and ordering unrelated fractions	• compare and order fractions, including mixed numbers, proper and improper fractions using equivalence and common multiple knowledge
			• use benchmarks eg $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$ to compare and order fractions
			• compare and order mixed numbers and improper fractions where the denominators are not always multiples of the same number
			• explore how finding a common numerator can be effective to compare and order fractions, eg comparing $\frac{3}{7}$ and $\frac{6}{11}$
	2	Comparing and ordering unrelated fractions	• compare and order proper fractions, using equivalence and common multiple knowledge
	3	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
	4	Comparing and ordering proper fractions with different numerators and denominators (denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 and 1,000)	• compare and order proper fractions using a benchmark fraction for support, eg half or quarter
			• record comparisons using >, < or =
Comparing and ordering mixed fractions	1	Comparing and ordering mixed numerals	• compare and order mixed numerals where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, >, ≤, ≥ symbols

Learning Journey	Step	Content	Description
	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	Comparing proper fractions greater than and less than 0	• place positive and negative proper fractions on a number line to compare their relative values
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
	5	Comparing mixed numbers and improper fractions greater than and less than 0	• compare mixed numbers and improper fractions by placing them on a number line to compare their relative values
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
Comparing and ordering fractions and decimals	1	Knowing common fraction and decimal equivalences	• know fraction and decimal equivalences for thirds, quarters, fifths and eighths
	2	Ordering fractions and decimals on a number line, including terminating and recurring decimals	• order fractions and decimals on a number line, including terminating and recurring decimals

N.3 use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property			
Quest: Products, factors & prime factorisation			
Learning Journey	Steps	Content	Description
Products, factors and prime factorisation	1	Finding the highest common factor using a list	• find the highest common factor using a list
		Finding greatest common divisor from prime factors (no indices)	• determine the greatest common factor of 2 whole numbers using their prime factorisations (no indices)
	2	Using prime factorisation of a whole number to express a number as a product of its prime factors (without indices)	• factorise a whole number to determine its unique factorisation, expressing the result as a product of its prime factors without indices
			• determine common factors and common multiples using the prime factorisation of numbers
			• use factor trees to determine the prime factors of a whole number

Learning Journey	Step	Content	Description
	4	Using prime factorisation of a whole number to express a number as a product of its prime factors (with indices)	• factorise a whole number to determine its unique factorisation, expressing the result as a product of its prime factors with indices
			• determine common factors and common multiples using the prime factorisation of numbers
			• use factor trees to determine the prime factors of a whole number
			• use factor ladders to determine the prime factors of a whole number
	5	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

N.4 use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative			
Quest: Use the four operations			
Learning Journey	Steps	Content	Description
Adding and subtracting integers	1	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
		Representing addition and subtraction on a horizontal or vertical number line diagram	• represent addition and subtraction on a horizontal or vertical number line diagram
	2	Describing situations in which opposite quantities combine to make 0	• describe situations in which opposite quantities combine to make 0, eg a hydrogen atom has 0 charge because its 2 constituents are oppositely charged
		Creating multiple number sentences that return a given total using addition and subtraction	• create multiple number sentences that return a given total using addition and subtraction
	3	Adding and subtracting a positive integer	• understand that adding a positive integer on a number line involves moving to the right and that subtracting a positive integer on a number line means moving to the left
			• add and subtract one or more positive integers to/from another integer using a given number line
			• add and subtract one or more positive integers to/from another integer without a given number line
	4	Adding and subtracting negative integers	• add and subtract negative integers
			• understand the way negative integers subtract from something actually adds positively

Learning Journey	Step	Content	Description
			• understand that 9–(–4) = 13 because –4 is 13 away from +9
		Adding integers	• add integers
		Subtracting integers	• subtract integers
	5	Solving problems in contexts involving addition and subtraction with integers	• solve problems in contexts involving addition and subtraction with integers
		Interpreting sums of rational numbers by describing real-world contexts	• interpret sums of rational numbers by describing real-world contexts
		Adding and subtracting integers with order of operations	• add and subtract integers with order of operations
Adding and subtracting rational numbers	1	Adding positive and negative fractions	• add positive and negative fractions
		Subtracting positive and negative fractions	• subtract positive and negative fractions
		Multiplying integers	• find the product of 2 integers
			• find the product of more than 2 integers
		Understanding the rules for multiplying signed numbers	• understand the rules for multiplying signed numbers
			• understand that if p and q are integers then -(p/q) = (-p)/q = p/(-q) where q ≠ 0
		Multiplying integers and whole numbers using repeated addition	• multiply integers and whole numbers using repeated addition
	2	Finding the sum of positive and negative decimals	• add positive and negative decimals
		Finding the difference between positive and negative decimals	• subtract positive and negative decimals
		Adding positive and negative decimals	• add positive and negative decimals
		Subtracting positive and negative decimals	• subtract positive and negative decimals
		Adding and subtracting signed decimals with order of operations	• add and subtract signed decimals with order of operations
		Determining the effect of multiplying by a number with magnitude less than 1 (decimals)	• determine the effect of multiplying by a number with magnitude less than 1 (decimals)
	3	Adding rational numbers	• add rational numbers

Learning Journey	Step	Content	Description
		Applying properties of operations as strategies to add and subtract rational numbers	• apply properties of operations as strategies to add and subtract rational numbers, ie fractions, decimals and integers
		Multiplying decimals using written/mental methods	• multiply decimals using mental/written methods
			• compare initial estimates with answers obtained by written methods and check by using a calculator
		Multiplying decimals using splitting	• multiply decimals using splitting
		Multiplying decimals using a calculator	• multiply decimals using a calculator
		Multiplying positive and negative decimals	• multiply positive and negative decimals
		Multiplying decimals involving negative values	• multiply decimals involving negative values
	4	Multiplying positive and negative fractions	• multiply positive and negative fractions
	5	Multiplying a fraction by a decimal	• multiply a fraction by a decimal
Dividing with integers	1	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
	2	Multiplying and dividing integers	• multiply and divide with more than 2 integers
Dividing with decimals	1	Understanding the effect of dividing by a decimal and using this knowledge to estimate calculations	• understand the effect of dividing by a decimal and use this knowledge to estimate calculations
		Determining the effect of dividing by a number with magnitude less than 1 (decimals)	• determine the effect of dividing by a number with magnitude less than 1
	2	Dividing decimals by powers of 10	• divide decimals by powers of 10
	3	Dividing decimals using a range of strategies	• divide decimals using a variety of tools (eg concrete materials, drawings, calculators) and strategies (eg estimation, algorithms)
		Dividing decimals using written/mental methods	• divide decimals using written/mental methods
	4	Dividing decimals involving negative values	• divide decimals involving negative values
	5	Dividing by decimals	• divide whole numbers by decimals involving tenths and hundredths, using concrete materials and estimation, eg divide 4 by 0.8

Learning Journey	Step	Content	Description
Dividing fractions and decimals	1	Dividing fractions (proper/improper/mixed) involving negative values (written methods)	• divide fractions with negative values using written methods
	2	Dividing fractions and decimals using a calculator	• divide fractions and decimals using a calculator
			• compare initial estimates with answers obtained by written methods and check by using a calculator
Multiple operations: integers, decimals, fractions	1	Using the 4 operations with integers	• use the 4 operations to solve problems involving integers
	2	Performing multiple operations with decimal fractions, using a calculator where appropriate	• perform multiple operations with decimal fractions, using a calculator where appropriate
	3	Demonstrating an understanding of the addition, subtraction multiplication and division of decimals to solve problems	• demonstrate an understanding of the addition, subtraction multiplication and division of decimals to solve problems
		Solving real-world and mathematical problems involving the 4 operations with rational numbers	• solve real-world and mathematical problems involving the 4 operations with rational numbers

N.5 use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals			
Quest: Order of operations			
Learning Journey	Steps	Content	Description
Simple order of operations	1	Adding and subtracting integers with order of operations	• add and subtract integers with order of operations
	2	Adding and subtracting signed decimals with order of operations	• add and subtract signed decimals with order of operations
	3	Adding and subtracting signed fractions with order of operations	• add and subtract signed fractions with order of operations
	4	Applying the order of operations to evaluate expressions involving integers with no exponents or radicals	• apply the order of operations to evaluate expressions involving integers with no exponents or radicals
Further order of operations	1	Applying the order of operations to evaluate expressions, including exponents, with no parentheses	• apply the order of operations to evaluate expressions, including exponents, with no parentheses
		Applying the order of operations to evaluate expressions including exponents or radicals	• apply the order of operations to evaluate expressions including exponents or radicals
	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

Learning Journey	Step	Content	Description
	3	Inserting or manipulating grouping symbols to create an expression that returns a specified result	• insert or manipulate grouping symbols to create an expression that returns a specified result
	4	Placing parentheses to create a true equation	• place parentheses to create a true equation
	5	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

N.6 recognise and use relationships between operations including inverse operations			
Quest: Inverse operations			
Learning Journey	Steps	Content	Description
Inverse operations	1	Understanding that a number and its opposite have a sum of 0 and that they are called additive inverses	• understand that a number and its opposite have a sum of 0 and that they are called additive inverses
		Understanding that addition and subtraction are inverse operations	• understand that addition and subtraction are inverse operations
	2	Understanding subtraction of rational numbers as adding the additive inverse	• understand subtraction of rational numbers as adding the additive inverse
	3	Recognising and using relationships between operations including inverse operations	• recognise and use relationships between operations including inverse operations
	4	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

N.7 use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations			
Quest: Use powers and real roots			
Learning Journey	Steps	Content	Description
Using powers and real roots	1	Finding square roots of non-perfect squares	• use a calculator to calculate approximations of square roots of positive integers and positive non-integers
			• mentally determine between which 2 whole numbers lies the square root of a non-perfect square number up to 100

Learning Journey	Step	Content	Description
			• estimate the square root of a non-perfect square number up to 100
			• understand why entering the square root of a negative number in a calculator returns an error message
		Recognising the link between squares and square roots	• recognise the link between squares and square roots
		Finding square roots of perfect square whole numbers only	• find the square roots of perfect square whole numbers up to 100
	2	Finding cube roots of non-perfect cubes	• mentally determine between which 2 whole numbers lies 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
		Recognising the link between cubes and cube roots	• recognise the link between cubes and cube roots
		Finding cube roots of perfect cube whole numbers	• find the cube roots of perfect cube whole numbers up to 125
	3	Recognising powers of 2, 3, 4, 5	• recognise powers of 2, 3, 4, 5
			• distinguish between exact representations of roots and their decimal approximations
	4	Expressing roots of higher powers	• express higher powers and roots using words and symbols, e.g., 'fifth root of 32' and $5\sqrt{32}$
			• use the √ and $x^{\square}$ buttons on a calculator to find powers and roots
	5	Evaluating the roots of higher powers up to 5	• evaluate the roots of higher powers up to 5

N.8 interpret and compare numbers in standard form A x $10^{\square}$ 1 ≤ A < 10, where n is a positive or negative integer or zero			
Quest: Use standard form			
Learning Journey	Steps	Content	Description
Using standard form with integers	1	Introducing standard form for whole numbers	• understand that standard form is a way of writing numbers which has 2 parts to it
			• establish how to write 1, 10, 100, 1000 etc as an exponent of the 10
			• write whole numbers as a number between 1 and 10 multiplied by 10, 100, 1000 etc
			• represent whole numbers in standard form
	2	Interpreting and comparing numbers in standard form a x $10^{\square}$ 1 ≤ a < 10, where n is a positive or negative integer or 0	• interpret and compare numbers in standard form a x $10^{\square}$ 1 ≤ a < 10, where n is a positive or negative integer or 0

Learning Journey	Step	Content	Description
Further standard form: Decimals and calculations	1	Converting from standard form to basic numbers for very large numbers	• convert from standard form to basic numbers for very large numbers
	2	Converting from standard form to basic numbers for very small numbers	• convert from standard form to basic numbers for very small numbers
	3	Converting from basic numbers to standard form for very large numbers	• convert from basic numbers to standard form for very large numbers
	4	Converting from basic numbers to standard form for very small numbers	• convert from basic numbers to standard form for very small numbers
	5	Calculating in standard form	• perform calculations involving standard form (without a calculator) applying laws of exponents where there is 1 bracket
			• perform calculations involving standard form (without a calculator) using laws of exponents and 2 brackets to be multiplied
			• perform calculations involving standard form (without a calculator) using laws of exponents with 2 brackets involving division

N.9 work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)			
Quest: Terminate decimals & their fractions			
Learning Journey	Steps	Content	Description
Terminating decimals & corresponding fractions	1	Ordering terminating decimals	• order terminating decimals
	2	Converting terminating decimals less than 1 into fractions	• convert terminating decimals less than 1 into fractions
	3	Converting terminating decimals greater than 1 into fractions	• convert terminating decimals greater than 1 into improper fractions
			• convert terminating decimals greater than 1 into mixed numbers

N.10 define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%			
Quest: Work with percentages			
Learning Journey	Steps	Content	Description
Defining, comparing and using percentages	1	Introducing percentages	• recognise that the symbol % means 'percent'
			• understand that 'percent' relates to 'number of parts per one hundred'
			• write fractions with a denominator of 100 as percentages and vice versa

Learning Journey	Step	Content	Description
			• model percentages with concrete materials/ drawings, eg using 10x10grid
			• identify real-life contexts where percentages are used
			• find a percent of a quantity as a rate per 100, eg 30% of a quantity means $\frac{30}{100}$ times the quantity
	2	Calculating with percentages	• find percentages of quantities
			• calculate percentages of quantities using mental, written and calculator methods and explain methods
			• choose an appropriate equivalent form for mental computation of percentages of quantities
			• express 1 quantity as a percentage of another, using mental, written and calculator methods
	3	Determining percentages of quantities (written and mental methods)	• determine percentages of quantities using written and mental strategies
		Determining percentages of quantities (calculator method)	• determine percentages of quantities using a calculator
	4	Calculating percentages of quantities greater than 100%	• calculate percentage amounts of quantities greater than 100%
	5	Solving problems involving percentages to 1 decimal place	• compare 2 quantities using percentages
Further percentages	1	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
	2	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
	3	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

Learning Journey	Step	Content	Description
	4	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
			• decrease an amount by a percentage by calculating the complementary percentage of that amount
	5	Comparing and ordering fractions, decimals and percentages	• compare and order a mix of fractions, decimals and percentages

N.11 interpret fractions and percentages as operators			
Quest: Fractions & percentages as operators			
Learning Journey	Steps	Content	Description
Interpreting fractions & percentages as operators	1	Interpreting percentages as operators	• interpret a percentage as an operator on a unit
	2	Interpreting fractions as operators	• interpret a fraction as an operator on a unit

N.12 use standard units of mass, length, time, money and other measures, including with decimal quantities			
Quest: Use standard units			
Learning Journey	Steps	Content	Description
Using the standard unit of mass	1	Converting standard units of mass including with decimal quantities	• convert standard units of mass including with decimal quantities
	2	Ordering and comparing standard units of mass including with decimal quantities	• order and compare standard units of mass including with decimal quantities
	3	Solving problems involving standard units of mass including with decimal quantities	• solve problems involving standard units of mass including with decimal quantities
Using the standard unit of length	1	Converting standard units of length including with decimal quantities	• convert standard units of length including with decimal quantities
	2	Ordering and comparing standard units of length including with decimal quantities	• order and compare standard units of length including with decimal quantities
			• convert between related standard units of length
	3	Solving problems involving standard units of length including with decimal quantities	• solve problems involving standard units of length including with decimal quantities
Using the standard unit of time	1	Converting standard units of time including with decimal quantities	• convert standard units of time including with decimal quantities

Learning Journey	Step	Content	Description
	2	Ordering and comparing standard units of time including with decimal quantities	• order and compare standard units of time including with decimal quantities
	3	Solving problems involving standard units of time including with decimal quantities	• solve problems involving standard units of time including with decimal quantities
Using the standard unit of money	1	Converting standard units of money including with decimal quantities (UK)	• convert standard units of money including with decimal quantities
	2	Ordering and comparing standard units of money including with decimal quantities (UK)	• order and compare standard units of money including with decimal quantities
	3	Solving problems involving standard units of money including with decimal quantities (UK)	• solve problems involving standard units of money including with decimal quantities

N.13 round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]			
Quest: Round numbers			
Learning Journey	Steps	Content	Description
Rounding to a specified number of decimal places	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
			• use symbols for approximation, eg ≈
	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
	3	Rounding time measurements to the nearest hour, minute or second	• round time measurements to the nearest hour, minute or second
Rounding to a number of significant figures	1	Introducing significant figures: whole numbers	• revise the value of each digit in a whole number
			• introduce the meaning of significant figures and relate this to whole numbers
			• determine how many significant figures there are in a number, no zeros present
			• determine how many significant figures there are in a number, where there are zeros surrounded by other digits
			• determine how many significant figures there are in a number, where there are zeros at the end

Learning Journey	Step	Content	Description
	2	Identifying what values in a number are significant	• identify what values in a number are significant, eg in the amount £10,000,000, when would you consider a change in value of one of the 0s as being a significant change to the overall amount?
		Rounding significant figures and whole numbers	• round whole numbers to 1 significant figure using the appropriate rule on 5
			• round whole numbers to 2 significant figures using the appropriate rule on 5
			• round whole numbers to a specified number of significant figures using the appropriate rule on 5
	3	Rounding significant figures and decimals >1	• revise the value of each number in a decimal >1
			• determine how many significant figures there are in a number, no zeros present
			• determine how many significant figures there are in a number, where there are zeros surrounded by other digits
			• determine how many significant figures there are in a number, where there are zeros at the end
		Rounding significant figures and decimals >1 to 1 significant figure	• round decimals >1 to 1 significant figure using the appropriate rule on 5
			• round decimals >1 to 2 significant figures using the appropriate rule on 5
			• round decimals >1 to a specified number of significant figures using the appropriate rule on 5
	4	Finding the number of significant figures in numbers <1	• determine how many significant figures there are in a number, no zeros present (except before the decimal point)
			• determine how many significant figures there are in a number, where there are zeros surrounded by other digits
			• determine how many significant figures there are in a number, where there are zeros at the end after the other digits or at the start
		Rounding significant figures and decimals <1 (positive)	• round decimals <1 to 1 significant figure using the appropriate rule on 5
			• round decimals <1 to 2 significant figures using the appropriate rule on 5

Learning Journey	Step	Content	Description
			• round decimals <1 to a specified number of significant figures using the appropriate rule on 5

N.14 use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$			
Quest: Approximation and errors			
Learning Journey	Steps	Content	Description
Using rounding to estimate answers and find errors	1	Using approximation through rounding to estimate answers	• use approximation through rounding to estimate answers
	2	Calculating possible resulting errors expressed using inequality notation $a < x \leq b$	• calculate possible resulting errors expressed using inequality notation $a < x \leq b$

N.16 appreciate the infinite nature of the sets of integers, real and rational numbers.			
Quest: Sets: integers, real & rational numbers			
Learning Journey	Steps	Content	Description
Sets of integers, real & rational numbers	1	Investigating integers	• recognise the location of negative whole numbers in relation to zero and place them on a number line
			• use the term 'integers' to describe positive and negative whole numbers and zero
			• investigate negative whole numbers and the number patterns created when counting backwards on a calculator
			• recognise that negative whole numbers can result from subtraction
	2	Interpreting integers in context	• use a model to interpret intervals across zero (in context)
	3	Defining rational numbers as any number that can be represented in the form p/q, where p and q are integers and $q \neq 0$	• define rational numbers as any number that can be represented in the form p/q, where p and q are integers and $q \neq 0$
	4	Comparing the relative value of rational numbers, including recording the comparison by using the symbols < and >	• compare the relative value of rational numbers, including recording the comparison by using the symbols < and >
	5	Understanding the infinite nature of the sets of integers, real and rational numbers	• appreciate the infinite nature of the sets of integers, real and rational numbers

2 Algebra

A.1 use and interpret algebraic notation, including: A.1.a ab in place of a × b A.1.b 3y in place of y + y + y and 3 × y A.1.c a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b A.1.d a/b in place of a ÷ b A.1.e coefficients written as fractions rather than as decimals A.1.f brackets			
Quest: Algebraic notation and conventions			
Learning Journey	Steps	Content	Description
Algebraic notation and conventions	1	Using and interpreting algebraic notation	• use and interpret ab in place of a x b
			• use and interpret 3y in place of y + y + y and 3 × y
			• use and interpret a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b
			• use and interpret a/b in place of a ÷ b
			• use and interpret algebraic notation when coefficients are written as fractions rather than as decimals
			• use and interpret algebraic notation when brackets are involved
	2	Connecting algebraic language to everyday language	• translate from everyday language to algebraic language and vice versa
			• use algebraic symbols to represent simple situations described in words
			• interpret statements involving algebraic symbols in other contexts

A.2 substitute numerical values into formulae and expressions, including scientific formulae 3427046			
Quest: Substitute values into formulae			
Learning Journey	Steps	Content	Description
Substituting values into expressions and formulae	1	Substituting known values in for variables	• substitute known values in for variables 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
			• identify, through investigation, the quantities in an equation that vary and those that remain constant
	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	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

A.3 understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors			
Quest: Understand algebraic vocabulary			
Learning Journey	Steps	Content	Description
Understanding algebraic vocabulary	1	Understanding and using the concepts and vocabulary of expressions, equations, inequalities, terms and factors	• understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

A.4 simplify and manipulate algebraic expressions to maintain equivalence by: A.4.a collecting like terms A.4.b multiplying a single term over a bracket A.4.c taking out common factors A.4.d expanding products of two or more binomials			
Quest: Work with algebraic expressions			
Learning Journey	Steps	Content	Description
Adding and subtracting algebraic expressions	1	Simplifying algebraic expressions that involve addition and subtraction	• 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
			• verify whether a simplified expression is correct by substituting numbers for pronumerals
			• connect algebra with the commutative and associative properties of arithmetic to determine that $a + b = b + a$ and $(a + b) + c = a + (b + c)$
			• recognise the role of grouping symbols and the different meanings of expressions, such as $2a + 1$ and $2(a + 1)$
	2	Simplifying algebraic expressions that involve addition and subtraction involving laws 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
			• recognise 'unlike' terms, identifying and classifying them
Multiplying a single term over a bracket	1	Extending and applying the distributive law to the expansion of algebraic expressions	• extend and apply the distributive law to the expansion of algebraic expressions
		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

Learning Journey	Step	Content	Description
	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)
Taking out common factors	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
			• check factorisations by performing the reverse process (applying the distributive law)
	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
	4	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
			• check factorisations by performing the reverse process (applying the distributive law)

Learning Journey	Step	Content	Description
	5	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
			• check factorisations by performing the reverse process (applying the distributive law)
Expanding products of binomials	1	Expanding binomial products by finding the areas of rectangles	• expand binomial products by finding the areas of rectangles
	2	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators are +'s	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators are +'s
	3	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators can be + or -	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators can be + or -
	4	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or -	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or -
	5	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or - and expansion involves indices	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or - and expansion involves indices

A.5 understand and use standard mathematical formulae; rearrange formulae to change the subject			
Quest: Understand & manipulate formulae			
Learning Journey	Steps	Content	Description
Understanding & manipulating mathematical formulae	1	Understanding formulas and equations	• identify the subject of a given equation/formula
	2	Manipulating formulas and equations	• use inverse operations to change the subject of the formula from one to another
			• substitute the given values into a formula and then change the subject to find the value of the desired pronumeral

A.6 model situations or procedures by translating them into algebraic expressions or formulae and by using graphs			
Quest: Situations as expressions or graphs			
Learning Journey	Steps	Content	Description
Creating algebraic expressions	1	Writing expressions with numbers and variables	• write expressions with numbers and variables
	2	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
			• create scenarios in words that match given algebraic operations
	3	Creating algebraic expressions	• create algebraic expressions and evaluate them by substituting a given value for each variable
Modelling situations using graphs	1	Modelling real-life relationships	• model real-life relationships involving constant rates where the initial condition starts at 0 (eg speed, heart rate, billing rate) through investigation using tables of values and graphs
			• model real-life relationships involving constant rates (eg speed, heart rate, billing rate) using algebraic equations with variables to represent the changing quantities in the relationship
			• analyse real-life relationships involving constant rates
	2	Exploring graphs of non-linear real-life data with and without the use of digital technologies	• use digital technologies to graph non-linear relationships
			• interpret and analyse graphs of non-linear relationships

A.7 use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)			
Quest: Solve linear equations			
Learning Journey	Steps	Content	Description
Solving equations basics	1	Using substitution to determine whether a given number in a specified set makes an equation true	• use substitution to determine whether a given number in a specified set makes an equation true
	2	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 equations:1-step with addition/subtraction	1	Solving linear equations using inverse operations involving 1 step of addition or subtraction with positive integer solutions only	• solve linear equations using inverse operations involving 1 step of addition or subtraction with positive integer solutions only

Learning Journey	Step	Content	Description
	2	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
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form x + a = b, where a and b are integers
Solving equations:1-step with mult/div	1	Solving linear equations using inverse operations involving 1 step of division needed with positive integer solutions only	• solve linear equations using inverse operations involving 1 step of division needed with positive integer solutions only
	2	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
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form x/a = b, a>0, where a and b are integers
	3	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
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form ax = b, where a and b are integers
Solving equations:1-step with mixed operations	1	Solving linear equations using inverse operations involving 1 step with mixed operations with positive integer solutions only	• solve linear equations using inverse operations involving 1 step with mixed operations with positive integer solutions only
	2	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
	3	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
	4	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

Learning Journey	Step	Content	Description
	5	Solving linear equations using inverse operations involving 1 step with mixed operations with positive integer and non-integer (decimal and fraction) solutions with pronumeral on right hand side	• solve linear equations using inverse operations involving 1 step with mixed operations with positive integer and non-integer (decimal and fraction) solutions with pronumeral on right hand side
Solving equations:2-step with mixed operations	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)
			• solve concretely, pictorially and symbolically, problems that can be represented by 2-step linear equations of the form ax + b = c, where a and b and c are integers
			• solve concretely, pictorially and symbolically, problems that can be represented by 2-step linear equations of the form x/a + b = c, a > 0, where a and b and c are integers
		Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer solutions (pronumeral always in numerator position)
	2	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)
		Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive 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 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 linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral always in numerator position)

Learning Journey	Step	Content	Description
	4	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)
		Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral always in numerator position) with pronumeral on the right hand side	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral always in numerator position) with pronumeral on the right hand side
	5	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)
		Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral in numerator or denominator position)
		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)
		Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral in numerator or denominator position) with pronumeral on right hand side	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer and non-integer solutions (pronumeral in numerator or denominator position) with pronumeral on right hand side
Solving equations:3-step with mixed operations	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

Learning Journey	Step	Content	Description
	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
Solving equations: variables on both sides	1	Solving linear equations (positive integer coefficients) using inverse operations involving pronumerals on both sides of the equation	• solve linear equations (positive integer coefficients) using inverse operations involving pronumerals on both sides of the equation
	2	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
	3	Solving linear equations (positive integer, fraction or decimal coefficients) using inverse operations involving pronumerals on both sides of the equation	• solve linear equations (positive integer, fraction or decimal coefficients) using inverse operations involving pronumerals on both sides of the equation
	4	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 (positive integer coefficients) using inverse operations involving expanding brackets	• solve linear equations (positive integer coefficients) using inverse operations involving expanding brackets
	2	Solving linear equations (integer coefficients) using inverse operations involving expanding brackets	• solve linear equations (integer coefficients) using inverse operations involving expanding brackets
			• solve concretely, pictorially and symbolically equations involving expanding brackets of the form a(x + b) = c where a and b and c are integers
	3	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
	4	Solving linear equations (positive integer, fraction or decimal coefficients) using inverse operations involving expanding brackets	• solve linear equations (positive integer, fraction or decimal coefficients) using inverse operations involving expanding brackets

A.8 work with coordinates in all four quadrants			
Quest: Work with coordinates			
Learning Journey	Steps	Content	Description
Working with coordinates	1	Locating points on the Cartesian plane	• plot and label points, given coordinates, in all 4 quadrants of the Cartesian plane
			• identify and label each quadrant on a Cartesian plane
			• plot a sequence of coordinates to create a picture
			• identify and record the coordinates of given points in all 4 quadrants of the Cartesian plane
			• recognise that the order of coordinates is important when locating points on the Cartesian plane, eg, (2, 3) is a location different from (3, 2)
	2	Solving real-world and mathematical problems by graphing points in all 4 quadrants of the coordinate plane	• solve real-world and mathematical problems by graphing points in all 4 quadrants of the coordinate plane
	3	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

A.9 recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane			
Quest: Graphs of linear and quadratic functions			
Learning Journey	Steps	Content	Description
Graphs of linear functions with a table of values	1	Forming a table of values for a linear relationship by substituting a set of appropriate values for either of the pronumerals and graphing the number pairs on the Cartesian plane	• form a table of values for a linear relationship by substituting a set of appropriate values for either of the pronumerals and graph the number pairs on the Cartesian plane
			• select appropriate x-values
	2	Graphing a linear relationship on the Cartesian plane using a table of values	• graph a linear relationship on the Cartesian plane using a table of values
			• graph the number pairs on the Cartesian plane
			• apply an appropriate scale to a Cartesian plane
Quadratic functions with a table of values	1	Graphing simple quadratics by completing a table of values	• graph simple quadratics by completing a table of values
			• compare graphs of quadratics drawn from a table of values with quadratics drawn using digital technology

Learning Journey	Step	Content	Description
	2	Graphing simple quadratics using digital technology	• graph simple quadratics using digital technology
			• describe the shape and connect the shape of a simple quadratic to its equation
	3	Understanding the language and important features of parabolas	• understand the language of parabolas, turning point (vertex), concavity, roots, x-intercept, y-intercept, axis of symmetry
			• understand the important features to be marked on a parabola; y-intercept, x-intercept(s)/roots, turning point(vertex)

A.10 interpret mathematical relationships both algebraically and graphically			
Quest: Algebraic and graphical relationships			
Learning Journey	Steps	Content	Description
Algebraic and graphical relationships	1	Comparing the graphs of a variety of simple non-linear relationships	• compare the graphs of a variety of simple non-linear relationships
	2	Identifying and naming different types of graphs from their equations	• identify and name different types of graphs from their equations
	3	Sketching any particular curve by using a table of values	• sketch any particular curve by using a table of values
			• refine appropriate x-values for the table of values once the shape becomes clear
	4	Sketching any particular curve by determining its features from its equation	• sketch any particular curve by determining its features from its equation including x and y-intercepts, turning points (if applicable), asymptotes (if applicable)

A.11 reduce a given linear equation in two variables to the standard form y = mx + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically			
Quest: Use the standard form of a line			
Learning Journey	Steps	Content	Description
Understanding the gradient and intercept	1	Investigating what the values of m and c mean graphically when an equation is given in the form y = mx + c	• investigate what the values of m and b mean graphically when an equation is given in the form y = mx + c
	2	Deriving the equation y = mx for a line through the origin	• derive the equation y = mx for a line through the origin
	3	Deriving the equation y = mx + c for a line intercepting the vertical axis at c	• derive the equation y = mx + c for a line intercepting the vertical axis at c
	4	Establishing that when given in the form y = mx + c, m is the gradient in the form rise/run	• establish that when given in the form y = mx + c, m is the gradient in the form rise/run

Learning Journey	Step	Content	Description
			• understand that the gradient is the same between any 2 points on a line
		Understanding that the gradient is the slope of a line in the form rise/run	• understand that the gradient is the slope of a line in the form rise/run
			• understand how a negative and positive gradient differ
		Using similar triangles to explain why the slope m is the same between any 2 distinct points on a non-vertical line in the coordinate plane	• use similar triangles to explain why the slope m is the same between any 2 distinct points on a non-vertical line in the coordinate plane
	5	Establishing that when given in the form y = mx + c, c is the y-intercept	• establish that when given in the form y = mx + c, c is the y-intercept
			• explain why c is always the y-intercept
Using the gradient intercept form of a line	1	Graphing a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is in the form y = mx + c	• graph a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is in the form y = mx + c by first plotting the y-intercept
			• find a second point on the line using the gradient in the form rise/run
			• use correct graphing conventions when graphing (arrows, line to the edge etc)
	2	Graphing a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is not in the form y = mx + c by rearranging to be in this form	• graph a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is not in the form y = mx + c by rearranging to be in this form first
	3	Establishing and using the fact that substituting y = 0 into a linear equation will give you the x-intercept	• establish that substituting y = 0 into a linear equation will give you the x-intercept
			• substitute y = 0 into a linear equation in order to find the x-intercept
			• reproduce the x-intercept in coordinate form
		Establishing and using the fact that substituting x = 0 into a linear equation will give you the y-intercept	• establish that substituting x = 0 into a linear equation will give you the y-intercept
			• substitute x = 0 into a linear equation in order to find the y-intercept
			• reproduce the y-intercept in coordinate form
	4	Deriving the equation from a straight line that has been graphed on the Cartesian plane	• derive the equation from a straight line that has been graphed on the Cartesian plane
	5	Graphing horizontal linear relationships from the equation where there is no x involved	• graph horizontal linear relationships from the equation where there is no x involved
			• know that a horizontal line has a zero gradient

Learning Journey	Step	Content	Description
		Graphing vertical linear relationships from the equation where there is no y involved	• graph vertical linear relationships from the equation where there is no y involved
			• know that a vertical line has an infinite gradient
		Finding the equation of a given vertical line	• find the equation of a given vertical line

A.12 use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations			
Quest: Use graphs to find solutions			
Learning Journey	Steps	Content	Description
Using graphs to find approximate solutions	1	Using linear and quadratic graphs to estimate values of y for given values of x and vice versa	• use linear and quadratic graphs to estimate values of y for given values of x and vice versa
	2	Finding an approximate solution to simultaneous equations by graphing	• find an approximate solution to simultaneous equations by graphing

A.13 find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs			
Quest: Solve contextual problems from graphs			
Learning Journey	Steps	Content	Description
Solving contextual problems from graphs	1	Analysing linear relationships that represent quantities to solve real-world problems	• analyse linear relationships that represent quantities to solve real-world problems
	2	Finding approximate solutions to contextual problems from piece-wise graphs	• find approximate solutions to contextual problems from piece-wise graphs
	3	Finding approximate solutions to contextual problems from exponential graphs	• find approximate solutions to contextual problems from exponential graphs
	4	Finding approximate solutions to contextual problems from reciprocal graphs	• find approximate solutions to contextual problems from reciprocal graphs
	5	Finding approximate solutions to contextual problems from given graphs of a variety of functions	• find approximate solutions to contextual problems from given graphs of a variety of functions

A.14 generate terms of a sequence from either a term-to-term or a position-to-term rule			
Quest: Generate terms of a sequence			
Learning Journey	Steps	Content	Description
Generating terms of a sequence	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
	2	Generating a linear or quadratic sequence given the term-to-term rule	• generate a linear or quadratic sequence given the term-to-term rule
	3	Generating a linear or quadratic sequence given the nth term rule	• generate the first few terms of a linear or simple quadratic (rules consisting of a n^2 term and +/- a constant) sequence given the nth term rule
			• 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

A.15 recognise arithmetic sequences and find the nth term			
Quest: Find the nth term in sequences			
Learning Journey	Steps	Content	Description
Finding the nth term in arithmetic sequences	1	Finding the nth term of linear sequences (including decreasing sequences and decimal/fractional coefficient of n)	• find the nth term of linear sequences (arising from a given set of numbers or sequences generated from concrete/ visual representations)
			• find and 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
	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
	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	Content	Description
		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

A.16 recognise geometric sequences and appreciate other sequences that arise.			
Quest: Work with geometric sequences			
Learning Journey	Steps	Content	Description
Working with geometric sequences	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
	2	Recognising geometric sequences from a list of sequences	• recognise geometric sequences from a list of sequences
	3	Finding the common ratio in a given geometric sequence	• find the common ratio in a given geometric sequence
	4	Recognising and using sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions	• recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (r^n where n is an integer, and r is a positive rational number {or surd}) and other sequences

3 Ratio, proportion and rates of change

RP.1 change freely between related standard units [for example time, length, area, volume/capacity, mass]			
Quest: Convert between standard units			
Learning Journey	Steps	Content	Description
Converting between standard units	1	Converting between related standard units of time	• convert between related standard units of time
	2	Ordering and comparing standard units of length including with decimal quantities	• order and compare standard units of length including with decimal quantities
	3	Converting between related standard units of area	• convert between related standard units of area
	4	Converting between related standard units of volume	• convert between related standard units of volume
		Converting between related standard units of capacity	• convert between related standard units of capacity
	5	Converting between related standard units of mass	• convert between related standard units of mass

RP.2 use scale factors, scale diagrams and maps			
Quest: Use scale factors			
Learning Journey	Steps	Content	Description
Using numerical scale factors	1	Enlarging a given shape using the scale factor on the lengths of the sides of the shape	• enlarge a given shape using the scale factor on the lengths of the sides of the shape
	2	Solving problems involving the increase/decrease in an amount or measurement according to a scale factor	• solve problems by applying basic scale factors on the dimensions of a shape such as: - altering the size of a garment/textile item - working with simplified building plans or drawings - adapting a plan for a prototype into a full scale model - enlarging/reducing an artist's picture to fit into a given frame
	3	Using successive scale factors to transform figures	• use successive scale factors to transform figures
	4	Finding the missing side on a shape given its similar figure and scale factor	• find the missing side on a shape given its similar figure and scale factor
		Finding the missing angle on a shape given its similar figure and scale factor	• find the missing angle on a shape given its similar figure and scale factor

Learning Journey	Step	Content	Description
Using scale factors in ratio form	1	Solving geometric problems using scale factors as ratios	• solve geometric problems using scale factors as ratios
	2	Applying the scale factor to find unknown lengths in similar figures in a variety of practical situations	• apply the scale factor to find unknown lengths in similar figures in a variety of practical situations
	3	Constructing scale drawings given an object and the scale factor	• construct scale drawings given an object and the scale factor
	4	Using scales on maps and diagrams to solve practical problems	• use scales on maps and diagrams to solve practical problems

RP.3 express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1			
Quest: One quantity as a fraction of another			
Learning Journey	Steps	Content	Description
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
			• choose appropriate units to compare 2 quantities as a fraction
	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
			• choose appropriate units to compare 2 quantities as a fraction

RP.4 use ratio notation, including reduction to simplest form			
Quest: Understand and simplify ratios			
Learning Journey	Steps	Content	Description
Understanding and simplifying ratios	1	Defining ratios	• define ratios
			• understand the symbol :
	2	Introducing simple ratios	• use ratios to compare quantities measured in the same units
			• represent ratios found in real-life contexts, using concrete materials, drawings, and standard fractional notation
			• write ratios using the : symbol
			• express 1 part of a ratio as a fraction of the whole
	3	Simplifying ratios using highest common factors	• simplify ratios using highest common factors
			• understand the simplest form of a ratio as being one expressed using the lowest possible integer terms
Ratios involving fractions and decimals	1	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

Learning Journey	Step	Content	Description
		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
	2	Identifying equivalent ratios	• identify equivalent ratios
			• understand how a change made to 1 part of a ratio affects the other parts of the same ratio

RP.5 divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio			
Quest: Solve problems with ratios			
Learning Journey	Steps	Content	Description
Solving problems with ratios	1	Comparing quantities measured in the same units using ratios	• compare quantities measured in the same units using ratios
	2	Dividing an interval into a given ratio on a number line	• divide an interval into a given ratio on a number line
	3	Dividing a quantity into a given ratio	• divide a quantity into a given ratio
			• describe 'sharing' in a given ratio
			• express the division of a quantity into 2 parts as a ratio using original amounts
	4	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
	5	Solving a variety of real-life problems involving dividing quantities into a given ratio	• solve a variety of real-life problems involving dividing quantities into a given ratio

RP.6 understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction			
Quest: Multiplicative relationships as ratios			
Learning Journey	Steps	Content	Description
Multiplicative relationships expressed as a ratio	1	Solving problems between 2 quantities when the multiplicative relationship is represented as a ratio	• solve problems between 2 quantities when the multiplicative relationship is represented as a ratio
	2	Solving problems between 2 quantities when the multiplicative relationship is represented as a fraction	• solve problems between 2 quantities when the multiplicative relationship is represented as a fraction

RP.7 relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions			
Quest: Relate ratios to fractions & functions			
Learning Journey	Steps	Content	Description
Relating ratios to fractions and linear functions	1	Expressing 1 part of a ratio as a fraction of the whole	• express 1 part of a ratio as a fraction of the whole
		Expressing 1 part of a ratio as a percentage of the whole	• express 1 part of a ratio as a percentage of the whole
	2	Creating tables of equivalent ratios	• make tables of equivalent ratios relating quantities
	3	Plotting pairs of values from ratio tables on the coordinate plane	• plot pairs of values from ratio tables on the coordinate plane
	4	Comparing ratios using a table of values	• compare ratios using a table of values
		Calculating missing values in a ratio table	• calculate missing values in a ratio table
	5	Solving problems of comparison of ratios and missing values in situations of variation	• solve problems of comparison of ratios and missing values in situations of variation

RP.8 solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics			
Quest: Percentage change and simple interest			
Learning Journey	Steps	Content	Description
Solving problems involving percentage change	1	Calculating price increases given the original price	• calculate a price increase amount given the original price and the percentage increase
			• calculate the final price of an item given the price increase percentage and original price
	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
	3	Calculating the original price given the final price and the amount it has been increased by	• calculate the original price given the final price and the amount it has been increased by
		Calculating price increases starting with the final price	• calculate the price increase amount given the final price and the percentage increase
			• calculate the original price given the final price and the percentage price increase
	4	Calculating discounts starting with the final price	• calculate a discount amount given the final price and the percentage discount

Learning Journey	Step	Content	Description
			• calculate the original price given the final price and the percentage discount

Learning Journey	Step	Content	Description
Solving problems involving simple interest	1	Calculating simple interest using the formula	• calculate simple interest using the formula
	2	Calculating either the principal, the interest rate or the time periods using the rearranged simple interest formula	• calculate the principal using the rearranged simple interest formula
			• calculate the interest rate using the rearranged simple interest formula
			• calculate the time periods using the rearranged simple interest formula
	3	Solving problems involving simple interest	• solve problems involving simple interest

RP.9 solve problems involving direct and inverse proportion, including graphical and algebraic representations			
Quest: Solve problems involving proportion			
Learning Journey	Steps	Content	Description
Solving problems involving direct proportion	1	Determining whether 2 quantities are in a proportional relationship	• determine whether 2 quantities are in a proportional relationship
		Recognising proportional relationships between quantities	• interpret information between 2 quantities and decide if they are in a proportional relationship
		Investigating and understanding direct variation/proportion	• investigate situations which are examples of direct variation/proportion
			• understand that x is directly proportional to y if x/y = constant (or y = kx, k being the constant)
	2	Identifying the constant of proportionality from a table of values	• identify the constant of proportionality from a table of values
			• find the missing values from a table using the constant of proportionality
	3	Using proportionality constants that are fractions or decimals	• use proportionality constants that are fractions or decimals
	4	Finding the value of the constant of variation (or proportionality) and using it to solve problems	• find the value of the constant of variation (or proportionality), given the appropriate information, within a direct variation/proportion problem
			• use information to write a direct variation/proportion equation and find the value of the constant of variation/proportion/proportionality
			• write, apply and solve equations within the context of direct variation/proportion problems
	5	Determining the constant of proportionality (k = y/x) within mathematical problems	• determine the constant of proportionality (k = y/x) within mathematical problems

Learning Journey	Step	Content	Description
		Determining the constant of proportionality (k = y/x) within real-world problems	• determine the constant of proportionality (k = y/x) within real-world problems
		Solving direct variation/proportion problems in various contexts	• solve problems involving rates and directly proportional relationships in various contexts, using dynamic geometry software to construct and measure scale drawings
Graphing directly proportional relationships	1	Graphing proportional relationships	• graph proportional relationships
			• interpret the unit rate as the slope of the graph
		Understanding what direct variation/proportion graphs look like	• understand that straight-line graphs represent direct variation/proportion for the values given on each axis
			• explain why straight line graphs represent direct variation/proportion
	2	Understanding what a point (x, y) on the graph of a proportional relationship means in terms of the situation	• understand what a point (x, y) on the graph of a proportional relationship means in terms of the situation
	3	Interpreting the unit rate as the slope of the line that models the relationship	• interpret the unit rate as the slope of the line that models the relationship
	4	Interpreting and comparing direct variation/proportion graphs	• interpret and compare graphs in real-life situations to make informed choices, eg mobile phone charges, temperature conversions, time/distance/speed etc
	5	Representing proportional relationships by equations	• represent proportional relationships by equations
Solving problems involving indirect proportion	1	Investigating and understanding indirect or inverse variation/proportion	• investigate situations which are examples of indirect or inverse variation/proportion
			• understand that x and y are indirectly proportional if, as the value of x increases, the value of y decreases and as the value of x decreases, the value of y increases
	2	Graphing inversely proportional relationships	• graph inversely proportional relationships
			• understand the graph of an inversely proportional relationship is a hyperbola
			• describe what happens to the function as x approaches 0
	3	Applying information to create indirect (inverse) variation/proportion graphs	• create tables of values for indirect (inverse) variation/proportion problems and then plot on the number plane

Learning Journey	Step	Content	Description
			• understand and/or comment on the significance of the shape of a graph representing indirect variation/proportionality
	4	Solving problems based on indirect (inverse) variation/proportion with and without digital technology	• solve problems using an understanding of indirect (inverse) variation/proportion with and without digital technology
Problems involving direct & indirect proportion	1	Solving problems involving proportional reasoning (for direct and indirect proportion)	• solve problems involving proportional reasoning
	2	Interpreting graphs which represent direct and indirect variation/proportion	• recognise and interpret graphs representing direct and indirect variation/proportion
			• identify whether a linear graph represents direct or indirect variation/proportion with reference to the values on each axis

RP.10 use compound units such as speed, unit pricing and density to solve problems.			
Quest: Solve problems with compound units			
Learning Journey	Steps	Content	Description
Working with compound units	1	Converting between related compound units (rates of pay, prices, density, pressure) in numerical and algebraic contexts (UK)	• convert between related compound units (rates of pay, prices, density, pressure) in numerical and algebraic contexts
	2	Using compound units such as speed, unit pricing and density to solve problems (UK)	• use compound units such as speed, unit pricing and density to solve problems
Solving problems involving speed	1	Converting speeds from one rate to another	• convert between units of speed, eg m/s converted to km/h
	2	Comparing speeds written in different rates	• understand the need to write speeds in the same rate to compare them
			• convert different speeds to the same rate to compare
			• introduce the formula to calculate the distance, given the speed and time
			• know that Distance = Speed x Time (D = S x T)

4 Geometry and measures

GM.1 derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)			
Quest: Perimeter of 2-D shapes			
Learning Journey	Steps	Content	Description
Perimeter of 2-D shapes	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
			• find the perimeter of polygons without the use of a calculator
	2	Using the appropriate formula to calculate the perimeter of polygons, square, rectangle	• use the appropriate formula to calculate the perimeter of polygons, squares, rectangles
	3	Using the appropriate formula to find a missing measurement, given the perimeter	• use the appropriate formula to find a missing measurement, given the perimeter
	4	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
			• solve problems involving the comparison of proportional changes in the linear dimensions of regular polygons
			• solve problems involving the comparison of non-proportional changes in the linear dimensions of regular polygons

Area of 2-D shapes			
Quest: Area of 2-D shapes			
Learning Journey	Steps	Content	Description
Area of triangles	1	Calculating area of any triangle	• establish that the area of any triangle is Area of triangle = $\frac{1}{2}$ × base × perpendicular height, including triangles in which the perpendicular height meets the base within the length of the base and also triangles in which the perpendicular height (altitude) meets the base outside the length of the base
			• calculate the area of triangles where more dimensions than are necessary are given, using the relationship that the area is half the area of a rectangle with the same base and perpendicular height

Learning Journey	Step	Content	Description
	2	Applying the formula to find the areas of right-angled triangles	• apply the formula to find the areas of right-angled triangles
		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
			• 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
Area of rectangles	1	Applying the formula for the area of a rectangle	• develop the formula for the area of a rectangle, $A = l \times w$ (also $A = lw$)
			• 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	Recognising that rectangles with the same area may have different dimensions	• recognise that rectangles with the same area may have different dimensions
			• connect factors of a number with the whole-number dimensions of different rectangles with the same area
		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

Learning Journey	Step	Content	Description
		Finding the dimensions of rectangles and squares given their areas	• find the possible dimensions of rectangles and squares given their areas
		Applying measurement skills to solve problems involving the areas of rectangles (including squares) in everyday situations	• apply measurement skills to solve problems involving the areas of rectangles (including squares) in everyday situations, eg determine the area of a basketball court
			• measure the dimensions of a large rectangular piece of land in metres and calculate its area in hectares, eg the local park
Area of 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
Area of a trapezium	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
	3	Solving real-life problems involving calculating the area of trapeziums	• solve real-life problems involving calculating the area of trapeziums

Learning Journey	Step	Content	Description
Area of a rhombus	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'
Area of a kite	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
Area of composite shapes	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
Quest: Volume of 3-D shapes			
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
			• model with centicubes how a prism can be built up using uniform cross-sections
			• develop methods and formulas to find the volume of any prism by recognising that the area of the base is identical to the uniform area of its cross-section so that V=Bh

Learning Journey	Step	Content	Description
	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 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
	4	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
	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
Volume of cuboids	1	Developing the formula for the volume of cuboids	• develop the formula for the volume of cuboids by recognising the area of the 'base' of a cuboid as being identical to the area of its uniform cross-section and using the formula V=Bh
		Finding the volumes of cuboids, given their perpendicular heights and the dimensions of their uniform cross-sections	• find the volumes of cuboids, given their perpendicular heights and the dimensions of their uniform cross-sections
	2	Finding the volume of a cuboid given the area of the uniform cross-section and perpendicular height in the same units	• find the volume of a cuboid given the area of the uniform cross-section and perpendicular height in the same units
	3	Finding the volume of a cuboid given the area of the uniform cross-section and perpendicular height in different units	• find the volume of a cuboid given the area of the uniform cross-section and perpendicular height in different units
	4	Finding the height or area of the cuboid uniform cross-section given the volume in the same units	• find the height or area of the cuboid uniform cross-section given the volume in the same units
	5	Finding the height/area of the cuboid uniform cross-section given the volume in different units	• find the height/area of the cuboid uniform cross-section given the volume in different units

Learning Journey	Step	Content	Description
		Finding a missing dimension of a cuboid given the volume in different units	• find a missing dimension of a cuboid given the volume in different units
Volume of triangular prisms	1	Developing the formula for the volume of triangular prisms	• develop the formula for the volume of triangular prisms by recognising the area of the 'base' of a prism as being identical to the area of its uniform cross-section and using the formula V=Abasexhperpendicular
		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
	2	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
	3	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
	4	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
		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
	5	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
Solving problems with 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

Learning Journey	Step	Content	Description
	2	Finding the height or area of a prism with a composite/irregular polygon with uniform cross-section given the volume in different units	• find the height or area of a prism with a composite/irregular polygon with uniform cross-section given the volume in different units
Volume of cylinders	1	Developing the formula for the volumes of cylinders	• develop the formula to find the volumes of cylinders by recognising the area of the 'base' of a prism as being identical to the area of its uniform cross-section and using the formula V=Abasexhperpendicular
			• describe the volume formula of a cylinder in terms of its base area and its height
		Recognising and understanding the similarities between the volume formulas for cylinders and prisms	• recognise and understand the similarities between the volume formulas for cylinders and prisms
		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
			• 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

GM.2 calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes			
Quest: Perimeter of composite 2-D shapes			
Learning Journey	Steps	Content	Description
Perimeters of composite shapes	1	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
Quest: Circumference of circles			
Understanding circles and finding circumference	1	Identifying parts of a circle	• identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
	2	Finding circumferences	• develop and use the formulas to find the circumferences of circles in terms of the diameter d or radius r
			• use mental strategies to estimate the circumferences of circles
	3	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 quadrants and semicircles	1	Finding the perimeters of quadrants and semicircles	• find the perimeters of quadrants and semicircles given the appropriate information
			• 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

Learning Journey	Step	Content	Description
			• 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
Quest: Area of a circle			
Finding the area of a circle	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
Finding the area of 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	Deriving the formula for the area of a sector in degrees: $A=\frac{\theta}{360}\pi r^2$	• derive the formula for the area of a sector in degrees: $A=\frac{\theta}{360}\pi r^2$
		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
			• 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

Learning Journey	Step	Content	Description
		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

GM.3 draw and measure line segments and angles in geometric figures, including interpreting scale drawings			
Quest: Geometric figures and scale drawings			
Learning Journey	Steps	Content	Description
Line segments, angles, interpreting scale drawings	1	Measuring line segments using digital measuring tools	• measure line segments using digital measuring tools
	2	Measuring angles using digital measuring tools	• measure angles using digital measuring tools
	3	Solving problems using scale drawings	• solve problems using scale drawings of geometric figures including actual lengths from a scale drawing

GM.5 describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric			
Quest: Geometrical conventions and language			
Learning Journey	Steps	Content	Description
Using 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
	2	Describing, using conventional terms, regular polygons and other polygons that are reflectively and rotationally symmetric	• describe, using conventional terms, regular polygons and other polygons that are reflectively and rotationally symmetric to a given polygon

Learning Journey	Step	Content	Description
Identifying parallel and perpendicular lines	1	Identifying perpendicular and parallel lines	• name and record perpendicular lines using the conventional notation
			• name and record parallel lines using the conventional notation

GM.6 use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles			
Quest: Triangle conventions			
Learning Journey	Steps	Content	Description
Using the conventions for angles and triangles	1	Using the standard conventions for marking the sides and angles of triangle ABC	• use the standard conventions for labelling the sides and angles of triangle ABC
Understanding criteria for triangle congruence	1	Determining if 2 triangles are congruent using the SSS test	• determine that when 3 sides of a triangle are respectively equal to the 3 sides of another triangle, then the 2 triangles are congruent
			• use the SSS test to determine if 2 or more triangles are congruent
	2	Determining if 2 triangles are congruent using the SAS test	• identify that if 2 sides and the included angle of a triangle are respectively equal to 2 sides and the included angle of another triangle, then the 2 triangles are congruent
			• use the SAS test to determine if 2 or more triangles are congruent
			• understand why the angle in the SAS test must be the included angle
	3	Determining if 2 triangles are congruent using the ASA test	• identify that if 2 angles and 1 side of a triangle are respectively equal to 2 angles and the matching side of another triangle, then the 2 triangles are congruent
			• use the ASA test to determine if 2 or more triangles are congruent
	4	Determining if 2 triangles are congruent using the RHS test	• identify that if the hypotenuse and a second side of a right-angled triangle are respectively equal to the hypotenuse and a second side of another right-angled triangle, then the 2 triangles are congruent
			• use the RHS test to determine if 2 or more triangles are congruent
	5	Determining if 2 triangles are congruent using the SSS, SAS, ASA 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, ASA, RHS) to identify a pair of congruent triangles from a selection of 3 or more triangles or from triangles embedded in a diagram

Learning Journey	Step	Content	Description
Applying 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
		Using transformations of congruent triangles to verify some of the properties of special quadrilaterals, including properties of the diagonals	• demonstrate the way that different congruent triangles make up special quadrilaterals and can be used to determine properties of the special quadrilaterals, eg the diagonals of a parallelogram bisect each other

GM.7 derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies			
Quest: Properties of 2-D shapes			
Learning Journey	Steps	Content	Description
Properties of 2-D shapes	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
	2	Sketching and labelling triangles from a worded or verbal description	• sketch and label triangles given lengths and angles of the triangle
	3	Exploring the relationship between sides and angles of triangles	• explain why the longest side of a triangle is always opposite the largest angle
	4	Investigating properties of special quadrilaterals: parallelograms	• investigate the properties of parallelograms
		Investigating properties of special quadrilaterals: rectangles	• investigate the properties of rectangles
		Investigating properties of special quadrilaterals: rhombuses	• investigate the properties of rhombuses
		Investigating properties of special quadrilaterals: squares	• investigate the properties of squares
		Investigating properties of special quadrilaterals: trapeziums/trapezoids	• investigate the properties of trapeziums
		Investigating properties of special quadrilaterals: kites	• investigate the properties of kites
	5	Reasoning about special quadrilaterals on the basis of their properties	• classify a set of quadrilaterals based on their properties
		Describing special quadrilaterals	• describe a quadrilateral in sufficient detail for it to be sketched
		Reasoning about triangles and special quadrilaterals	• use the properties of special triangles and quadrilaterals to solve simple numerical problems with appropriate reasoning

GM.8 identify properties of, and describe the results of, translations, rotations and reflections applied to given figures			
Quest: Understand transformations			
Learning Journey	Steps	Content	Description
Understanding translations	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	Performing successive translations	• perform up to 3 consecutive translations, recognising which 1 translation would have the same result
Understanding reflections	1	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
			• investigate and describe the relationship between the coordinates of P and P' following a reflection in the x- or y-axis
	2	Plotting points reflected in any line on the Cartesian (number) plane	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from reflection in any line in the number plane
Understanding rotations	1	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 180° about the origin
			• investigate and describe the relationship between the coordinates of P and P' following a rotation of 180° 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
	2	Plotting points rotated about the origin	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation about the origin using multiples of 90° in either direction (clockwise or anti-clockwise/counterclockwise)
Understanding all transformations	1	Plotting the transformations of shapes on the Cartesian plane	• plot the position of the image of a given shape on the Cartesian plane resulting from a one-step translation, reflection in the x-axis or y-axis, or rotation about the origin by a multiple of 90°

Learning Journey	Step	Content	Description
			• plot the position of the image of a given shape on the Cartesian plane resulting from a combination of translations, reflections in the x-axis or y-axis, and rotations about the origin by a multiple of 90°
			• explore and describe different combinations of transformations that produce the same image of a given shape
	2	Identifying the length of a line or line segment after a translation, reflection or rotation	• identify the length of a line or line segment after a translation, reflection or rotation
		Identifying the measure of an angle after a translation, reflection or rotation	• identify the measure of an angle after a translation, reflection or rotation
		Identifying parallel lines after a translation, reflection or rotation	• identify parallel lines after a translation, reflection or rotation
	3	Exploring combinations of transformations on a point (including reflection in any line)	• explore and describe different combinations of transformations that produce the same image of a given point (including reflection in any line)
	4	Plotting the transformations of shapes on the Cartesian plane	• plot the position of the image of a given shape on the Cartesian plane resulting from a one-step translation, reflection in the x-axis or y-axis, or rotation about the origin by a multiple of 90°
			• plot the position of the image of a given shape on the Cartesian plane resulting from a combination of translations, reflections in the x-axis or y-axis, and rotations about the origin by a multiple of 90°

GM.9 identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids			
Quest: Congruent and similar triangles			
Learning Journey	Steps	Content	Description
Identify and construct congruent triangles	1	Determining if 2 triangles are congruent using the SSS, SAS, ASA and RHS test	• identify which test to use to determine congruence of triangles
			• use the SSS, SAS, ASA and RHS tests to determine if 2 or more triangles are congruent
	2	Drawing congruent triangles with coordinate grids	• draw a congruent triangle to a given triangle with coordinate grids
Construct similar shapes by enlargement	1	Constructing similar triangles by enlargement	• construct and label a similar triangle to a given triangle and scaling constant by enlarging the triangle
			• construct and label a similar triangle to a given triangle and scaling constant by reducing the triangle

Learning Journey	Step	Content	Description
	2	Enlarging a given shape using the scale factor on the lengths of the sides of the shape	• enlarge a given shape using the scale factor on the lengths of the sides of the shape

GM.10 apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles			
Quest: Properties of angle relationships			
Learning Journey	Steps	Content	Description
Properties of angle relationships	1	Investigating and defining complementary angles	• investigate, with and without digital technology, adjacent angles that form a right angle and establish that they add to 90°
			• 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)
	2	Investigating and defining supplementary angles	• investigate, with and without digital technology, adjacent angles that form a straight angle and establish that they add to 180°
			• 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)
	3	Investigating and identifying adjacent angles	• investigate features of adjacent angles
			• identify adjacent angles within a diagram
	4	Investigating angles at a point that form angles of revolution	• investigate, with and without digital technology, angles at a point that form an angle of revolution and establish that they add to 360°
		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°)
			• understand the ambiguity when labelling the reflex angle when 2 angles make up an angle of revolution
	5	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
		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	Content	Description
			• 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

GM.11 understand and use the relationship between parallel lines and alternate and corresponding angles			
Quest: Angle relationships on parallel lines			
Learning Journey	Steps	Content	Description
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
			• explore, through measurement, the relationships between pairs of angles formed when a transversal is drawn on a pair of 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	• apply 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	• apply 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 supplementary angles on parallel lines	• apply geometric reasoning with consecutive interior angles on parallel lines
			• use consecutive interior 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	• apply geometric reasoning with angles on parallel lines by choosing the appropriate angle relationship

Learning Journey	Step	Content	Description
			• choose and apply the appropriate angle property to calculate unknown angles on parallel lines represented by variables

GM.12 derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons			
Quest: Explore the angle sum of a triangle			
Learning Journey	Steps	Content	Description
Exploring the angle sum of a triangle	1	Exploring and proving the sum of interior angles of a triangle	• explore, through measurement, the sum of interior angles of a triangle
			• investigate the sum of the angles in a triangle using digital technology
			• calculate an unknown angle represented by a variable within a triangle, given the other 2 angles
	2	Finding the sum of interior angles of a quadrilateral	• explore the sum of interior angles of a quadrilateral using concrete materials and digital technology
			• calculate an unknown angle/s represented by a variable/s within quadrilaterals, given the appropriate angles
	3	Finding the interior angle sum of a polygon	• explore the interior angle sum of a polygon using concrete materials and digital technology

GM.14 use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles			
Quest: Pythagoras' Theorem			
Learning Journey	Steps	Content	Description
Introducing the Pythagoras' Theorem	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
			• describe how to identify the hypotenuse in a right-angled triangle using either the fact that it is the longest side or 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

Learning Journey	Step	Content	Description
		Investigating and describing the relationship between the lengths of the sides of any right-angle triangle	• investigate the relationship between the lengths of the sides of any right-angle triangle in practical ways and using digital technologies
			• describe the relationship between the lengths of the sides of any right-angle triangle
		Exploring the relationship between the lengths of the sides of a right-angled triangle in practical ways including with the use of digital technologies	• explore the relationship between the lengths of the sides of a right-angled triangle in practical ways including with the use of digital technologies
		Establishing the relationship between the sides of a right-angled triangle formally and identifying that this is Pythagoras' theorem: $c^2 = a^2 + b^2$	• establish the relationship between the sides of a right-angled triangle formally and identifying that this is Pythagoras' theorem: $c^2 = a^2 + b^2$
Finding the shorter side using Pythagoras' Theorem	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
	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
	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 using 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
	2	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

Learning Journey	Step	Content	Description
	3	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
	4	Interpreting the information within a word question to draw a right-angled triangle diagram for the given context, showing all information	• interpret the information within a word question to draw a right-angled triangle diagram for the given context, showing all information
	5	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
		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
Pythagoras' Theorem: Triads and the converse	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
			• identify that when each term of a Pythagorean triad is multiplied/divided by a constant, the resultant 3 figures also form a Pythagorean triad
	2	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
Quest: Trigonometry			
Trigonometry introduction	1	Identifying and labelling parts of a right-angled triangle with reference to a given angle	• identify the location of the opposite, adjacent and hypotenuse in right-angled triangles of different orientation
			• assign and label the hypotenuse in right-angled triangles with different orientations
			• label 2 non-hypotenuse sides of a right-angled triangle 'opposite' and 'adjacent' with respect to a given angle

Learning Journey	Step	Content	Description
	2	Labelling and assigning sides and their corresponding angles in triangles	• identify sides in relation to angles in any triangle, eg side c is opposite angle C
			• label sides in relation to angles in any triangle, eg side c is opposite angle C
		Exploring the relationship between 2 sides as an assigned angle changes in size from 0 to 90 degrees in a right-angled triangle	• explore the relationship between each set of 2 sides with respect to the given angle and describe the relationship, eg as angle increases, the ratio of the opposite side to the hypotenuse approaches 1
			• explore the relationship between each set of 2 sides with respect to the given angle and describes the relationship, eg as angle increases, the ratio of the adjacent side to the hypotenuse approaches 0
			• explore the relationship between each set of 2 sides with respect to the given angle and describes the relationship, eg as angle increases, the ratio of the opposite side to the adjacent approaches infinity
			• explore all 3 combinations of sides using dynamic geometrical software
			• describe the relationship between 2 sides as an assigned angle changes in size in right-angled triangles
			• describe how the size of the angle changes as each ratio of 2 sides is changed
		Investigating the constancy of the 3 primary trigonometric ratios for a given angle in right-angled triangles using similar triangles	• investigate the constancy of the sine ratio for a given angle in right-angled triangles using similar triangles. Traditional methods and digital software to be implemented
			• investigate the constancy of the cosine ratio for a given angle in right-angled triangles using similar triangles. Traditional methods and digital software to be implemented
			• investigate the constancy of the tangent ratio for a given angle in right-angled triangles using similar triangles. Traditional methods and digital software to be implemented
Trigonometric relationships	1	Establishing the sine trigonometric relationship on right-angled triangles	• establish the relationship of the opposite side to the hypotenuse with respect to a given angle as the sine of that angle
			• define sine ratio using correct language and notation including abbreviations, eg sine x = opposite/hypotenuse sin x =opp/hyp

Learning Journey	Step	Content	Description
	2	Establishing the cosine trigonometric relationship on right-angled triangles	• establish the relationship of the adjacent side to the hypotenuse with respect to a given angle as the cosine of that angle.
			• define cosine ratio using correct language and notation including abbreviations, eg cosine x = adjacent/hypotenuse cos x = adj/hyp
	3	Establishing the tangent trigonometric relationship on right-angled triangles	• establish the relationship of the opposite side to the adjacent with respect to a given angle as the tangent of that angle
			• define tangent ratio using correct language and notation including abbreviations, eg tangent x = opposite/adjacent tan x = opp/adj
	4	Determining which 2 sides each trigonometric ratio applies with reference to a given angle	• determine which 2 sides of a right-angled triangle each trigonometric ratio applies to
			• determine which 2 sides of a right-angled triangle each trigonometric ratio applies to using SOHCAHTOA acronym
			• select correct trigonometric ratio on triangles of different orientation
		Identifying which trigonometric ratio to use given 2 sides and an angle in a right-angled triangle	• identify that the sine ratio is relevant when given the opposite and hypotenuse sides with respect to a given angle
			• identify that the cosine ratio is relevant when given the adjacent and hypotenuse sides with respect to a given angle
			• identify that the tangent ratio is relevant when given the opposite and adjacent sides with respect to a given angle
	5	Attaining the 3 primary trigonometric ratios on simple right-angled triangles with respect to a given angle	• attain the sine ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals
			• attain the cosine ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals
			• attain the tangent ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals

Learning Journey	Step	Content	Description
Trigonometry and the calculator	1	Calculating the approximation of trigonometric ratios for a given angle measured in degrees using the calculator	• calculate the approximate value of the sine ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg sin 30°=0.5
			• calculate the approximate value of the cosine ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg cos 60°=0.5
			• calculate the approximate value of the tangent ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg tan 45°=1
			• calculate the approximate value of each of the 3 trigonometric ratios for a given angle measured in degrees on right-angled triangles with different orientation using the calculator, rounding to a specified number of decimal places or significant figures
	2	Calculating the approximation of trigonometric ratios for a given angle measured in degrees, minutes and seconds using the calculator	• calculate the approximate value of each of the 3 trigonometric ratios for a given angle measured in degrees, minutes and seconds on right-angled triangles with different orientation using the calculator, eg sin 32°43'15=0.54...
	3	Using a calculator to find an angle correct to the nearest degree, given one of the trigonometric ratios for the angle	• use a calculator to find an angle correct to the nearest degree, given one of the trigonometric ratios for the angle
Using trigonometric ratios to find missing sides	1	Using trigonometric ratios to find the length of the missing numerator side on a right angled triangles	• use the tangent ratio to calculate the length of the 'opposite' side given the respective angle and adjacent side in a right-angled triangle
			• use the sine ratio to calculate the length of the 'opposite' side given the respective angle and hypotenuse in a right-angled triangle
			• use the cosine ratio to calculate the length of the 'adjacent' side given the respective angle and hypotenuse in a right-angled triangle
	2	Selecting the correct ratio in order to calculate the missing numerator side given an angle in a right-angled triangle with different orientations	• select the correct ratio in order to calculate the missing numerator side given an angle in a right-angled triangle with different orientations

Learning Journey	Step	Content	Description
	3	Using trigonometric ratios to find the length of the missing denominator side on a right-angled triangles	• use the tangent ratio to calculate the length of the 'adjacent' side given the respective angle and opposite side in a right-angled triangle
			• use the sine ratio to calculate the length of the 'hypotenuse' side given the respective angle and opposite side in a right-angled triangle
			• use the cosine ratio to calculate the length of the 'hypotenuse' side given the respective angle and adjacent side in a right-angled triangle
	4	Selecting the correct ratio in order to calculate any missing denominator given an angle in a right-angled triangle with different orientations	• select the correct ratio in order to calculate any missing denominator given an angle in a right-angled triangle with different orientations
	5	Solving more complex problems involving finding the missing side on a right-angled triangle	• solve a range of more complex right-angled triangle problems that involve finding the missing side given 1 angle with diagrams included
			• solve a range of more complex worded right-angled triangle problems that involve finding the missing side given 1 angle without diagrams included
			• solve a range of more complex problems involving 1 or more than 1 right-angled triangle where side lengths needs to be found. Include examples in context using metric units, eg shadows, reflections, scale models, surveying, navigation, inaccessible objects around the school (using a clinometer)
Using trigonometric ratios to find missing angles	1	Introducing inverse trigonometric ratios as undoing the original function of the trigonometric ratio	• introduce inverse trigonometric ratios as the operator that does the opposite (or undoes) the original function of the trigonometric ratio
			• use inverse trigonometric functions to find an angle, given the ratio eg if sin C = $\frac{1}{2}$, find the size of angle C C = sin-1($\frac{1}{2}$) C = 30°
	2	Using trigonometric ratios to find the size of a missing angle on a right-angled triangle	• use the inverse tangent ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations
			• use the inverse sine ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations

Learning Journey	Step	Content	Description
			• use the inverse cosine ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations
	3	Selecting the correct inverse ratio in order to calculate any missing angle given 2 or more sides in a right-angled triangle with different orientations	• select the correct inverse ratio in order to calculate any missing angle given 2 or more sides in a right-angled triangle with different orientations
	4	Solving more complex problems involving finding the missing angle on a right-angled triangle	• solve a range of more complex right-angled triangle problems that involve finding the missing angle with diagrams included
			• solve a range of more complex worded right-angled triangle problems that involve finding the missing angle without diagrams included
			• solve a range of more complex problems involving 1 or more than 1 right-angled triangle where angle needs to be found. Include examples in context using metric units, eg shadows, reflections, scale models, surveying, navigation, inaccessible objects around the school (using a clinometer)
Solving problems using trigonometry	1	Solving various right-angled triangle problems involving two-dimensional problems	• represent word problems with a sketch with all important details
			• solve various two-dimensional problems involving right-angled triangles of different orientation, with or without a diagram. Sides and/or angles
			• develop an awareness of the use of trigonometry to solve problems in context
			• discuss when trigonometric ratios should be used versus when Pythagoras' theorem should be used
			• solve problems with points described using coordinates
	2	Solving various right-angled triangle problems involving three-dimensional problems	• use the trigonometric ratios to calculate the lengths of edges and diagonals in cuboids. Pythagoras can also be used in this context. Solve problems when the diagram is provided
			• solve various authentic three-dimensional problems involving right-angled triangles of different orientation, with or without a diagram

GM.15 use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D			
Quest: Use properties of 3-D shapes			
Learning Journey	Steps	Content	Description
Using properties of 3-D shapes to solve problems	1	Using the properties of faces, surfaces, edges and vertices of cubes, prisms and cylinders to solve problems in 3D	• use the properties of faces, surfaces, edges and vertices of cubes, prisms and cylinders to solve problems in 3D
	2	Using the properties of faces, surfaces, edges and vertices of pyramids, cones and spheres to solve problems in 3D	• use the properties of faces, surfaces, edges and vertices of pyramids, cones and spheres to solve problems in 3D

GM.16 interpret mathematical relationships both algebraically and geometrically.			
Quest: Interpret mathematical relationships			
Learning Journey	Steps	Content	Description
Relationships algebraically and geometrically	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
	2	Matching mathematical relationships represented algebraically with their corresponding geometric representation and vice versa	• match mathematical relationships represented algebraically with their corresponding geometric representation and vice versa
	3	Investigating linear relationships on Cartesian plane (coordinate grid) for number and geometric (spatial) patterns	• investigate linear relationships on the coordinate grid by completing a table of values, plotting the results and from there determine whether the relationship is linear or not (with and without digital technology)
			• identify a table of values matching a linear relationship plotted on the coordinate grid (with and without digital technology)
			• identify the table of values for a given number pattern that matches the points plotted on a coordinate grid
			• describe the linear relationship and the rules (term-to-term and also position-to-term)

5 Probability

P.1 record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale			
Quest: Understand probability			
Learning Journey	Steps	Content	Description
Language and concepts of probability	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)
		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
		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	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	Exploring the 'fairness' of simple games involving chance	• identify what can affect the fairness of games involving chance eg: bias, weighted, uneven outcomes etc
			• explore how to make an unfair game fair and vice versa
		Applying probabilities to the outcomes of events	• use the term 'event' to describe either 1 outcome or a collection of outcomes in the sample space of a chance experiment

Learning Journey	Step	Content	Description
		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 the difference between experiments, events, outcomes and the sample space in chance situations	• understand the difference between experiments, events, outcomes and the sample space in chance situations
Expressing and interpreting probabilities	1	Applying probabilities to simple events by reasoning about equally likely outcomes	• apply probabilities to simple events by reasoning about equally likely outcomes
	2	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
	3	Expressing probabilities as decimals, fractions and percentages	• express probabilities as decimals, fractions and percentages
	4	Interpreting probabilities expressed as fractions, percentages or decimals	• interpret probabilities expressed as fractions, percentages or decimals
	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
Probability 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
			• use the terms 'chance experiment', 'outcome' and 'sample space' appropriately for 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
			• use the terms 'chance experiment', 'outcome' and 'sample space' appropriately for experiments in which the outcomes are equally and not equally likely
	3	Creating and conducting a chance experiment given equally probable events	• create a chance experiment given equally probable events
			• determine the theoretical probability of a series of events using tree diagrams

Learning Journey	Step	Content	Description
			• conduct the chance experiment with both small and large numbers of trials using digital technologies
			• 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

P.2 understand that the probabilities of all possible outcomes sum to 1			
Quest: Complementary probabilities			
Learning Journey	Steps	Content	Description
Complementary probabilities	1	Establishing that the sum of the probabilities of all of the possible outcomes of a single-step experiment is 1	• establish that the sum of the probabilities of all of the possible outcomes of a single-step experiment is 1
	2	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
		Establishing that the sum of the probability of an event and its complement is 1	• establish that the sum of the probability of an event and its complement is 1
	3	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
	4	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

P.3 enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams			
Quest: Venn diagrams, set theory & 2-way tables			
Learning Journey	Steps	Content	Description
Introducing Venn diagrams	1	Understanding Venn diagrams and how they demonstrate compound events	• understand Venn diagrams and how they demonstrate compound events
		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

Learning Journey	Step	Content	Description
	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
	4	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 given data to calculate missing values in a Venn diagram	• use given data to calculate missing values in a Venn diagram
	2	Using data presented in Venn diagrams to answer problems, including probability questions	• use data presented in Venn diagrams to answer problems, including probability questions
	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
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 given data to calculate missing values in a two-way table	• use given data to calculate missing values in a two-way table
	4	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
	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
Venn Diagrams and two-way tables	1	Comparing Venn diagrams and two-way tables	• compare the utility of Venn diagrams and two-way tables

Learning Journey	Step	Content	Description
		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
Introducing set theory	1	Understanding set theory and its notation and vocabulary	• understand set theory and its notation and vocabulary
		Defining unions, intersections and complements of subsets using symbols	• define unions as the combination of subsets, ie if an element is in A U B then the element can be in either A or B
			• define intersections as the crossover between subsets, ie if an element is in A ∩ B then the element must be in A and B
			• define complements of an event as all outcomes that are not the event
	2	Identifying different regions on a Venn diagram using set theory	• identify different regions on a Venn diagram using set theory

P.4 generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities.			
Quest: Sample spaces and probability			
Learning Journey	Steps	Content	Description
Sample spaces and probability	1	Recognising that outcomes are described as 'equally likely' when any 1 outcome has the same chance of occurring as any other outcome	• recognise that outcomes are described as 'equally likely' when any 1 outcome has the same chance of occurring as any other outcome
		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
	5	Representing sample spaces for compound events using organised lists, tables and tree diagrams	• represent sample spaces for compound events using organised lists, tables and tree diagrams

6 Statistics

S.1 describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)			
Quest: Understand data language			
Learning Journey	Steps	Content	Description
Understanding data language	1	Defining 'variable' in the context of statistics as something measurable or observable that is expected to change over time or between individual observations	• define 'variable' in the context of statistics as something measurable or observable that is expected to change over time or between individual observations
		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)
			• recognise that data collected on a rating scale (Likert-type scale) is categorical, eg, 1 = dislike, 2 = neutral, 3 = like
	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
			• discuss the practicalities of collecting data through a census compared to a sample, including limitations due to population size, eg in countries such as China and India, a census is conducted only once per decade
Quest: Central tendency & data analysis			
Mean, median, mode and range	1	Identifying different ways people often refer to the mean, median and mode using everyday language	• identify different ways people often refer to the mean, median and mode using everyday language. Use words such as: 'usually', 'approximately', 'typically', 'around' in questions relating to those measures of central tendency in the appropriate manner
		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

Learning Journey	Step	Content	Description
			• recognise that the mean is often referred to as the 'average' in everyday language
			• identify that the bar notation represents the mean score for a set of data
		Using the statistical functions of a calculator to determine the mean for small sets of data	• use the statistical functions of a calculator to determine the mean for small sets of data
		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
	2	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
	3	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
	4	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
		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
Data analysis	1	Recognising which statistical measures are appropriate for the data type, eg the mean, median and range are meaningless for categorical data	• recognise which statistical measures are appropriate for the data type
			• explain why one measure is the most appropriate
			• describe real-life situations where either mean, median or range would be the most appropriate statistical measure
		Identifying and describing the mean, median and mode as 'measures of location' or 'measures of centre' and the range as a 'measure of spread'	• identify and describe the mean, median and mode as 'measures of location' or 'measures of centre' and the range as a 'measure of spread'
		Describing, in practical terms, the meaning of the mean, median, mode and/or range in the context of the data	• describe, in practical terms, the meaning of the mean, median, mode and/or range in the context of the data

Learning Journey	Step	Content	Description
	2	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
		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
			• explain why it is more appropriate to use the median than the mean when the data contains 1 or more outliers
			• determine situations when it is more appropriate to use the median or mode, rather than the mean, when analysing data, eg median for property prices, mode for shoe sizes
		Analysing collected data to identify any obvious errors and justifying the inclusion of any individual data values that differ markedly from the rest of the data collected	• analyse collected data to identify any obvious errors and justify the inclusion of any individual data values that differ markedly from the rest of the data collected
	3	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
	4	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

S.2 construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data			
Quest: Represent & interpret data displays			
Learning Journey	Steps	Content	Description
Construct and interpret tables and pictograms	1	Using a tally to organise data into a frequency distribution table	• use a tally to organise data into a frequency distribution table
	2	Collecting, recording and interpreting data in tables and pictograms	• read and interpret data in pictograms
Construct and interpret vertical line charts	1	Constructing and interpreting frequency histograms and polygons	• construct and interpret frequency histograms and polygons

Learning Journey	Step	Content	Description
			• select and use appropriate scales and labels on horizontal and vertical axes
			• recognise why a half-column-width space is necessary between the vertical axis and the first column of a histogram
	2	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
	3	Constructing histograms for discrete data sets where grouping is required	• construct histograms for discrete data sets where grouping is required
	4	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
Construct and interpret dot plots	1	Interpreting dot plots	• interpret dot plots
	2	Constructing dot plots	• construct dot plots
			• explain the importance of aligning data points when constructing dot plots
Construct & interpret ordered stem and leaf plots	1	Constructing ordered stem-and-leaf plots with whole numbers	• construct ordered stem-and-leaf plots with whole numbers only
	2	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
	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
		Explaining the importance of ordering and aligning data values when constructing stem-and-leaf plots	• explain the importance of ordering and aligning data values when constructing stem-and-leaf plots
Construct and interpret 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
		Constructing divided bar graphs without the use of digital technology	• construct divided bar graphs without the use of digital technology
			• calculate the length of the bar required for each section of divided bar graphs
Construct and interpret pie charts	1	Interpreting pie charts	• interpret pie charts
	2	Constructing pie charts with the use of digital technology	• construct pie charts with the use of digital technology

Learning Journey	Step	Content	Description
		Constructing pie charts without the use of digital technology	• construct pie charts without the use of digital technology
			• calculate the angle at the centre required for each sector of pie charts
Construct and interpret 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
		Constructing line graphs without the use of digital technology	• construct line graphs without the use of digital technology
			• construct line graphs for time series data
Interpreting data in a variety of forms	1	Interpreting a variety of graphs, including dot plots, stem-and-leaf plots , divided bar graphs , pie charts and line graphs	• interpret a variety of graphs, including dot plots, stem-and-leaf plots , divided bar graphs , pie charts and line graphs
			• calculate the percentage of the whole represented by different categories in a divided bar graph or pie chart
			• 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 pie charts, line graphs, bar graphs and pictograms

S.3 describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs.			
Quest: Bivariate data			
Learning Journey	Steps	Content	Description
Understanding bivariate data	1	Recognising the difference between an independent variable and its dependent variable	• recognise the difference between an independent variable and its dependent variable
	2	Distinguishing bivariate data from single variable (univariate) data	• distinguish bivariate data from single variable (univariate) data
		Describing the difference between bivariate data and single variable data using an appropriate example	• describe the difference between bivariate data and single variable data using an appropriate example
		Investigating a matter of interest, representing the dependent numerical variable against the independent variable, time, in an appropriate graphical form	• investigate a matter of interest, representing the dependent numerical variable against the independent variable, time, in an appropriate graphical form

Learning Journey	Step	Content	Description
	3	Exploring why line graphs are the most appropriate method of representing data collected over time	• explore why line graphs are the most appropriate method of representing data collected over time
		Describing changes in the dependent variable over time	• describe changes in the dependent variable over time
		Suggesting reasons for changes in the dependent variable over time with reference to relevant world or national events	• suggest reasons for changes in the dependent variable over time with reference to relevant world or national events
	4	Interpreting data displays representing 2 or more dependent numerical-variables against time	• interpret data displays representing 2 or more dependent numerical-variables against time
		Investigating a matter of interest involving 2 numerical variables and construct a scatter graph, with or without the use of digital technologies, to determine and comment on the relationship between them	• investigate a matter of interest involving 2 numerical variables and construct a scatter graph, with or without the use of digital technologies, to determine and comment on the relationship between them
Understanding scatter graphs	1	Describing, informally, the strength and direction of the relationship between 2 variables displayed in a scatter graph	• describe, informally, the strength and direction of the relationship between 2 variables displayed in a scatter graph
	2	Making predictions from a given scatter graph or other graph	• make predictions from a given scatter graph or other graph
	3	Drawing conclusions from a given scatter graph	• draw conclusions from a given scatter graph

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