Year 12

Term	1	2	3	4	5	6
Topic Title	Algebra (Chp 1) Quadratics & Cubics (Chp 2) Trigonometry (Chp 6)	Inequalities & Simultaneous Equations (Chp 3) Coordinate Geometry (Chp 4) Exponentials & Logarithms (Chp 7)	Binomial Expansion (Chp 5) Vectors (Chp 10) Sampling, Data Presentation and Interpretation (Chp 11)	Vectors (Chp 10) Sampling etc (Chp 11) Differentiation (Chp 8)	Differentiation (Chp 8) Intergration (Chp 9) Probability (Chp 12)	Statistical Distribution (Chp 13) Hypothesis Testing (Chp 14) Kinematics (Chp 15) Forces, Newton's Laws (Chp 16)
Rationale	Algebraic rigour is the foundation of mathematics at A-Level. KS4 algebraic knowledge needs to be solid in order to move forward. KS4 work on quadratics leads to more in-depth knowledge at A-Level and allows progression to cubics. Trigonometry, as seen at KS4, is developed and gives students a real sample of A-Level content early in the course. The topic enables students to appreciate the depth and complexity of the topics that will be covered.	The graph skills covered in term 1 naturally progress to inequality skills. Coordinate geometry extends their previous knowledge and uses the algebraic and quadratic skills from term 1 Exponentials and logarithms are a new concept, developing a broader knowledge base.	Binomial Expansions extend their previous knowledge of powers and polynomials and uses and develops their algebraic and quadratic skills from term 1. Vectors are studied to a much deeper level than met previously in GCSE and use coordinate geometry from term 2 to support the new concepts covered. Students are introduced to statistical sampling topics along with a more detailed look at location and dispersion topics.	Further vector studies allow students to build confidence in attempting solutions to exam-style problems independently. Correlation and regression are taken forward from KS4 and looked at more rigourously. Calculus topics, covering differentiation first, requires strong algebraic understanding from the previous terms.	Term 4 knowlegde on differentiation now needs extending and provides students with the skills required to progress to intergration. KS4 statistical skills and those covered in terms 3 and 4 are now ready to be devoloped further.	Statistical skills are now to a standard where they can be used to tackle problems in everyday life; analysing situations and applying the appropriate distributions and hypothesis tests. Students are now ready to use their mathematical skills to solve real-world mechanical problems involving Newton's laws.
Prior knowledge	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics	AS and A level mathematics specifications must build on the skills, knowledge and understanding set out in the whole GCSE subject content for mathematics
Key knowledge/skills development	**1)** Proof by deduction, proof by exhaustion, disproof by counter example Expanding brackets of polynomials Laws of indices, manipulate surds, including rationising the denominator. **2)**Quadratic functions and graphs, the discriminant Completing the square Algebraic long division Factor/remainder theorem. **6)**Understand and use the definitions of sine, cosine and tangent. Sine and cosine rules, area of a non-right-angled triangle. Sine, cosine and tangent graphs, periodicity and symmetries. Understand and use. Understand and use. Solve simple trigonometric equations.	**3)** Linear simultaneous equations Nonlinear simultaneous equations Solving linear inequalities Solving quadratic inequalities Represent inequalities graphically. **4)** Equation of a straight line . Equation of a straight line ax + by + c = 0. Gradient conditions for two straight lines to be parallel or perpendicular. Equation of a circle. Completing the square to find the centre and radius of a circle. Circle properties. Understand and use graphs of functions, including quadratic, cubic and reciprocal Use intersection points of graphs to solve equations Describe and sketch transformations of graphs. **7)** Graphs of exponentials. Know the gradient of e^{kx} is equal to ke^{kx}. Know and use the definition of $\log_a x$ as the inverse of a^x. Know and use the function ln x and its graph. Know and use ln x as the inverse function of e^x.	**5)** Understand and use the binomial expansion of (a+bx)n for positive n. Understand and use notation such as n! **10)** Use vectors in two dimensions. Calculate the magnitude and direction of a vector. Convert between component and magnitude/direction form. Vector addition and multiplication by scalars. Understand and use position vectors. Use vectors to solve problems in pure mathematics and in context. **11)** Understand and use the terms 'population' and 'sample'. Understand, use and critique sampling techniques, including simple random sampling and opportunity sampling. Interpret diagrams for single-variable data, including histograms. Interpret scatter diagrams and regression lines for bivariate data. Understand that correlation does not imply causation. Interpret measures of central tendancy and variation, including standard deviation. Recognise and interpret possible outliers in data sets and statistical diagrams.	**10)** Use vectors in two dimensions. Calculate the magnitude and direction of a vector. Convert between component and magnitude/direction form. Vector addition and multiplication by scalars. Understand and use position vectors. Use vectors to solve problems in pure mathematics and in context. **8)** Understand and use the derivative of f(x) as the gradient of the tangent to the graph of y=f(x) at a point (x, y). Differentiate from first principles. Second derivatives. Apply differentiation to find gradients, tangents and normals. Apply differentiation to find maxima and minima and stationary points	**8)** Understand and use the derivative of f(x) as the gradient of the tangent to the graph of y=f(x) at a point (x, y). Differentiate from first principles. Second derivatives. Apply differentiation to find gradients, tangents and normals. Apply differentiation to find maxima and minima and stationary points. **9)** Know and use the 'Fundamental Theorem of Calculus'. Apply integration. Evaluate definite integrals. Use a definite integral to find the area between a curve and the x axis. **12)** Understand and use mutually exclusive and independent events when calculating probabilities.	**13)** Calculate probabilities using the binomial distribution. **14)** Understand and apply the language of statistical hypothesis testing. Conduct a statistical hypothesis test and interpret the results in context. **15)** Fundamental units in SI system: length, time, mass. Derived units: velocity, acceleration, force, weight. **16)** Newton's first law, concept of a force. Newton's second law, F=ma. Use weight and motion in a straight line under gravity. Newton's third law, equilibrium of forces on a particle and motion in a straight line.
National Curriculum/ specification links	OT1.1 Construct and present mathematical arguments through appropriate use of diagrams; sketching graphs; logical deduction; precise statements involving correct use of symbols and connecting language OT2.2 Construct extended arguments to solve problems presented in an unstructured form, including problems in context.	OT1.3 Understand and use language and symbols associated with set theory, as set out in the content Apply to solutions of inequalities and probability. OT1.5 Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics	OT2.3 Interpret and communicate solutions in the context of the original problem. OT2.4 Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy.	OT2.6 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. OT3.3 Interpret the outputs of a mathematical model in the context of the original situation	OT1.3 Understand and use language and symbols associated with set theory, as set out in the content Apply to solutions of inequalities and probability. OT3.1 Translate a situation in context into a mathematical model, making simplifying assumptions.	OT2.1 Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved. OT2.6 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. OT2.7 Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics.
Literacy	Trigonometrical Functions group activity. Twelve problems requiring students to explore the properties of the functions of sine, cosine and tangent. Students explain which is the odd one out, state which functions can be represented by which graph, devise questions which give a certain set of solutions and state whether statements are true sometimes, always or never. The problems are constructed in a way which creates the opportunity for rich discussion in the classroom. Activity - https://nrich.maths.org/6384 Dodgy proof - linking proof to logic and problem solving scenerios	Create a table defining each ot the eight key circle theorems with definitions for all key vocabulary	Task - written report to define what is meant by a vector and differentiate between a vector and scalar quantity	Tabulate advantages and disadvantages for the different types of sampling.	Create a bank of definitions for the vocabulary specific to probability. Eg. Conditional, given, notation, dependent, combined etc.	Task- Investigate and produce detailed notes on Newtons three laws of motion, define key words and illustrate with examples
Numeracy	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.
STEM	Trigonometrical Functions group activity. Twelve problems requiring students to explore the properties of the functions of sine, cosine and tangent. Students explain which is the odd one out, state which functions can be represented by which graph, devise questions which give a certain set of solutions and state whether statements are true sometimes, always or never. The problems are constructed in a way which creates the opportunity for rich discussion in the classroom Activity - https://nrich.maths.org/6384 Dodgy proof - linking proof to logic and problem solving scenerios		Vector Introduction - activity Explore vectors, beginning with the definition of a vector followed by the algebra of vectors and the scalar product. The opening slides of the presentation explain the difference between scalar and vector quantities followed by a simple activity. The first presentation explains the properties of vectors including line vectors, free vectors, the modulus of a vector, equal vectors, negative vectors, multiplying a vector by a scalar quantity, unit vectors and the angle between two vectors. The second presentation explains Cartesian vectors, introducing i, j and k unit vectors followed by an interactive page looking at different vector notation in two dimensions. The algebra of vectors covers the addition of vectors, multiplication by a scalar and the magnitude of a vector. The scalar product presentation shows how the scalar product can be used to calculate the angle between two vectors, followed by an interactive page where students can explore for themselves.		Casio demonstration activity - develop use of calculator skills to solve engineering problems. **Investigating Stationary Points and Finding the Value of the First Derivative at a Particular Point on the Curve** https://www.stem.org.uk/rx342q Linking and modelling solutions from graphing functions.	Exploring Equations of Motion 02 (Department for Education Standards Unit) Use the equations of motion for constant acceleration and allow them to develop their ability to generalise from specific situations of motion.
Cross curricular links	Surds are used in Physics and mathematical related subjects. Indices link to all sciences to enable scientific, standard notation, SI units and ability to write small and large numbers.	Study of transformation of functions, transformation of graphs link to electronics and waves etc, physics for wavelength Crystal formation in chemistry	Vectors are also studied within the physics curriculum Used in sport for angle and direction calculations Computer programming uses vectors for gaming theory. In engineering, forces are represented in vector notation for design and safety of rollercoasters, equipment etc.	Calculus links to physics, engineering, economics,statistics and medicine, eg. creating mathematical models in order to arrive at an optimal solution. In physics for heat, light, motion, electricity, harmonics, accoustics, astronomy and dynamics. In chemistry for reaction rates and radioactive decay etc. In Biology for birth and death rates. In economics to predict maximum profits using marginal cost and marginal revenue.	Probability links to studies in psycology in the investigation of human behaviour. In economics to assess risk and in biology to evaluate tests on various medications and assess risks etc.	Link to all sciences to enable the correct use of SI units and the ability to write small and large numbers. In engineering, forces need solving for design and safety of rollercoasters, equipment etc. Statistics and probablity are widely used in everyday life, studying distributions supports many other subjects where data is collected and analysed for any investigation, experiment or research task.
Key vocabulary	Constant, coefficient, expression, equation, function, identity, index, term, variable, rationalising the denominator.	Linear, quadratic, polynomial, set notation, simultaneous, equating coefficients.	Population sample. Simple random sampling, opportunity sampling, single-variable data, histograms, scatter diagrams, regression lines, bivariate data, correlation, central tendancy, variation, standard deviation, outliers.	Derivative, inflection, constant, intersection, coefficients, normals, tangents, second derivatives, maximum and minimum points.	Intergration, definite integrals, mutually exclusive, independant, functions, perpendicular, exponential.	Forces, equilibrium,tension, thrust, inextensible, magnitude, acceleration, resultant, friction, normal reaction.

Year 13

Term	1	2	3	4	5	6
Topic Title	Proof, Algebra & Functions (Chp 17) Differentiation (Chp 22)	Trigonometry (Chp 18) Integration (Chp 23) Numerical Methods (Chp 24)	Parametric Equations (Chp 19) Sequences & Series (Chp 20) Correlation & Regression (Chp 26) Probability (Chp 27)	Binomial Expansion (Chp 21) Kinematics (Chp 29) Dynamics (Chp 30) Normal Distribution (Chp 28)	Vectors (Chp 25) Moments (Chp 31)	Exam Period
Rationale	Completing the final type of proof completes the Y12 topic and enables the full topic to be assessed. Differentiating trigonometric functions needs to be studied before the final section of trigonometry can be studied.	Developing further concepts within calculus and introducing numerical methods are now necessary to use within solving complex problems.	Parametric equations build upon all the algebraic skills learnt so far and links together the different aspects to allow more complex functions to be solved. Correlation and regression needs studying before distributions are studied next term.	This term is used to bring all the statistics work together and then moving on to the mechanics section which requires the calculus learnt earlier in the year.	The remainder of the mechanics topics are studied bringing all the previous skills together and used to solve more complex problems.	Pupils consolidate all their previous knowledge in final targeted revision and past paper practice. Independent learning is encouraged through the regular use of feedback via personalised learning checklists.
Prior knowledge	A level mathematics specifications must build on the skills, knowledge and understanding of the AS mathematics specification and in the whole GCSE subject content for mathematics.	A level mathematics specifications must build on the skills, knowledge and understanding of the AS mathematics specification and in the whole GCSE subject content for mathematics.	A level mathematics specifications must build on the skills, knowledge and understanding of the AS mathematics specification and in the whole GCSE subject content for mathematics.	A level mathematics specifications must build on the skills, knowledge and understanding of the AS mathematics specification and in the whole GCSE subject content for mathematics.	A level mathematics specifications must build on the skills, knowledge and understanding of the AS mathematics specification and in the whole GCSE subject content for mathematics.	All Curriculum
Key knowledge/skills development	**17)** Proof by contradiction. Expanding brackets and collecting like terms, factorisation and simple algebraic division; use of the factor theorem. Composite functions. Inverse functions. Decompose rational functions into partial fractions. Use of functions in modelling, including consideration of limitations and refinements of the models. **22)** Be able to differentiate sin kx, cos kx, tan kx and related sums, differences and constant multiples. Be able to differentiate e^(kx), a^(kx) and ln kx, and related sums, differences and constant multiples. Classify points of inflection. The Product Rule. The Quotient Rule. The Chain Rule. Implicit differentiation. Differentiating parametric functions. Be able to construct simple differential equations in pure mathematics and in context.	**18)** Know standard exact values of sin, cos and tan. Draw graphs of sin, cos and tan. Arc length and area of a sector. Small angle approximations for sin, cos and tan. Relationship with sin, cos and tan, their graphs, ranges and domain. Understand and be able to use sec^2(θ) = 1 + tan^2(θ) and cosec^2(θ) = 1 + cot^2(θ). Understand and be able to use double angle formulae. Be able to write a cos θ + b sinθ in the forms r cos (θ ±α) or r sin (θ ±α). Construct proofs involving trigonometric functions and identities. **23)** Be able to integrate sin kx, cos kx, e^x , 1/x and related sums, differences and constant multiples.. Be able to use a definite integral to find the area between two curves.. Understand and be able to use integration as the limit of a sum.. Be able to carry out simple cases of integration by substitution.. Be able to carry out simple cases of integration by parts. Be able to integrate functions using partial fractions that have linear terms in the denominator. Using integration to solve simple first order differential equations with separable variables, including finding particular solutions. **24)** Be able to locate roots of f(x)=0 by considering changes of sign of f(x) in an interval of x on which f(x) is sufficiently well-behaved. Be able to solve equations approximately using simple iterative methods. Be able to solve equations using the Newton-Raphson method and other recurrence relations of the form x(n+1) = g(xn). Use of the trapezium rule, and estimating the	**19)** Parametric equations of curves and be able to convert between cartesian and parametric forms. Parametric equations in modelling. **20)** Increasing sequences, decreasing sequences, periodic sequences. Iterative sequences. Understand the sigma notation. Understand and work with arithmetic sequences. Work with geometric sequences. Finding the nth term, the sum to n terms and the sum to infinity. Use of sequences and series in modelling. **26)** Understand Pearson's product-moment correlation coefficient as a measure of how close data points lie to a straight line. Use and be able to interpret Pearson's product-moment correlation coefficient in hypothesis tests, using either a given critical value or a p-value and a table of critical values. **27)** Understand and be able to use conditional probability, including the use of tree diagrams, Venn diagrams and two-way tables. Understand the concept of conditional probability, and calculate it from first principles in given contexts. Be able to model with probability, including critiquing assumptions made and the likely effect of more realistic assumptions.	**21)** Extend the binomial expansion of (a+bx)^n to any rational n, including its use for approximation. **29)** Be able to extend the constant acceleration formulae to motion in two dimensions using vectors. Be able to extend the application of calculus to two dimensions using vectors. Be able to model the motion of a projectile as a particle moving with constant acceleration. **30)** Be able to extend use of Newton's third law to situations where forces need to be resolved (restricted to two dimensions). Understand and use the F ≤ μ R model for friction. **28)** Understand and be able to use the normal distribution as a model. Be able to find probabilities using the normal distribution, using appropriate calculator functions. Understand 'Normal Distribution' links to histograms, mean and standard deviation.. Be able to select an appropriate probability distribution for a context. Be able to conduct a statistical hypothesis test for the mean of a normal distribution with known, given or assumed variance and interpret the results in context.	**25)** Be able to use vectors in 3 dimensions. Be able to use vectors to solve problems in kinematics. **31)** Be able to use moments in simple static problems. Solve problems in context, including problems involving vectors, kinematics and forces.	
National Curriculum/specification links	OT1.2 Understand and use mathematical language and syntax as set out in the content. OT1.3 Understand and use language and symbols associated with set theory, as set out in the content. Apply to solutions of inequalities and probability. OT1.5 Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics. OT2.2 Construct extended arguments to solve problems presented in an unstructured form, including problems in context. OT2.6 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.	OT2.1 Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved. OT2.3 Interpret and communicate solutions in the context of the original problem. OT2.4 Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy. OT2.5 Evaluate, including by making reasoned estimates, the accuracy or limitations of solutions, including those obtained using numerical methods. OT3.1 Translate a situation in context into a mathematical model, making simplifying assumptions. OT3.2 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)	OT1.3 Understand and use language and symbols associated with set theory, as set out in the content Apply to solutions of inequalities and probability. OT2.4 Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy. OT2.5 Evaluate, including by making reasoned estimates, the accuracy or limitations of solutions, including those obtained using numerical methods.	OT1.3 Understand and use language and symbols associated with set theory, as set out in the content Apply to solutions of inequalities and probability. OT2.1 Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved. OT2.7 Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics. OT3.4 Understand that a mathematical model can be refined by considering its outputs and simplifying assumptions; evaluate whether the model is appropriate.	OT2.1 Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved. OT2.3 Interpret and communicate solutions in the context of the original problem. OT2.7 Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics. OT3.3 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) OT3.5 Understand and use modelling assumptions.	
Literacy	Define the four types of proof and the criteria required for each. Activity- Use a mathematical argument and appropriate use of logiocal deduction. Students are asked to choose two triangular numbers and find when the difference is a prime number. Students should then be encouraged to attempt to prove their conjecture. The teacher notes suggest a pictorial proof and an algebraic proof. (Extension - investigate when the difference of two squares is prime and when the difference of two cubes is prime).	Create definitions for 'domain' and 'range'	Activity - APs and GPs: find a sequence contains two tasks designed to develop connections between the properties of the sequence and the notation describing it. In each task students have to match the information given about a sequence with the correct sequence. https://www.stem.org.uk/resources/elibrary/resource/32369/sequences-and-series	Create a table to show the meaning of all set notation, including definitions of mean, variance and standard deviation of a given distribution.	To investigate the 'principle/law of moments' and produce a definition	
Numeracy	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national cuuriculum guidance, and followed by all curriculum subjects.	
STEM	Activity - RISPS - Use a mathematical argument and appropriate use of logiocal deduction. Students are asked to choose two triangular numbers and find when the difference is a prime number. Students should then be encouraged to attempt to prove their conjecture. The teacher notes suggest a pictorial proof and an algebraic proof. (Extension - investigate when the difference of two squares is prime and when the difference of two cubes is prime).	STEM activity https://www.stem.org.uk/resources/elibrary/resource/31522/trigonometric-functions Trigonometric functions shows the practical importance of trigonometric functions within a real life situation - 'Cylindrical oil container' covers applications of sine, cosine and tangent linking to physcics and science applications.	Tasks - Sequences and Series (five advanced level activities designed to practise and strengthen understanding of the use of notation when dealing with sequences and series). **Introduction to sequences and series** -starter activities followed by a task designed for students to practise using mathematical notation. **Matching the sequence** match information to the given sequences. The task is extended by the fact that there will be some information remaining. **APs and GPs**: to develop connections between the properties of the sequence and the notation describing it. In each task students have to match the information given about a sequence with the correct sequence. **Which belongs to which?** to find and use a formula to describe the nth term of a sequence. Students are given the first few terms of a number sequences and are asked to which sequence a particular number belongs. **Sorting sequence**s is a task which really tests students understanding of the topic. Students are given three different, blank, Venn diagrams and have to lavel the sets of the diagrams using a list of different types of sequence.	STEM activity - Baby Boom https://www.stem.org.uk/resources/elibrary/resource/75891/baby-boom	Stem activity - Balancing a ruler - paired activity -investigate the law of moments using metre rules and weights Further guidance from 'Mechanics in Action' on stem.org	
Cross curricular links	Structuring a proof logically links to structuring an argument in the study of politics or law. Functions link to biology for population growth, spreading of diseases etc. In economics, compound interest is a function of initial invesment, interest rates and time. Calculus links to physics, engineering, economics, statistics and medicine, mainly by creating mathematical models in order to arrive at an optimal solution.	Calculus links to physics, engineering, economics, statistics and medicine, mainly by creating mathematical models in order to arrive at an optimal solution. In physics - for heat, light, motion, electricity, harmonics, accoustics, astronomy and dynamics. In chemistry- for reaction rates and radioactive decay etc. In biology- for birth and death rates. In economics- for to predict maximum profits using marginal cost and marginal revenue.	Parametric equations link to engineering, physics and creating mathematical models to simulate a problem in real-life scenarioes. Probability links to studies in psycology in the investigation of human behaviour. In economics to assess risk and in biology to evaluate tests on various medications and assess risks etc.	Statistics and probablity are widely used in everyday life, studying distributions supports many other subjects where data is collected and analysed for any investigation, experiment or research task. In computing binomial theorem is linked to the distribution of IP addresses. In economics the binomial theorem is used to predict the behaviour of the economy over time.	Vectors are also studied within the physics curriculum Used in sport for angle and direction calculations Computer programming uses vectors for gaming theory. In engineering, forces are represented in vector notation for design and safety of rollercoasters, equipment etc.	
Key vocabulary	Modulus, inverse fuctions, range, domain, quotient, diivisor, contradiction, primes, rational, natural.	Partial fractions, cosec, sec, cot, arcsin, arccos, arctan,radians, sector, arc, identities, limits, recurrence, first order differential equations.	Cartesian, polar, parametric equations, parameter, recurrence, periodic sequences, infinite, arithmetic sequences, geometric sequence, series, sigma notation.	Binomial expansion, kinematics, dynamics, normal distribution, expansion, terms, factorial, histogram, standard deviation, statistical hypothesis.	Moments, vectors, unit vector, scalar, components, particle, perpendicular distance, pivot, non-uniform, lamina, coefficient of friction, limiting equilibrium.	