Maths

Course overview

Mathematics at Bishop Luffa is much more than completing a set of questions or replicating a process that the teacher has just explained. It is more about generating strategies for solving problems, applying those approaches, seeing if they lead to solutions and checking that the answers generated make sense. We firmly believe mathematics cannot be taught successfully as a series of isolated topics and that real understanding can only be developed as pupils realise how new ideas are related or connected to other things they know.

Consequently throughout our KS3 programme our intention is for our pupils to create new knowledge from prior knowledge. Often this is achieved through the use of thought provoking questions that intentionally drive the learning from the "known" towards the "unknown." This approach is based on internationally recognised best practice in learning mathematics but specifically on the Japanese approach to learning through problem solving. The point is that we believe that real understanding develops only as pupils reflect and communicate about mathematical problems for which they have no prescribed or memorised rules to follow.

We also think that it is important for the pupils to believe that is not necessarily a "correct" solution method but that there are many such methods. Their task is often to find as many solutions as possible to a specific problem before refining their ideas through classroom discussion. This approach then led us to define our overarching aim for our pupils.

Our Overarching Aim

> *"Our pupils will become independent thinkers (learners) who enjoy working together to produce creative solutions in unfamiliar situations."*

Objectives

Our pupils will

- *Enjoy doing mathematics* – to help students learn to enjoy and sense personal reward in the process of thinking, searching for patterns and solving problems.
- *Gain confidence and belief in their abilities* - to develop students' confidence in their ability to do mathematics and to confront unfamiliar tasks
- *Be willing to take risks and to persevere* – to improve students' willingness to attempt unfamiliar problems and to develop perseverance in solving problems without being discouraged by initial setbacks
- *Interact with others to develop new ideas* – to encourage students to share ideas and results, compare and evaluate strategies, challenge results, determine the validity of answers and negotiate ideas on which they all can agree.

Progression

Of course there is also a need for all pupils to develop mathematical proficiency through practise and there is a clear structure of what is expected of our pupils to demonstrate mastery at each step. Decisions about progression will be based on the security of pupils' understanding (mastery) and their readiness to progress to the next step. Pupils who grasp concepts rapidly will be challenged through being offered rich and sophisticated problems rather than any acceleration through new content in preparation for key stage 4. Those who are not sufficiently fluent will consolidate their understanding through tackling less demanding problems.

Maths Steps – Number

Step	Competency
At all steps	▪ I can understand and use place value for decimals, measures and integers of any size ▪ I can order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =,≠, <, >,≤,≥ ▪ I can use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, square, cube, square root and cube root ▪ I can appreciate the infinite nature of the sets of integers, real and rational numbers ▪ I can use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals ▪ I can recognise and use relationships between any operations including inverse operations
1	▪ I can round any whole number ▪ I can use negative numbers in practical contexts such as temperature and calculate intervals across zero [N5] ▪ I can count forwards or backwards in steps of any whole number with one significant figure, e.g. 9, 20, 3000 [N1] ▪ I can add and subtract whole numbers with more than four digits, using formal written methods where appropriate [C2] ▪ I can use their understanding of place value to multiply and divide whole numbers and decimals with up to two decimal places by 10 or 100 (e.g. 1532 ÷ 100 = , ÷ 100 = 6.3) [C6] ▪ I can multiply and divide whole numbers mentally drawing upon multiplication facts up to 12 × 12 and place value (e.g. 60 × 70) and begin to use these facts to work with larger numbers [C6] ▪ I can multiply numbers with up to two digits by a two digit number using the formal long multiplication method and becoming more confident with multiplication with larger numbers; multiply and divide numbers with up to four digits by a single digit number using the formal short division method and become more confident with division using larger numbers including the long division method. [C7] ▪ I can round decimals with two decimal places to the nearest whole number and to one decimal place ▪ I can solve problems involving number up to three decimal places ▪ I can add and subtract decimal numbers that have the same number of decimal places (e.g. 157.31 – 29.16) [F10] ▪ I can multiply a one digit decimal number by a single digit number (e.g. 0.6 × 8) [F9] ▪ I can express one quantity as a fraction of another in simple cases ▪ I can compare and order fractions whose denominators are all multiples of the same number ▪ I can identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths ▪ I can recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example] ▪ I can add and subtract fractions with the same denominator and denominators that are multiples of the same number ▪ I can multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams ▪ I can read and write decimal numbers as fractions ▪ I can recognise and use fractional thousandths and relate them to tenths, hundredths and decimal equivalents ▪ I can 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 100, and as a decimal ▪ I can solve problems which require knowing fraction, percentage and decimal equivalents of halves, quarters, fifths and those fractions with a denominator of a multiple of 10 or 25

	▪ I can use common factors to simplify fractions; use common multiples to express fractions in the same denomination ▪ I can use the time to cover calculations (FEMA) and FDP
2	▪ I can identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places ▪ I can multiply one-digit numbers with up to two decimal places by whole numbers ▪ I can use written division methods in cases where the answer has up to two decimal places ▪ I can solve problems which require answers to be rounded to specified degrees of accuracy ▪ I can compare and order fractions, including fractions > 1 ▪ I can add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions ▪ I can multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ▪ I can divide proper fractions by whole numbers [for example, ▪ I can associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, ▪ I can recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. ▪ I can recognise the relationship between fractions, decimals and percentages and can express them as equivalent quantities (e.g. one piece of cake that has been cut into 5 equal slices can be expressed as a fifth or 0.2 or 20% of the whole cake). ▪ I can calculate using fractions, decimals or percentages both as numbers and operators ▪ I can use ratio notation, including reduction to simplest form ▪ I can relate the language of ratios and the associated calculations to the arithmetic of fractions ▪ I can divide a given quantity into two parts in a given part:part ratio; express the division of a quantity into two parts as a ratio
3	▪ I can round numbers and measures to different degrees of accuracy, for example to the nearest whole number or to one decimal place ▪ I can use the four operations, including formal written methods, applied to integers and decimals, all both positive and negative ▪ I have an understanding of numbers in contextual calculations ▪ I can round numbers and measures to an appropriate degree of accuracy, for example to the nearest whole number or to one decimal place ▪ I can use approximation, through rounding to the nearest whole number or to one decimal place, to estimate answers ▪ I can define percentage as 'number of parts per hundred', and know their decimal and fraction equivalents ▪ I can multiply proper and improper fractions, and mixed numbers ▪ I can work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8) ▪ I understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction ▪ I can solve problems involving direct proportion ▪ I can use compound units such as unit pricing to solve problems
4	▪ I can state the multiplicative relationship between the numbers represented by any two digits in any number ▪ I can use prime factorisation ▪ I can use integer powers ▪ I can round numbers and measures to an appropriate degree of accuracy, for example to the nearest whole number or to one or two decimal places ▪ I can use approximation, through rounding to the nearest whole number or to one significant figure, to estimate answers ▪ I can relate percentages to decimals and fractions by showing their relative positions on a number line

	▪ I can multiply and divide a whole number by a fraction, whether positive and negative ▪ I can interpret fractions and percentages as operators ▪ I can work interchangeably with terminating decimals their corresponding fractions and percentages (such as 3.5, 7/2, and 350% or 0.375, 3/8, and 37.5%) ▪ I can 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% ▪ I can solve ratio problems where the part relationship is known rather than the total ▪ I can solve problems involving direct proportion, including graphical and algebraic representations
5	▪ I can state in the form $A \times 10^n$ (n any positive or negative integer) the multiplicative relationship between the numbers represented by any two digits in any number ▪ I can round numbers and measures to different degrees of accuracy, for example, to a number of decimal places or significant figures ▪ I can use the four operations applied to real numbers, whether positive or negative ▪ I can use prime factorisation, including using product notation and the unique factorisation property ▪ I can use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 ▪ I can distinguish between exact representations of roots and their decimal approximations ▪ I can interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or zero ▪ I can round numbers and measures to an appropriate degree of accuracy, for example, to a number of decimal places or significant figures ▪ I can calculate possible resulting errors expressed using inequality notation $a < x \leq b$ ▪ I can relate percentages to decimals and fractions, moving efficiently between the different forms in any context ▪ I can use A = 1/n of B implies B = nA, and A = n% of B implies B = (100A)/n ▪ I can work interchangeably with terminating decimals their corresponding fractions and percentages, and know the fraction and percentage equivalents of some common recurring decimals (such as 3.5, 7/2, and 350% or 0.375, 3/8, and 37.5%, or 0.33333...., ⅓ and 33⅓%) ▪ I can understand why an "n% increase" is not the inverse operation of an "n% decrease" ▪ I can solve problems involving inverse proportion, including graphical and algebraic representations ▪ I can use compound units such as speed and density to solve problems

Maths Steps – Algebra

Step	Competency
At all steps	▪ I understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
1	▪ I can make and use word formulas by modelling real world situations or procedures ▪ I can substitute positive whole numbers into word formulas to find the value of the subject. ▪ I can use and interpret algebraic notation including: *ab* in place of *a* x *b,* 3*y* in place of 3 x *y* ▪ I can substitute numerical values into simple algebraic formulas that model real world situations or procedures ▪ I can simplify expressions by collecting like terms ▪ I can continue simple sequences and can explain how to find the next term ▪ I can find missing numbers in a number sequence ▪ I can generate terms of a sequence from a term-to-term rule including practical examples such as matchstick patterns ▪ I can begin to investigate linear sequences when the n^{th} term is given

2	▪ I can use interpret algebraic notation, including: ab, $3y$ in place of $y + y + y$, a^2 in place of a x a, a^3 in place of a x a x a, a^2b in place of a x a x b, x/y instead of x ÷ y, coefficients written as fractions rather than decimals ▪ I can set up and solve one-step equations with integer coefficients. ▪ I can use simple function machines to deal with inputs and outputs, recognising basic inverse functions. ▪ I can model situations or procedures by translating them into simple algebraic formulas. ▪ I can understand and solve problems involving exchange rate ▪ I can understand and solve problems involving unit costs ▪ I can generate terms of a sequence from a term-to-term or a position to term rule ▪ I can begin to generalise their results in words
3	▪ I can create and solve two-step equations that model real world situations or procedures ▪ I can simplify and manipulate expressions to maintain equivalence by multiplying a single term over a bracket and taking out common factors ▪ I can rearrange simple formulae to change the subject ▪ I can use the rules of indices for positive whole number powers ▪ I can model and interpret real life situations or procedures graphically ▪ I can plot graphs of linear functions ▪ I can find the position to term formula for given linear sequences and for linear sequences that arise from modelling real world situations ▪ I can investigate and recognise special sequences such as triangular numbers, square numbers and Fibonacci numbers
4	▪ I can create and solve equations using brackets and where the unknown appears on both sides of the equation ▪ I can simplify and manipulate algebraic expressions to maintain equivalence by expanding products of two or more binomials ▪ I can use the rules of indices for positive and negative whole number powers ▪ I can form and solve simple linear inequalities in one variable and represent the solution set on a number line ▪ I can calculate and interpret gradients and intercepts of graphs of linear equations in the standard form $y = mx + c$ numerically, graphically and algebraically ▪ I can recognise and generate lines that are parallel to a given line and pass through a given point ▪ I can plot quadratic and cubic graphs and use then to estimate values of y for given values of x and vice versa ▪ I can solve quadratic equations graphically ▪ I can recognise and can sketch simple quadratic and cubic graphs ▪ I can generate terms a quadratic sequence from a position to a term rule
5	▪ I can use more complex formula; they substitute positive and negative numbers into formulas that involve powers and roots ▪ I can rearrange complex formulae to change the subject, including cases where the new subject appears twice or includes powers and roots ▪ I can use trial and improvement methods to solve equations that do not have an analytical solution that is accessible to pupils ▪ I can use the rules of indices for positive and negative whole number and fractional powers ▪ I can find the exact solution of two simultaneous equations in two unknowns by eliminating a variable, and interpret the equations as lines and their common solution as the point of intersection ▪ I can find the exact solution of two simultaneous equations in two unknowns by substitution ▪ I can find the rule for simple quadratic sequences (i.e. coefficient of n^2 is one) ▪ I can recognise geometric sequences and find the term to term rule
5+	▪ recognise geometric sequences and find the position to term rule ▪ Factorise simple quadratic expressions where the coefficient of $x^2 = 1$

Maths Steps – Geometry and Measures

Step	Competency
At all steps	▪ I can use the standard conventions for labelling the sides and angles of triangle ABC ▪ I can draw and measure line segments and angles in geometric figures, including interpreting scale drawings ▪ I can describe, sketch and draw: points, lines, parallel lines, perpendicular lines, right angles. use conventional terms and notations, such as using 'dashes' to indicate equal lengths and (multiple) arrows to indicate parallel lines ▪ I can derive and illustrate properties of circles
1	▪ I can compare and classify 3–D and 2–D shapes based on their properties (e.g. for 2–D shapes: parallel sides, length of sides, type and size of angles [G4], reflective symmetry [G2], regular / irregular polygons [G2]; for 3–D shapes: faces, vertices and edges) [G2] ▪ I can recognise and describe simple 3–D shapes, including using nets and other 2–D representations [G3] ▪ I can complete simple shapes using given lengths, such as 7.5cm, (accurate to +/-2 mm) and acute angles that are multiples of 5° (accurate to +/– 2°) [G3] know and use the facts that angles at a point sum to 360°, angles at a point on a straight line sum to 180° and angles in a triangle sum to 180° (e.g. calculate the base angles of an isosceles triangle where the other angle is 110°) and identify other multiples of 90° [G4] ▪ I can identify, describe; and represent the position of a shape following a reflection or translation [P2] ▪ I can describe positions on a 2–D co-ordinate grid using axes with equal scales in the first quadrant (in the context of number or geometry) and use co-ordinates to complete a given rectangle; become more confident in plotting points in all four quadrants [P3] ▪ I can read, write and convert time between analogue (including clock faces using Roman numerals) and digital 12 and 24– hour clocks, using a.m. and p.m. where necessary [M4] ▪ I can calculate the duration of an event using appropriate units of time (e.g. A film starts at 6:45p.m. and finishes at 8:05p.m. How long did it last?) [M4] ▪ I can convert between 'adjacent' metric units of measure for length, capacity and mass (e.g. 1.2 kg = 1200 g; how many 200 ml cups can be filled from a 2 litre bottle?; write 605 cm in metres) [M5] ▪ I can find the perimeter of compound shapes when all side lengths are known or can be easily determined (e.g. a simple shape made from two identical rectangles joined together to make an L-shape with given dimensions of the rectangle) [M7] ▪ I can 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 by counting squares [M7]
2	▪ I can compare and classify geometric shapes based on their properties and sizes [G2a] ▪ I can draw 2-D shapes using given dimensions and angles [G3a] ▪ I can describe and build simple 3-D shapes, including making nets [G3b] ▪ I can find unknown angles in any triangles, quadrilaterals, and regular polygons [G4a] ▪ I can derive and apply formulae to undertake calculations and solve problems involving perimeter and area of rectangles ▪ I can recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles [G4b] ▪ I can apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles ▪ I can illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius [G5] ▪ I can draw and translate simple shapes on the co-ordinate plane, and reflect them in the axes [P2] ▪ I can describe positions on the full co-ordinate grid (all four quadrants) [P3]

	▪ I can use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places [M5] ▪ I can convert between miles and kilometres [M6] ▪ I can recognise that shapes with the same areas can have different perimeters and vice versa [M7] ▪ I can recognise when it is possible to use formulae for area and volume of shapes [M7] ▪ I can calculate the area of parallelograms and triangles [M7] ▪ I can calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (for example, mm^3 and km^3) [M8] ▪ I can solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places [M9]
3	▪ I can classify quadrilaterals by their geometric properties, and provide convincing arguments to support classification decisions ▪ I can use the properties of faces, surfaces, edges and vertices of cubes and cuboids to solve problems in 3-D ▪ I can draw , sketch and describe regular polygons, and other polygons that are reflectively and rotationally symmetric; ▪ I can derive and illustrate properties [for example, equal lengths and angles] of triangles, quadrilaterals, and other plane figures using appropriate language and technologies ▪ I can construct similar shapes by enlargement, with and without coordinate grids ▪ I can apply translations, rotations and reflections to given figures, and identify examples of translations, rotations and reflections (for example, be able to pick out from a group of shapes those that are translations, rotations or reflections of a given shape) ▪ I can draw and measure line segments and angles in geometric figures; calculate lengths represented by line segments in scale drawings given scale factors as ratios in the form 1 : n, and understand that the lengths are approximate ▪ I can derive and apply formulae to undertake calculations and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) ▪ I can derive and use the sum of angles in a triangle ▪ I can undertake calculations and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
4	▪ I can 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 ▪ I can use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms and cylinders to solve problems in 3-D ▪ I can construct similar shapes by enlargement, with coordinate grids using fractional and negative scale factors ▪ I can find the centre of enlargement and SF when given the object and image of a n enlargement ▪ I can understand implications of the accuracy of the measurements for the accuracy of the calculated lengths ▪ I can use Pythagoras' Theorem to solve problems involving right-angled triangles ▪ I can use conventional terms and notations, such as complementary to describe angles with a sum of 90˚ and supplementary to describe angles with a sum of 180˚ ▪ I can understand and use the relationship between parallel lines and alternate and corresponding angles. Use vertically opposite angles and other angle relationships to solve angle problems ▪ I can use the sum of angles in a triangle to deduce the angle sum in any polygon, and to derive properties of regular polygons ▪ I can derive and apply formulae to undertake calculations and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)

5	▪ I can use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D ▪ I know that translations, rotations and reflections map shapes onto congruent shapes; understand that the relation 'is congruent to' implies that there exists a translation, rotation or reflection that takes one shape to another ▪ I can identify properties of, and describe the results of, translations, rotations and reflections applied to given figures; know that any reasoning using these transformations could be replaced by reasoning using congruence criteria, and be familiar with some examples ▪ I can use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles ▪ I can identify and construct congruent triangles, with and without coordinate grids
5+	▪ I can use construction methods to: investigate what happens (for example to the angle bisectors, or perpendicular bisectors of sides, of triangles) in changing situations; explore derived shapes, such as circumcircles and inscribed circles of triangles, and other polygons (where possible) ▪ I know and use the criteria for congruence of triangles ▪ I can 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

Maths Steps – Probability and Statistics

Step	Competency
At all steps	**Probablity** ▪ I can emphasise the difference between being absolutely sure and probably sure about something happening ▪ I can make sure everyone understands that probability is the study of the chances of something happening ▪ I understand and test the idea of fairness ▪ I can emphasise that we study probability so that we can make predictions over the long term rather than the predictions about individual events. Link this to the law of large numbers. ▪ I can use experimental probabilities ▪ I can emphasise 'gut reaction', experimental probability and theoretical probability **Statistics**
1	**Probability** ▪ I can explain what is meant by a probability scale and position key words on that scale ▪ I can list all possible outcomes for two events such as choosing from a menu ▪ I can investigate simple games **Statistics** ▪ I can complete, read and interpret information presented in tables, pictograms and bar charts (e.g. find the difference between two bars showing temperatures, where one is 20°C and the other is 13°C, on a scale labelled in multiples of 5) [S1] ▪ I can interpret line graphs (e.g. begin to find the difference between two temperatures on a line graph, where one is 20°C and the other is 13°C, on a scale labelled in multiples of 5) and simple pie charts (e.g. a pie chart cut into eight pieces for favourite fruit using whole numbers for each section) [S1] ▪ I can plot and interpret scatter diagrams - describe mathematical relations between the two variables in simple words. ▪ I can calculate the mean as an average for simple sets of discrete data (e.g. find the mean mass of three parcels weighing 5 kg, 3 kg and 10 kg) [S3] ▪ I can summarise data using the mean, mode as "representative or typical" values and the range as a measure of spread

2	**Probability** ▪ I can mark events and/or probabilities on a probability scale of 0 to 1 ▪ I can find and justify probabilities by considering equally likely outcomes for single events ▪ I can list all possible outcomes for three events such as from a menu ▪ I can investigate more complicated game **Statistics** ▪ I can interpret and construct pie charts and line graphs and use them to solve problems [S1] ▪ I can describe, interpret and compare two simple datasets of a single variable through: appropriate graphical representations ▪ I can plot and interpret scatter diagrams - describe mathematical relations between the two variables in less obvious cases ▪ I can calculate the mean and interpret the mean as an average [S3] ▪ I can calculate the range and interpret the range as a measure of spread ▪ I can describe, interpret and compare two simple datasets of a single variable through: by considering the mean or median or mode and range of the datasets
3	**Probability** ▪ I can use systematic listing strategies to list all possible outcomes for four events such as tossing four coins ▪ I can record outcomes of probability experiments in tables ▪ I can use a two circle Venn diagram to calculate related probabilities ▪ I can enumerate sets systematically making use of tables and grids ▪ I can investigate games **Statistics** ▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, ungrouped data in simple frequency tables ▪ I can construct and interpret frequency tables, bar charts, pie charts, and stem and leaf diagrams for simple categorical data, and vertical line (or bar) charts for small sets of ungrouped numerical data and numerical data grouped into a small number of groups ▪ I can recognise graphical misrepresentation through incorrect scales, labels etc. ▪ I can plot and interpret scatter diagrams recognize and use the language of correlation ▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate measures of central tendency (mean, mode, median) and spread (range) involving discrete, ungrouped data in simple frequency tables
4	**Probability** ▪ I can understand why, when there are only two possible outcomes, the probabilities of the two possible outcomes sum to 1 ▪ I can use a two circle Venn diagram to enumerate sets, and use this to calculate related probabilities ▪ I can use simple set notation to describe simple sets of numbers and objects ▪ I can generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities **Statistics** ▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete grouped data ▪ I can construct and interpret frequency tables, bar charts, pie charts, and pictograms for larger sets of categorical data, and vertical line (or bar) charts for larger sets of ungrouped and grouped numerical data ▪ I can identify an outlier in simple cases and appreciate there may be errors in data from values (outliers) that do not 'fit' ▪ I can plot and interpret scatter diagrams - draw a line of best fit by eye and use it to make predictions. Discuss implications of outliers ▪ I can interpolate and extrapolate from data and be aware of the limitations of these techniques ▪ I can define the population in a study and understand the difference between population and sample

	▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate measures of central tendency (mean, mode, median) and spread (range) ▪ I can infer the properties of populations or distributions from a sample ▪ I understand what is meant by simple random sampling and bias in sampling
5	**Probability** ▪ I can understand that the probabilities of all possible outcomes sum to 1 ▪ I can enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams ▪ I can use tree diagrams to calculate the probability of two independent events ▪ I can understand selection with or without replacement ▪ I can use Venn diagrams to calculate conditional probability ▪ I can draw a frequency tree based on given information and use this to find probability and expected outcome **Statistics** ▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete or continuous grouped data ▪ I can 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 ▪ I can plot and interpret scatter diagrams - interpret correlation within the context of the variables and appreciate the distinction between correlation and causation ▪ I can describe, interpret and compare observed distributions of a single variable through: appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers) ▪ I can draw and interpret cumulative frequency diagrams and boxplots