Rutlish School

CURRICULUM MAP

Subject	**Mathematics**
Head of Department	**Philip Pryce**

SCHOOL INTENT

Rutlish School Vision: Rutlish School is committed in providing **the highest quality education and opportunities** for students.
*Through all we do, we prepare students for opportunities, responsibilities and experiences later in life. We aim to inspire, enable and facilitate lifelong learners able to build on their individual strengths and capabilities, who achieve their ambitions. We seek to support our students becoming **healthy, happy, successful** modern people young adults; knowledgeable, kind, aware, confident, capable and skilful members of society. (Curriculum Intent)*
Rutlish School Mission Statement: "Modeste, Strenue, Sancte: Be modest, be thorough, pursue righteousness"
We want students to:
***succeed** (we strive to provide pathways to support their success)*
***embrace challenge**, build resilience, overcome setbacks and become increasingly independent in pursuit of their goals*
***be aware of their responsibilities** and feel confident to participate and contribute to society. (Curriculum Intent)*

Rutlish School: Curriculum Intent
Rutlish School provides a meaningful, broad and balanced curriculum, which is accessible to all, as well as supports and challenges all students.

The School aims to:

- ensure that the curriculum is designed for every student of every ability and every background to be supported in making the best possible progress and attainment from their starting point;
- ensure all students can successfully access the curriculum offer, making any reasonable adjustments required where particular needs are identified;
- ensure that the curriculum is accessible to all abilities and that planning and teaching aim to support, stretch and challenge all learners across a full range of abilities;
- provide a curriculum that is sequenced to build skills and knowledge throughout students' time at Rutlish School, to equip them for their next steps in education, and careers and in life;
- provide a curriculum that promotes a deeper and wider understanding of the world outside of the classroom;
- ensure our curriculum consistently promotes high moral standards, social and self-awareness and allow students to form informed opinions on social issues such as, equality, diversity and inclusivity as well as the practical aspects of society;
- provide opportunities for students to personalise and apply learning in other contexts, including personal and cross-curricular;
- provide students with the skills and knowledge necessary to becoming independent, analytical, critical, and innovative thinkers;
- provide opportunity to encourage students' curiosity, creativity, self-expression, resilience, and confidence;
- develop staff to deliver skills beyond their own subject specialism and incorporate cross curricular initiatives, in particular Literacy, Reading, Numeracy, ICT and Enterprise;
- ensure that our curriculum offer support for different educational and career pathways, including EBACC and vocational;

provide consistent opportunities for students to develop and enhance their reading skills, and support is provided to ensure all students are able to access the curriculum.

DEPARTMENT INTENT

The Mathematics Department Teaches the National Curriculum at Key Stages 3 and 4. At Key Stage 5 the Curriculum is based on the course for A Level Mathematics delivered by Edexcel. The core of the curriculum intent is based on Mathematics 5 to 16 supported by the aims and objectives of the National Curriculum.

Aims

1. Mathematics as an essential element of communication
2. Mathematics as a powerful tool
3. Appreciation of relationships within mathematics
4. Awareness of the fascination of mathematics
5. Imagination, initiative and flexibility of mind in mathematics
6. Working in a systematic way
7. Working independently
8. Working cooperatively
9. In-depth study in mathematics

10. Pupils' confidence in their mathematical abilities

Objectives

Facts

Pupils need to know and remember some basic mathematical facts at each level if progress is to be made with confidence, but the memory demands in mathematics can be much reduced through a sound conceptual understanding of the structure of the subject. Many pupils who are 'good at mathematics' have a relatively poor memory for factual details, but have a firm grasp of the principles. Never the less there are some things which need to be remembered.

1. Remembering terms
2. Remembering notation
3. Remembering conventions
4. Remembering results

SKILLS

"Skills include not only the use of the number facts and the standard computational procedures of arithmetic and algebra, but also of any well established procedures which it is possible to carry out by the use of routine. They need not only to be understood and embedded in the conceptual structure but also to be brought up to the level of immediate recall or fluency of performance by regular practice." (Mathematics counts, para. 240)

1. Performing basic operations
2. Sensible use of a calculator
3. Simple practical skills in mathematics
4. Ability to communicate mathematics
5. The use of ICT in mathematical activities

CONCEPTUAL STRUCTURES
"Conceptual structures are richly interconnecting bodies of knowledge, including the routines required for the exercise of skills. It is these which make up the substance of mathematical knowledge stored in the longterm memory. They underpin the performance of skills and their presence is shown by the ability to remedy a memory failure or to adapt a procedure to a new situation." (Mathematics counts, para. 240).

1. Understanding basic concepts
2. The relationships between concepts
3. Selecting appropriate data
4. Using mathematics in context
5. Interpreting results

GENERAL STRATEGIES

"General Strategies are procedures which guide the choice of which skills to use or what knowledge to draw upon at each stage in the course of solving a problem or carrying out an investigation. They enable a problem to be approached with confidence and with the expectation that a solution will be possible." (Mathematics counts, p

1. Ability to estimate
2. Ability to approximate
3. Trial and error methods
4. Simplifying difficult tasks
5. Looking for pattern
6. Reasoning
7. Making and testing hypotheses
8. Proving and disproving

PERSONAL QUALITIES

Each of the objectives already considered makes a contribution, whether direct or indirect, to the development of desirable personal qualities, especially if the content of the mathematics curriculum and the classroom approaches used are appropriate (Chapters 3 and 4). Nevertheless, the checklist of objectives would be incomplete without the following objectives which refer specifically to these personal qualities. It must not be assumed that these objectives relate only to older, more able pupils as they are, in fact, achievable by pupils of all ages and abilities within appropriate contexts. They ought to be given high priority.

1. Good work habits
2. A positive attitude to mathematics

KEY STAGE 3 RATIONALE/ INTENT

To build a base for future work based on initial ability and attainment. This includes developing core competencies and stimulating creative mathematical thinking. To build on what has been done at primary school and to further develop mathematical problem solving. To prepare for the start of GCSE including developing the ability to work independently.

KEY STAGE 4 RATIONALE/ INTENT

Further develop students to reach their potential in the subject. Ensure a broad access to the curriculum including experiences of mathematics in the wider world. Building on KS3 to allow students to progress in the subject post KS4. To be able to put maths together and work from first principles to develop mathematics that is unfamiliar to them. To qualify with the best possible outcome in their GCSE.

KEY STAGE 5 RATIONALE/ INTENT

To build and extend on GCSE experiences. To develop critical thinking in mathematics and progress to their next steps. To develop enthusiasm for mathematics and to develop great confidence and fluency in the subject.

Rutlish School

	Key Stage 3	Key Stage 4	Key Stage 5	
Develop Fluency	♣ 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.	♣ 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 ♣ 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.	Mathematical argument, language and proof	Construct and present mathematical arguments through appropriate use of diagrams; sketching graphs; logical deduction; precise statements involving correct use of symbols and connecting language, including: constant, coefficient, expression, equation, function, identity, index, term, variable. Understand and use mathematical language and syntax Understand and use language and symbols associated with set theory, as set out in the content. Apply to solutions of inequalities and probability. as set out in the content. Understand and use the definition of a function; domain and range of functions. Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics.

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 counterexamples ♣ 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 ♣ explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally.	♣ 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 Mathematics ♣ 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.	Mathematical problem solving	Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved Construct extended arguments to solve problems presented in an unstructured form, including problems in context. Interpret and communicate solutions in the context of the original problem. Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy. Evaluate, including by making reasoned estimates, the accuracy or limitations of solutions, including those obtained using numerical methods. Understand the concept of a mathematical problem-solving cycle, including specifying the problem, collecting information, processing and representing information and interpreting results, which may identify the need to repeat the cycle. Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics.

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.	♣ 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.	Mathematical modelling	Translate a situation in context into a mathematical model, making simplifying assumptions. Use a mathematical model with suitable inputs to engage with and explore situations (for a given model or a model constructed or selected by the student). interpret the outputs of a mathematical model in the context of the original situation (for a given model or a model constructed or selected by the student). Understand that a mathematical model can be refined by considering its outputs and simplifying assumptions; evaluate whether the model is appropriate. Understand and use modelling assumptions.

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, including using product notation and the unique factorisation property ♣ use the four 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 x 10n 1≤A where n is a positive or negative integer or zero ♣ work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 2 /7 or 0.375 and 8 3) ♣ define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% ♣ interpret fractions and percentages as operators Mathematics ♣ use standard units of mass, length, time, money and other measures, including with decimal quantities	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}	Content overview	● Proof ● Algebra and functions ● Coordinate geometry in the (x, y) plane ● Sequences and series ● Trigonometry ● Exponentials and logarithms ● Differentiation ● Integration ● Numerical methods ● Vectors Statistics ● Statistical sampling ● Data presentation and interpretation ● Probability ● Statistical distributions ● Statistical hypothesis testing Mechanics ● Quantities and units in mechanics ● Kinematics ● Forces and Newton's laws ● Moments Further Mathematics • Pure Mathematics • Proof • Complex Numbers • Matrices • Algebra and Functions • Calculus • Vectors • Polar Coordinates • Hyperbolic Functions • Differential Equations • Trigonometry • Coordinate Systems • Numerical Methods

	♣ 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			• Inequalities Statistics • Discrete probability distributions • Poisson and Binomial distributions • Geometric and negative binomial distributions • Hypothesis Testing • Central limit Theorem • Chi Squared Tests • Probability generating functions • Quality of tests • Linear regression • Continuous probability distributions • Correlation • Combinations of random variables • Estimation, confidence intervals and tests using normal distribution • Other Hypothesis Tests and Confidence Intervals • Confidence Intervals and Tests using the t – Distribution Mechanics • Momentum and impulse • Work, Energy and Power • Elastic Strings and Springs and Elastic Energy • Elastic Collisions in One Dimension • Elastic Collisions in Two dimensions • Motion in a Circle • Centres of Mass of Plane Figures • Further Centres of Mass • Further Dynamics • Further Kinematics

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, a3 in place of a × a × a; a2 b in place of a × a × b ♣ b/a 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 two 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 one variable (including all forms that require rearrangement) ♣ work with coordinates in all four quadrants ♣ recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane ♣ interpret mathematical relationships both algebraically and graphically Mathematics – key stage 3 7 ♣ reduce a given linear equation in two variables to the standard form y = mx + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically	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 2 x bx c + + 2 ax bx c + + , including the difference of two squares; {factorising quadratic expressions of the form } ♣ 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 two functions as a 'composite function'} Mathematics ♣ use the form y mx c = + to identify parallel {and perpendicular} lines; find the equation of the line through two given points, or through one 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} ♣ recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function 1 y = x y x = cos with x ≠ 0, {the exponential function x y k = y x = sin for positive values of k, and the trigonometric functions (with arguments in degrees), and y x = tan 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		

	♣ 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.	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 two simultaneous equations in two 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 two simultaneous equations), solve the equation(s) and interpret the solution ♣ solve linear inequalities in one {or two} variable{s}, {and quadratic inequalities in one 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 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 one 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 two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio ♣ understand that a multiplicative relationship between two 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	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 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	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	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}		

	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 ♣ 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.	♣ 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 ♣ apply the concepts of congruence and similarity, including the relationships between lengths, {areas and volumes} in similar figures Mathematics – key stage 4 ♣ apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures ♣ know the exact values of sin cos θ θ and 0 0 0 θ = 0, 30 , 45 60 0 and sin sin sin abc ABC = = for 0 0 0 0 θ = 0 , 30 , 45 , 60 90 0 and ; know the exact value of tanθ a2 = b2 2 + − c 2bc cos A 1 Area = sin 2 ab C for ♣ {know and apply the sine rule and cosine rule to find unknown lengths and angles} ♣ {know and apply 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	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 ♣ 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.	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 one ♣ 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	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 two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs.	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, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use} Mathematics ♣ 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.		