Kingfisher Curriculum Offer – Maths

Curriculum Offer
(SLT)

Progression Map and National Curriculum Aims and Expectations
(Curriculum Lead)

Progression Map and Proposed Timescale with Core Curriculum Aims, Qualification Mapping and Teaching Schedule
(Subject Lead)

Lesson plans and Resources including Displays and Assessment
(Classroom Teacher)

Progression Map

Level Expected at the end of:

- Pre Key Stage 2
- Key Stage 2
- Key Stage 3
- Key Stage 4
- Post 16

Key Stage 2 Kingfisher School Curriculum Offer	Key Stage 2 Content National Curriculum Expectations
Autumn Term: **Year 3** **Number** recognise the place value of each digit in a three-digit number (hundreds, tens, ones) compare and order numbers up to 1000 identify, represent and estimate numbers using different representations solve number problems and practical problems involving these ideas recognise the place value of each digit in a three-digit number (hundreds, tens, ones) compare and order numbers up to 1000 identify, represent and estimate numbers using different representations solve number problems and practical problems involving these ideas **Geometry** draw 2-D shapes and make 3-D shapes using modelling materials identify horizontal and vertical lines - recognise that angles are a property of shape or a description of a turn **Calculation** add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction estimate the answer to a calculation and use inverse operations to check answers solve problems, including missing number problems, using number facts, place value - recall and use multiplication and division facts for the 3 and 4 multiplication tables - write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods - solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects	**LKS2** The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number. By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12-multiplication table and show precision and fluency in their work. Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling. **UKS2** The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of

Measure add and subtract amounts of money to give change, using both £ and p in practical contexts measure, compare: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) measure the perimeter of simple 2-D shapes **Statistics** interpret and present data using bar charts, pictograms and tables **Fractions** recognise and show, using diagrams, equivalent fractions with small denominators begin to compare and order unit fractions, and fractions with the same denominators solve problems that involve all of the above **Year 4** **Number and place value** find 1000 more or less than a given number count backwards through zero to include negative numbers recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) order and compare numbers beyond 1000 identify, represent and estimate numbers using different representations solve number and practical problems that involve all of the above and with increasingly large positive numbers count in multiples of 6, 7, 9, 25 and 1000 round any number to the nearest 10, 100 or 1000 plot specified points and draw sides to complete a given polygon **Number – fractions** recognise and show, using diagrams, families of common equivalent fractions solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number **Calculation - addition and subtraction** add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why **Calculation – multiplication and division** recall multiplication and division facts for multiplication tables up to 12 × 12 use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers	numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages. Pupils should read, spell and pronounce mathematical vocabulary correctly.

multiply two-digit and three-digit numbers by a one-digit number using formal written layout **Statistics** interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs **Measurement** measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres convert between different units of measure (e.g. kilometre to metre; hour to minute) find the area of rectilinear shapes by counting squares **Geometry** compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes describe positions on a 2-D grid as coordinates in the first quadrant **Year 5 & 6** **Number** read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers through zero solve number problems and practical problems that involve all of the above count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 compare and order fractions whose denominators are all multiples of the same number identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. 2/5 + 4/5 = 6/5 = 11/5) read Roman numerals to 1000 (M) and recognise years written in Roman numerals **Measure** convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) understand and use equivalences between met ic units and common imperial units such as inches, pounds and pints solve problems involving converting between units of time **Geometry** identify 3-D shapes, including cubes and other cuboids, from 2-D representations distinguish between regular and irregular polygons based on reasoning about equal sides and angles	

know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles draw given angles, and measure them in degrees (°) identify: angles at a point and one whole turn (total 360°) angles at a point on a straight line and ½ a turn (total 180°) other multiples of 90° **Calculation** add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) add and subtract numbers mentally with increasingly large numbers use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19 multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 including long multiplication for two-digit numbers multiply and divide numbers mentally drawing upon known facts divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, **Statistics** complete, read and interpret information in tables solve comparison, sum and difference problems using information presented in a line graph **Spring Term:** **Year 3** **Number** count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number	

read and write numbers up to 1000 in numerals and in words recognise the place value of each digit in a three-digit number (hundreds, tens, ones) compare and order numbers up to 1000 identify, represent and estimate numbers using different representations solve number problems and practical problems involving these ideas compare and order unit fractions, and fractions with the same denominators recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators solve problems that involve all of the above **Fractions** count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 solve problems that involve all of the above **Measure** tell and write the time from an analogue clock know the number of seconds in a minute and the number of days in each month, year and leap year tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks **Geometry** recognise 3-D shapes in different orientations and describe them recognise three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle **Calculation** add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds solve problems, including more complex addition and subtraction write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental methods write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods **Statistics**	

solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables interpret and present data using bar charts, pictograms and tables solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables **Year 4** **Number - fractions** recognise and write decimal equivalents of any number of tenths or hundredths recognise and write decimal equivalents to 1/4; 1/2; ¾ **Calculation - addition and subtraction** add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why **Calculation – multiplication and division** recognise and use factor pairs and commutativity in mental calculations solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects recall multiplication and division facts for multiplication tables up to 12 × 12 use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers multiply two-digit and three-digit numbers by a one-digit number using formal written layout **Geometry** identify acute and obtuse angles and compare and order angles up to two right angles by size identify lines of symmetry in 2-D shapes presented in different orientations complete a simple symmetric figure with respect to a specific line of symmetry **Measurement** read, write and convert time between analogue and digital 12 and 24-hour clocks solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days estimate, compare and calculate different measures, including money in pounds and pence **Statistics**	

solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs **Number and place value** read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value **Year 5 & 6** **Number** read, write, order and compare numbers with up to three decimal places solve problems involving number up to three decimal places read and write decimal numbers as fractions (e.g. 0.71 = 71/100) round decimals with two decimal places to the nearest whole number and to one decimal place **Calculation** solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes **Geometry** identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed **Measure** measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes **Number** recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator hundred, and as a decimal fraction solve problems which require knowing percentage and decimal equivalents of 1/2, 1/4, 1/5, 2/5, 4/5 and those with a denominator of a multiple of 10 or 25 **Summer Term:**	

Year 3 **Number (fractions)** recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators add and subtract fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7) solve problems that involve all of the above count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators compare and order unit fractions, and fractions with the same denominators **Measure** compare time in terms of seconds, minutes, hours and o'clock; use to estimate and read time with increasing accuracy to the nearest minute; record and vocabulary such as a.m./p.m., morning, afternoon, noon and midnight compare durations of events, for example to calculate the time taken by particular events or tasks measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight **Geometry** identify horizontal and vertical lines and pairs of perpendicular and parallel lines identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle **Statistics** solve one-step and two-step questions such as 'How many more?' and 'How many fewer?' using information presented in scaled bar charts and pictograms and tables count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number read and write numbers up to 1000 in numerals and in words interpret and present data using bar charts, pictograms and tables **Calculation** recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods **Year 4** **Number – fractions** find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten add and subtract fractions with the same denominator` round decimals with one decimal place to the nearest whole number compare numbers with the same number of decimal places up to two decimal places solve simple measure and money problems involving fractions and decimals to two decimal places **Number and place value** count in multiples of 6, 7, 9, 25 and 1000 find 1000 more or less than a given number count backwards through zero to include negative numbers recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) order and compare numbers beyond 1000 identify, represent and estimate numbers using different representations round any number to the nearest 10, 100 or 1000 solve number and practical problems that involve all of the above and with increasingly large positive numbers **Calculation - addition and subtraction** add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate estimate and use inverse operations to check answers to a calculation solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why **Calculation – multiplication and division** recognise and use factor pairs and commutativity in mental calculations solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects recall multiplication and division facts for multiplication tables up to 12 × 12	

use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together three numbers multiply two-digit and three-digit numbers by a one-digit number using formal written layout **Measurement** convert between different units of measure (e.g. kilometre to metre; hour to minute) measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres find the area of rectilinear shapes by counting squares read, write and convert time between analogue and digital 12 and 24-hour clocks solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days **Geometry** describe movements between positions as translations of a given unit to the left/right and up/down describe positions on a 2-D grid as coordinates in the first quadrant plot specified points and draw sides to complete a given polygon **Statistics** interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs **Year 5 & 6** **Number** count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 add and subtract fractions with the same denominator and multiples of the same number multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents add and subtract fractions with the same denominator and multiples of the same number multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams read, write, order and compare numbers with up to three decimal places solve problems involving number up to three decimal places **Calculation** add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) add and subtract numbers mentally with increasingly large numbers use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy	

solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes **Statistics** solve comparison, sum and difference problems using information presented in a line graph complete, read and interpret information in tables, including timetables **Geometry** use the properties of rectangles to deduce related facts and find missing lengths and angles **Measure** measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling	
Key Stage 3 Kingfisher School Curriculum Offer	**Key Stage 3 Content National Curriculum Expectations**

In Key Stage 3 pupils should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing, and other subjects. Each term the six areas of mathematics will be taught to support students understanding and independent learning. This will also ensure recall from their short-term memory to move to their long-term memory from repetition and recall of prior knowledge. **<u>Year 7</u>** **<u>Autumn Term:</u>**	**Working mathematically** Through the mathematics content, pupils should be taught to: **Develop fluency**

Number Pupils should be taught to: • understand and use place value for decimals, measures and integers of any size • Pupils should be taught to: • 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 ***Algebra*** Pupils should be taught to: • use and interpret algebraic notation, including: o ab in place of a × b o 3y in place of y + y + y and 3 × y o a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b o in place of a ÷ b o coefficients written as fractions rather than as decimals o brackets • substitute numerical values into formulae and expressions, including scientific formulae • understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors ***Ratio, proportion and rates of change*** Pupils should be taught to: • change freely between related standard units [for example time, length, area, volume/capacity, mass] ***Geometry and measures*** Pupils should be taught to: • 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) • calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes • Pupils should be taught to:	• consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots • select and use appropriate calculation strategies to solve increasingly complex problems • use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships • substitute values in expressions, rearrange and simplify expressions, and solve equations • move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs] • develop algebraic and graphical fluency, including understanding linear and simple quadratic functions • use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics **Reason mathematically** • extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations • extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically • identify variables and express relations between variables algebraically and graphically • make and test conjectures about patterns and relationships; look for proofs or counter-examples • begin to reason deductively in geometry, number and algebra, including using geometrical constructions • interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning

- draw and measure line segments and angles in geometric figures, including interpreting scale drawings

Statistics

Pupils should be taught to:

- 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)

<u>Spring Term:</u>

Number

Pupils should be taught to:

- use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals
- Pupils should be taught to:
- use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish betPween exact representations of roots and their decimal approximations
- interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or 0

Algebra

Pupils should be taught to:

- simplify and manipulate algebraic expressions to maintain equivalence by:
  - collecting like terms
  - multiplying a single term over a bracket
  - taking out common factors
  - expanding products of 2 or more binomials
- understand and use standard mathematical formulae; rearrange formulae to change the subject
- understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally

Solve problems

- develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems
- develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics
- begin to model situations mathematically and express the results using a range of formal mathematical representations
- select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems

Subject content

Number

Pupils should be taught to:

- understand and use place value for decimals, measures and integers of any size
- order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation,

• model situations or procedures by translating them into algebraic expressions or formulae and by using graphs **Ratio, proportion and rates of change** Pupils should be taught to: • change freely between related standard units [for example time, length, area, volume/capacity, mass] **Geometry and measures** Pupils should be taught to: • derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line • 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 **Probability** Pupils should be taught to: • 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 **Statistics** Pupils should be taught to: • 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 **<u>Summer Term:</u>** **Number** Pupils should be taught to:	including using product notation and the unique factorisation property • use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative • use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals • recognise and use relationships between operations including inverse operations • 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 • interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or 0 • work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$) • define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100% • interpret fractions and percentages as operators • use standard units of mass, length, time, money and other measures, including with decimal quantities • round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] • use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$ • use a calculator and other technologies to calculate results accurately and then interpret them appropriately

• work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$) • round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] **Algebra** Pupils should be taught to: • use algebraic methods to solve linear equations in 1 variable (including all forms that require rearrangement) • work with coordinates in all 4 quadrants **Ratio, proportion and rates of change** Pupils should be taught to: • use scale factors, scale diagrams and maps **Geometry and measures** Pupils should be taught to: • use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles • derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies **Probability** Pupils should be taught to: • understand that the probabilities of all possible outcomes sum to 1 **Statistics** Pupils should be taught to: • describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs	• appreciate the infinite nature of the sets of integers, real and rational numbers **Algebra** Pupils should be taught to: • use and interpret algebraic notation, including: ○ ab in place of a × b ○ 3y in place of y + y + y and 3 × y ○ a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b ○ $\frac{a}{b}$ in place of a ÷ b ○ coefficients written as fractions rather than as decimals ○ brackets • substitute numerical values into formulae and expressions, including scientific formulae • understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors • simplify and manipulate algebraic expressions to maintain equivalence by: ○ collecting like terms ○ multiplying a single term over a bracket ○ taking out common factors ○ expanding products of 2 or more binomials • understand and use standard mathematical formulae; rearrange formulae to change the subject • model situations or procedures by translating them into algebraic expressions or formulae and by using graphs • use algebraic methods to solve linear equations in 1 variable (including all forms that require rearrangement) • work with coordinates in all 4 quadrants

Year 8
Autumn Term:

Number

Pupils should be taught to:

- order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative

Algebra

Pupils should be taught to:

- use and interpret algebraic notation, including:
  - ab in place of a × b
  - 3y in place of y + y + y and 3 × y
  - a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b
  - $\frac{a}{b}$ in place of a ÷ b
  - coefficients written as fractions rather than as decimals
  - brackets
- understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- interpret mathematical relationships both algebraically and graphically

Ratio, proportion and rates of change

Pupils should be taught to:

- express 1 quantity as a fraction of another, where the fraction is less than 1 and greater than 1
- divide a given quantity into 2 parts in a given part:part or part:whole ratio; express the division of a quantity into 2 parts as a ratio
- recognise, sketch and produce graphs of linear and quadratic functions of 1 variable with appropriate scaling, using equations in x and y and the Cartesian plane
- interpret mathematical relationships both algebraically and graphically
- reduce a given linear equation in 2 variables to the standard form y = mx + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- 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
- find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- generate terms of a sequence from either a term-to-term or a position-to-term rule
- recognise arithmetic sequences and find the nth term
- recognise geometric sequences and appreciate other sequences that arise

Ratio, proportion and rates of change

Pupils should be taught to:

- change freely between related standard units [for example time, length, area, volume/capacity, mass]
- use scale factors, scale diagrams and maps
- express 1 quantity as a fraction of another, where the fraction is less than 1 and greater than 1
- use ratio notation, including reduction to simplest form
- divide a given quantity into 2 parts in a given part:part or part:whole ratio; express the division of a quantity into 2 parts as a ratio

Geometry and measures

Pupils should be taught to:

- 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)
- calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
-

Probability

Pupils should be taught to:

- enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams

Statistics

Pupils should be taught to:

- 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)

<u>Spring Term:</u>

Number

Pupils should be taught to:

- recognise and use relationships between operations including inverse operations
- interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or 0

Algebra

- understand that a multiplicative relationship between 2 quantities can be expressed as a ratio or a fraction
- relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions
- solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- solve problems involving direct and inverse proportion, including graphical and algebraic representations
- use compound units such as speed, unit pricing and density to solve problems

Geometry and measures

Pupils should be taught to:

- 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)
- calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- 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

Pupils should be taught to: • reduce a given linear equation in 2 variables to the standard form y = mx + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically • 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 **Ratio, proportion and rates of change** Pupils should be taught to: • use ratio notation, including reduction to simplest form **Geometry and measures** Pupils should be taught to: • understand and use the relationship between parallel lines and alternate and corresponding angles • 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 **Probability** Pupils should be taught to: • generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities **Statistics** Pupils should be taught to: • 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 **<u>Summer Term:</u>**	• use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles • derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies • identify properties of, and describe the results of, translations, rotations and reflections applied to given figures • identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids • apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles • understand and use the relationship between parallel lines and alternate and corresponding angles • 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 • apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs • use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles • use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D • interpret mathematical relationships both algebraically and geometrically **Probability** Pupils should be taught to:

Number

Pupils should be taught to:

- define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100%
- use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a<x\leq b$

Algebra

Pupils should be taught to:

- find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- generate terms of a sequence from either a term-to-term or a position-to-term rule
- recognise arithmetic sequences and find the nth term
- recognise geometric sequences and appreciate other sequences that arise

Ratio, proportion and rates of change

Pupils should be taught to:

- divide a given quantity into 2 parts in a given part:part or part:whole ratio; express the division of a quantity into 2 parts as a ratio
- understand that a multiplicative relationship between 2 quantities can be expressed as a ratio or a fraction

Geometry and measures

Pupils should be taught to:

- apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs
- 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
- understand that the probabilities of all possible outcomes sum to 1
- enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams
- generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities

Statistics

Pupils should be taught to:

- 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)
- 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
- describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs

• identify properties of, and describe the results of, translations, rotations and reflections applied to given figures **Probability** Pupils should be taught to: • 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 **Statistics** Pupils should be taught to: • describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs	
Key Stage 4 Kingfisher School Curriculum Offer	**Key Stage 4 Content National Curriculum Expectations**
<u>Autumn 1</u> **Number** In addition to consolidating subject content from key stage 3, pupils should be taught to: • apply systematic listing strategies, {including use of the product rule for counting} • {estimate powers and roots of any given positive number} **Algebra** • simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: • factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of 2 squares; {factorising quadratic expressions of the form $ax^2 + bx + c$} • recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, {the exponential function $y = k^x$ for	**Develop fluency** • consolidate their numerical and mathematical capability from key stage 3 and extend their understanding of the number system to include powers, roots {and fractional indices} • select and use appropriate calculation strategies to solve increasingly complex problems, including exact calculations involving multiples of π {and surds}, use of standard form and application and interpretation of limits of accuracy • consolidate their algebraic capability from key stage 3 and extend their understanding of algebraic simplification and manipulation to include quadratic expressions, {and expressions involving surds and algebraic fractions} • extend fluency with expressions and equations from key stage 3, to include quadratic equations, simultaneous equations and inequalities

positive values of k, and the trigonometric functions (with arguments in degrees) y = sin x, y = cos x and y = tan x for angles of any size}

Ratio, proportion & rate of change

- compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)

Geometry and Measures

- interpret and use fractional {and negative} scale factors for enlargements
- {describe the changes and invariance achieved by combinations of rotations, reflections and translations}
- identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

Probability

- apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to 1
- use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size

Autumn 2

Number

In addition to consolidating subject content from key stage 3, pupils should be taught to

- calculate with roots, and with integer {and fractional} indices
- calculate exactly with fractions, {surds} and multiples of π {simplify surd expressions involving squares [for example √12 = √(4 × 3) = √4 × √3 = 2√3] and rationalise denominators}

Algebra

- simplifying expressions involving sums, products and powers, including the laws of indices
    - know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs}
    - where appropriate, interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the 'inverse function'; interpret the succession of 2 functions as a 'composite function'}

- move freely between different numerical, algebraic, graphical and diagrammatic representations, including of linear, quadratic, reciprocal, {exponential and trigonometric} functions
- use mathematical language and properties precisely

Reason mathematically

- extend and formalise their knowledge of ratio and proportion, including trigonometric ratios, in working with measures and geometry, and in working with proportional relations algebraically and graphically
- extend their ability to identify variables and express relations between variables algebraically and graphically
- make and test conjectures about the generalisations that underlie patterns and relationships; look for proofs or counter-examples; begin to use algebra to support and construct arguments {and proofs}
- reason deductively in geometry, number and algebra, including using geometrical constructions
- interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning
- explore what can and cannot be inferred in statistical and probabilistic settings, and express their arguments formally
- assess the validity of an argument and the accuracy of a given way of presenting information

Solve problems

- develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems
- develop their use of formal mathematical knowledge to interpret and solve problems, including in financial contexts
- make and use connections between different parts of mathematics to solve problems
- model situations mathematically and express the results using a range of formal mathematical representations, reflecting on how their solutions may have been affected by any modelling assumptions
- select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem

Subject content

Number

• use the form y = mx + c to identify parallel {and perpendicular} lines; find the equation of the line through 2 given points, or through 1 point with a given gradient • identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically {and turning points by completing the square} **Ratio, proportion & rate of change** • convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts **Geometry and Measures** • {apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results} • construct and interpret plans and elevations of 3D shapes • interpret and use bearings **Statistics** • infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling • interpret and construct tables and line graphs for time series data **<u>Spring 1</u>** **Number** In addition to consolidating subject content from key stage 3, pupils should be taught to • calculate with numbers in standard form A × 10n, where 1 ≤ A < 10 and n is an integer **Algebra** • {sketch translations and reflections of the graph of a given function} • plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration **Ratio, proportion & rate of change** • understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$; {construct and} interpret equations that describe direct and inverse proportion **Geometry and Measures** • calculate arc lengths, angles and areas of sectors of circles	In addition to consolidating subject content from key stage 3, pupils should be taught to: • apply systematic listing strategies, {including use of the product rule for counting} • {estimate powers and roots of any given positive number} • calculate with roots, and with integer {and fractional} indices • calculate exactly with fractions, {surds} and multiples of π {simplify surd expressions involving squares [for example √12 = √(4 × 3) = √4 × √3 = 2√3] and rationalise denominators} • calculate with numbers in standard form A × 10n, where 1 ≤ A < 10 and n is an integer • {change recurring decimals into their corresponding fractions and vice versa} • identify and work with fractions in ratio problems • apply and interpret limits of accuracy when rounding or truncating, {including upper and lower bounds **Algebra** In addition to consolidating subject content from key stage 3, pupils should be taught to: • simplify and manipulate algebraic expressions (including those involving surds {and algebraic fractions}) by: ○ factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of 2 squares; {factorising quadratic expressions of the form $ax^2 + bx + c$} ○ simplifying expressions involving sums, products and powers, including the laws of indices • know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments {and proofs} • where appropriate, interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the 'inverse function'; interpret the succession of 2 functions as a 'composite function'} • use the form y = mx + c to identify parallel {and perpendicular} lines; find the equation of the line through 2 given points, or through 1 point with a given gradient

• calculate surface areas and volumes of spheres, pyramids, cones and composite solids **Probability** • calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions **<u>Spring 2</u>** **Number** In addition to consolidating subject content from key stage 3, pupils should be taught to • {change recurring decimals into their corresponding fractions and vice versa} **Algebra** • {calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts} • {recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point} • solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph **Ratio, proportion & rate of change** • interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion **Geometry and Measures** • apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures • apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in 2 {and 3} dimensional figures **Statistics** • {construct and interpret diagrams for grouped discrete data and continuous data, ie, histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use} • interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:	• identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically {and turning points by completing the square} • recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, {the exponential function $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) y = sin x, y = cos x and y = tan x for angles of any size} • {sketch translations and reflections of the graph of a given function} • plot and interpret graphs (including reciprocal graphs {and exponential graphs}) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration • {calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts} • {recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point} • solve quadratic equations {including those that require rearrangement} algebraically by factorising, {by completing the square and by using the quadratic formula}; find approximate solutions using a graph • solve 2 simultaneous equations in 2 variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph • {find approximate solutions to equations numerically using iteration} • translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or 2 simultaneous equations), solve the equation(s) and interpret the solution • solve linear inequalities in 1 {or 2} variable {s}, {and quadratic inequalities in 1 variable}; represent the solution set on a number line, {using set notation and on a graph} • 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 a surd}) {and other sequences}

- appropriate graphical representation involving discrete, continuous and grouped data, {including box plots}
- appropriate measures of central tendency (including modal class) and spread {including quartiles and inter-quartile range}

Summer 1

Number

In addition to consolidating subject content from key stage 3, pupils should be taught to

- identify and work with fractions in ratio problems

Algebra

- solve 2 simultaneous equations in 2 variables (linear/linear {or linear/quadratic}) algebraically; find approximate solutions using a graph
- {find approximate solutions to equations numerically using iteration}
- translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or 2 simultaneous equations), solve the equation(s) and interpret the solution

Ratio, proportion & rate of change

- {interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of instantaneous and average rate of change (gradients of tangents and chords) in numerical, algebraic and graphical contexts}

Geometry and Measures

- know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45°, 60°
- {know and apply the sine rule, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$, and cosine rule, $a^2 = b^2 + c^2 - 2bc \cos A$, to find unknown lengths and angles}
- {know and apply Area = $\frac{1}{2}$ ab sin C to calculate the area, sides or angles of any triangle}

Statistics

- apply statistics to describe a population

- deduce expressions to calculate the nth term of linear {and quadratic} sequences.

Ratio, proportion and rates of change

In addition to consolidating subject content from key stage 3, pupils should be taught to:

- compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity (including trigonometric ratios)
- convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts
- understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$; {construct and} interpret equations that describe direct and inverse proportion
- interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion
- {interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of instantaneous and average rate of change (gradients of tangents and chords) in numerical, algebraic and graphical contexts}
- set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}

Geometry and measures

In addition to consolidating subject content from key stage 3, pupils should be taught to:

- interpret and use fractional {and negative} scale factors for enlargements
- {describe the changes and invariance achieved by combinations of rotations, reflections and translations}
- identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
- {apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results}
- construct and interpret plans and elevations of 3D shapes
- interpret and use bearings
- calculate arc lengths, angles and areas of sectors of circles
- calculate surface areas and volumes of spheres, pyramids, cones and composite solids

- use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.

Summer 2

Number

In addition to consolidating subject content from key stage 3, pupils should be taught to

- apply and interpret limits of accuracy when rounding or truncating, {including upper and lower bounds}

Algebra

- solve linear inequalities in 1 {or 2} variable {s}, {and quadratic inequalities in 1 variable}; represent the solution set on a number line, {using set notation and on a graph}
- 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 a surd}) {and other sequences}
- deduce expressions to calculate the nth term of linear {and quadratic} sequences.

Ratio, proportion & rate of change

- set up, solve and interpret the answers in growth and decay problems, including compound interest {and work with general iterative processes}

Geometry and Measures

- describe translations as 2D vectors
- apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}

Probability

- {calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}

- apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures
- apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in 2 {and 3} dimensional figures
- know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45°, 60°
- {know and apply the sine rule, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$, and cosine rule, $a^2 = b^2 + c^2 - 2bc \cos A$, to find unknown lengths and angles}
- {know and apply Area = $\frac{1}{2}$ ab sin C to calculate the area, sides or angles of any triangle}
- describe translations as 2D vectors
- apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}

Probability

In addition to consolidating subject content from key stage 3, pupils should be taught to:

- apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to 1
- use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size
- calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
- {calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams}

Statistics

In addition to consolidating subject content from key stage 3, pupils should be taught to:

- infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling
- interpret and construct tables and line graphs for time series data

	• {construct and interpret diagrams for grouped discrete data and continuous data, ie, histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use} • interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: ○ appropriate graphical representation involving discrete, continuous and grouped data, {including box plots} ○ appropriate measures of central tendency (including modal class) and spread {including quartiles and inter-quartile range} • apply statistics to describe a population • use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.

Intent - Maths

The mathematics curriculum is mapped to include coverage of the National Curriculum and designed to challenge, engage and motivate with the ultimate goal that our learners progress academically and become successful, confident individuals, who make a positive contribution to the community and society - both now and in the future. Our curriculum is bespoke to our school and is devised according to the needs of our children.

Implementation

Our Learning is sequenced into coherent and cumulative lessons that build and connect on previous content. Specific skills are discretely taught and practised so that they become transferrable. Carefully sequenced units activate prior learning, build on skills and deepen knowledge and understanding. Learning, vocabulary and content is cumulative; content is learned, retrieved and built upon.
Subject content is broken down as new topics are introduced and teaching is paused regularly to check understanding, giving feedback throughout. High quality resources are carefully chosen to support the learning journey. Our pupils are then able to apply learned knowledge and practiced skills confidently during independent application. Independent application is then followed by cumulative quizzing to assess understanding. This in turn informs planning for the next day.
Maths is taught primarily built around a child centred lesson design that models and embeds a growth mindset approach to maths and focuses on helping all children to build a deep understanding of maths concepts. However, our children regularly need to focus for longer on individual mathematical concepts therefore these skills are taught in small steps and consolidated and applied throughout the lesson. Problem solving and reasoning are integral components of our Maths lessons.

Impact

A judgement on the impact of the curriculum on pupils is based upon a triangulation of different monitoring and evaluation activities within school. Work and book scrutiny, pupil voice discussions, outcomes of assessments and quality of teaching and learning are all used at tools to help senior leaders assess the impact of the curriculum.

The impact of the school's curriculum can be seen through the rising quality of work in the books the pupils produce, and the in-year progress demonstrated by all groups of pupils.