STJ Long-Term Plan: Maths

Department Curriculum Overview Document

Year 7	Cycle 1	Cycle 2	Cycle 3	TRANSFER skills/links to KS3 end points
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** **Awaiting details of Ark Maths**	***Focus of Cycle :***	***Focus of Cycle :***	**The ability to ...** **1. Fluency in the Fundamentals** Uses efficient written and mental methods for all four operations. Works confidently with fractions, decimals, percentages, and ratios. Applies number sense to check answers and estimate effectively. **2. Algebraic Thinking** Manipulates algebraic expressions, including expanding, factorising, and simplifying. Solves linear and quadratic equations and inequalities. Understands and uses sequences, including nth term rules. Interprets and sketches graphs of linear and quadratic functions. **3. Geometry and Measures** Applies angle rules in increasingly complex diagrams. Uses Pythagoras' Theorem and basic trigonometry in right-angled triangles. Works with transformations, congruence, and similarity. Calculates area, surface area, and volume of 2D and 3D shapes. **4. Statistics and Probability** Constructs and interprets a range of charts and graphs (e.g., pie charts, histograms). Calculates averages and range from raw and grouped data. Understands and calculates theoretical and experimental probability. **5. Mathematical Reasoning and Problem Solving** Tackles unfamiliar problems by applying known strategies. Justifies methods and explains reasoning clearly. Makes connections across topics (e.g., using algebra in geometry problems). Reflects on solutions and evaluates their efficiency. **6. Attitudes and Behaviours** Shows resilience and independence in tackling challenging problems. Engages in mathematical discussions and explains ideas clearly. Demonstrates curiosity and a willingness to explore beyond the curriculum.
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?				

Faith Learning Attitude Mutual Respect Enrichment

Year 8	Cycle 1	Cycle 2	Cycle 3
What do students need to know and understand by the end of each cycle to progress to the next stage? (Deep End points)	***Focus of Cycle*** Ratio: Divide a given quantity into two parts in a given ratio. Use scale factors, scale diagrams and maps Graphs: Reduce a given linear equation in two variables to the standard form y = mx + c Use scatter graphs to convert between bivariate data Probability: Generate theoretical sample spaces for single and combined events and use these to calculate theoretical probabilities Enumerate sets and unions/intersections of sets systematically using Venn diagrams	***Focus of Cycle*** Algebra: Solving equations with brackets and unknowns on both sides Solving inequalities and giving integer values Expanding single brackets (including indices) Sequences: Generate sequences from an algebraic rule Find the nth term of a linear sequence. Indices: Simplify expressions involving the laws of indices FDP: Calculating percentage change Standard form: Calculations with standard form & adjusting numbers to standard form Estimate answers to calculations using rounding	***Focus of Cycle :*** 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 Area: Solve problems involving perimeters and area of 2-D shapes (including circles and compound shapes) Derive formulae to solve problems involving the area of triangles, parallelograms and trapezia Be able to transform shapes with or without a coordinate grid Representing data: Compare frequency tables, charts and diagrams and draw conclusions Identify errors in frequency tables, charts and diagrams Averages: Calculate the mean for continuous data Calculate missing values in a data set when given some or all of the averages and the range
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points? (Surface end points)	Use ratio notation, including reduction to simplest form Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction Interpret scale drawings Use multiplication and division, including formal written methods, applied to proper fractions Work with coordinates in all four quadrants Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane Describe simple mathematical relationships between two variables (bivariate data) in observational contexts and illustrate using scatter graphs. Describe and interpret distributions of a single variable through appropriate graphical representation involving discrete, continuous and grouped data Construct and interpret appropriate tables, charts, and diagrams for ungrouped and grouped numerical data	Identifying expressions, equations, formulae and identities Expand one bracket (no indices) Writing expressions and formulae from words Representing single inequalities on a number line Solving one and two step equations Solving single inequalities (one and two step) Generate sequences from a worded rule Simplify expressions involving sums, products and powers Simplify expressions involving sums, products and powers Interchange between fractions, decimals and percentages Percentages and fractions of amounts One number as a fraction or percentage of another Basic percentage increase and decrease Multiply & divide by powers of 10 Writing numbers in standard form	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 Calculate perimeters and area of 2-D shapes (including circles and compound shapes) Apply formulae to calculate perimeter and area of triangles, parallelograms and trapezia Know and understand the properties of 2D shapes Describe, sketch and draw using conventional terms and notations including polygons that are reflectively and rotationally symmetric 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, interpret and compare observed distributions of a single variable through: appropriate graphical

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	Understand that the probabilities of all possible outcomes sum to 1	Rounding to powers of 10 and significant figures Convert metric units	representation involving discrete, continuous and grouped data Calculate the mean, mode, median and range for a set of discrete data	
	Faith ***Learning***	***Attitude*** ***Mutual Respect***	***Enrichment***	
Year 9	**Cycle 1**	**Cycle 2**	**Cycle 3**	
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** Number: Calculate highest common factor and lowest common multiple Identify error intervals Express number as product of primes Writing numbers in standard form Estimation Use of inverse operations Algebra: Substitution of integers and decimals, both positive and negative Rearranging formulae Expanding two or more binomials Solving equations with brackets and unknowns on both sides Solving double inequalities and represent on number line Factorise into single brackets	***Focus of Cycle :*** Representing data: Identify errors in frequency tables, charts and diagrams Use scatter graphs to convert between bivariate data (line of best fit) Fractions & percentages: Using the four operations with mixed numbers Finding the original amount (fractions and percentages) Solving problems with fractions greater than 1 Ratio & rates of change: Write ratio in the form 1:n Calculating percentage increase or decrease Calculating simple interest Calculating repeated percentage change Sequences: Finding the nth term of a linear sequence Graphs: Calculate and interpret y=mx+c	***Focus of Cycle :*** Area, perimeter & volume: Solve problems involving perimeters of 2D shapes and area of circles and composite shapes Explore surface area of prisms Derive formula for parallelograms and trapezia Derive formula to solve problems involving volume of cuboids and cylinders Pythagoras & Trigonometry: Show that a triangle is right angled Solve problems involving right angled triangles Angles: Derive and use the sum of angles in a triangle and use it to deduce the angle sum of any polygon and derive properties of regular polygons Transformations: Know and use the criteria for congruence of triangles	
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Consistent and accurate use of the 4 main operations with integers and decimals, both positive and negative Identify primes, factors and multiples Rounding to powers of 10 and significant figures Understand algebraic notation Collect like terms Write expressions and formulae Expanding single brackets	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. Interchange between fractions, decimals and percentages Calculate fractions and percentages of amounts Express one number as a fraction of another Calculating best buys Recognise common sequences, including squares, triangular numbers and Fibonacci Recognise types of sequences (arithmetic/geometric) Work with coordinates in all 4 quadrants Recognise and sketch quadratic, cubic, exponential and reciprocal graphs Understand and interpret gradient and y-intercept	Calculate perimeters and areas of 2D shapes (including circles and compound shapes) Apply formulae to calculate perimeter and area of triangles, parallelograms, trapezia and volume of cuboids an other prisms Calculate surface area of cuboids and cylinders Know and understand the properties of 2D and 3D shapes Understand and use Pythagoras' Theorem to find missing sides Use standard conventions for labelling the sides and angles of a triangle Explore ratios in right angled triangles Apply the properties of angles at a point, on a straight line and vertically opposite angles Understand and use the relationship between parallel lines and alternate and corresponding angles Be able to transform shapes with or without a coordinate grid	

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		Faith *Learning* *Attitude*	*Mutual Respect* *Enrichment*	
Year 10 Higher	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle:*** Calculate with roots and indices; including fractional and negatives. Surds including simplifying, arithmetic and rationalising the denominator. Use various methods to solve quadratic equations To be able to solve linear and non-linear simultaneous equations. Solve linear equations and inequalities Expand and factorise quadratics. To be able to calculate and use HCF and LCM to solve problems, including the use of Venn diagrams.	***Focus of Cycle:*** Calculate, form and use formula for both direct and inverse proportion Use and understand the probability scale, including theoretical and experimental. Use, create and interpret a range of probability diagrams, including Venn diagrams. Construct and interpret diagrams for both discrete and continuous data. Interpret, analyse and compare distributions using measures of spread and location. Understand and use similarity and congruence in 2D and 3D shapes. Apply and use Pythagoras' theorem and right-angled trigonometry in 2D and 3D.	***Focus of Cycle:*** Use and apply formula for non-right-angled triangles, such as sine rule and cosine rule. Simplify, manipulate and solve algebraic fractions. Rearrange and solve quadratic equations by factorising, completing the square or using the quadratic formula. Rearrange formulae to change the subject, including cases where the subject appears twice, or where a power or reciprocal of the subject appears. Interpret the reverse process as the 'inverse function'. Interpret the succession of two functions as a 'composite function'. Find approximate solutions to equations using systematic sign-change methods (for example, decimal search or interval bisection) when there is no simple analytical method of solving them.	***The ability to…** To achieve grade 9, candidates will be able to: • perform procedures accurately • interpret and communicate complex information accurately • make deductions and inferences and draw conclusions • construct substantial chains of reasoning, including convincing arguments and formal proofs • generate efficient strategies to solve complex mathematical and non-mathematical problems by translating them into a series of mathematical processes • make and use connections, which may not be immediately obvious, between different parts of mathematics • interpret results in the context of the given problem • critically evaluate methods, arguments, results and the assumptions made
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Know and apply basic index laws Simplify expressions with surds, including rationalising denominators. Understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation Solve linear simultaneous equations involving linear & quadratic Solve quadratic equations algebraically by factorising including completing the square and by using the quadratic formula Solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable Expanding products of two or more binomials Factorising quadratic expressions of the form ax^2+bx+c Identify prime numbers. Use power notation in expressing a whole number as a product of its prime factors. e.g. $600 = 2^3 \times 3 \times 5^2$ Find the HCF and LCM of two whole numbers from their prime factorisations	Design tables to classify data. Interpret and construct line graphs for time series data and identify trends (e.g. seasonal variations). Define the population in a study and understand the difference between population and sample. Infer properties of populations or distributions from a sample. Understand what is meant by simple random sampling, and bias in sampling. Calculate the mean, mode, median and range for ungrouped data. Find the modal class, and calculate estimates of the range, mean and median for grouped data, and understand why they are estimates. Describe a population using statistics. Make simple comparisons. Compare data sets using 'like for like' summary values. Understand the advantages and disadvantages. Use tree diagrams and other representations to calculate the probability of independent and dependent combined events. Construct a Venn diagram to classify outcomes and calculate probabilities. Use set notation to describe a set of numbers or objects. e.g.D = #x x | 1 3 1 1 - E = #x x | is a factor of 280- [Knowledge of intersection (∩), union ( ) and complement (') notation will not be required.] Know and apply the trigonometric ratios and apply them to find angles and lengths in right-angled triangles in 2D figures. Apply similarity to calculate unknown lengths in similar figures. Formulate equations and solve problems involving a quantity in direct proportion to a power or root of another quantity.	Rearrange formulae to change the subject, where the subject appears once only. Recall and use index laws and factorising quadratics to simplify and solve algebraic fractions. Understand and use the SUVAT equations, knowing what each letter represents. Interpret, where appropriate, simple expressions as functions with inputs and outputs. Use graphs to find approximate roots of quadratic equations and the approximate solution of two linear simultaneous equations. Solve (several) linear inequalities in two variables, representing the solution set on a graph. Recognise and sketch various graphs, including quadratic, cubic, reciprocal and exponential	
Year 10 Core	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle:*** Calculate with roots and indices; including fractional and negatives. Surds including simplifying and arithmetic. Use various methods to solve quadratic equations To be able to solve linear and non-linear simultaneous equations. Solve linear equations and inequalities	***Focus of Cycle :*** Use ratio notation, including reduction to simplest form, and share into a given ratio. Apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations) including better value or best-buy problems.	***Focus of Cycle :*** Understand and use Pythagoras' theorem in both 2D and 3D. Use and interpret questions involving the use of SOHCAHTOA. Advanced trigonometry, which includes sine rule, cosine rule and area of any triangle using sine.	***The ability to…** To achieve grade 5, candidates will be able to: • perform routine single- and multi-step procedures effectively by recalling, applying and interpreting notation, terminology, facts, definitions and formulae • interpret and communicate information effectively

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	Expand and factorise quadratics. To be able to calculate and use HCF and LCM to solve problems, including the use of Venn diagrams.	Solve problems involving direct and inverse proportion, including graphical and algebraic representations Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees. Students need to be able to calculate probabilities from Venn diagrams and understand the term mutually exclusive. Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to 1 Apply and interpret limits of accuracy, including upper and lower bounds Construct and interpret diagrams for grouped discrete data and continuous data, ie, histograms with equal and unequal class intervals and cumulative frequency graphs and know their appropriate use. Students should know and understand the terms: primary data, secondary data, discrete data and continuous data. Apply the concepts of congruence and similarity, including the relationships between lengths in similar figures.	Students need to be able to construct and interpret various graphs, including linear, quadratic, cubic and graphs of proportionality. They also need to be able to use and interpret the data that the graph provides. Students need to be able to perform a number of transformations, including reflections, translations, enlargements and rotations. The need to be able to combine and describe such transformations.	• make deductions, inferences and draw conclusions • construct chains of reasoning, including arguments • generate strategies to solve mathematical and non-mathematical problems by translating them into mathematical processes, realising connections between different parts of mathematics • interpret results in the context of the given problem • evaluate methods and results
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Know and apply basic index laws Simplify expressions with surds. Understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation Solve linear simultaneous equations involving linear & quadratic Solve quadratic equations algebraically by factorising including completing the square and by using the quadratic formula Solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable Expanding products of two or more binomials Factorising quadratic expressions of the form ax2+bx+c Identify prime numbers. Use power notation in expressing a whole number as a product of its prime factors. e.g. 600 = 2^3 x 3 x 5^2 Find the HCF and LCM of two whole numbers from their prime factorisations	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 Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: Appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers), including quartiles and interquartile range Appropriate graphical representation involving discrete, continuous and grouped data, including box plots Use inequality notation to specify simple error intervals due to truncation or rounding. Including the relationships between lengths, areas and volumes in similar figures. Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)	Apply them, Pythagoras' Theorem & standard trigonometric ratios, to find angles and lengths in right-angled triangles Students should be able to: Use a table of values to plot graphs of linear and quadratic functions. Know that the coordinates of the points of intersection of a curve and a straight line are the solutions to the simultaneous equations for the line and curve Use a column vector to describe a translation of a simple shape and perform a specified translation. Reflect a simple shape in a given mirror line and identify the mirror line from a shape and its image. Rotate a simple shape clockwise or anti-clockwise through a multiple of 90c about a given centre of rotation. Enlarge a simple shape from a given centre using a whole number scale factor, and identify the scale factor of an enlargement.	

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Year 10 Foundation	Cycle 1	Cycle 2	Cycle 3	
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** *Not applicable. Foundation may begin in cycle 2 after discussions with CL and teacher.*	***Focus of Cycle :*** Use ratio notation, including reduction to simplest form, and share into a given ratio. Apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations) including better value or best-buy problems. Solve problems involving direct and inverse proportion, including graphical and algebraic representations Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees. Students need to be able to calculate probabilities from Venn diagrams and understand the term mutually exclusive. Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to 1 Apply and interpret limits of accuracy, including upper and lower bounds Construct and interpret diagrams for grouped discrete data and continuous data, ie, histograms with equal and unequal class intervals and cumulative frequency graphs and know their appropriate use. Students should know and understand the terms: primary data, secondary data, discrete data and continuous data. Apply the concepts of congruence and similarity, including the relationships between lengths in similar figures.	***Focus of Cycle :*** Understand and use Pythagoras' theorem Use and interpret questions involving the use of SOHCAHTOA. Students need to be able to work with fractions and mixed numbers and perform all 4 operations with them. Students need to be able to construct and interpret various graphs, including linear, quadratic, cubic and graphs of proportionality. They also need to be able to use and interpret the data that the graph provides. Students need to be able to perform a number of transformations, including reflections, translations, enlargements and rotations. The need to be able to combine and describe such transformations. Know and use the sum of the angles at a point is 360o. Know that the sum of the angles at a point on a line is 180o. Derive and use the sum of the interior angles of a triangle is 180o. Derive and use the sum of the exterior angles of a polygon is 360 o. Find the sum of the interior angles of a polygon. Find the interior angle of a regular polygon. Identify and find equations of parallel lines.	
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?		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 Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size. Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: Appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers), including quartiles and interquartile range	Apply them, Pythagoras' Theorem & standard trigonometric ratios, to find angles and lengths in right-angled triangles Add, subtract, multiply and divide simple fractions (proper and improper), including mixed numbers and negative fractions. Use a table of values to plot graphs of linear and quadratic functions. Know that the coordinates of the points of intersection of a curve and a straight line are the solutions to the simultaneous equations for the line and curve Use a column vector to describe a translation of a simple shape and perform a specified translation. Reflect a simple shape in a given mirror line and identify the mirror line from a shape and its image. Rotate a simple shape clockwise or anti-clockwise through a multiple of 90c about a given centre of rotation. Enlarge a simple shape from a given centre using a whole number scale factor, and identify the scale factor of an enlargement. Students need to know the basic angle facts and be able to describe the types of angles in parallel lines.	

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		Appropriate graphical representation involving discrete, continuous and grouped data, including box plots Use inequality notation to specify simple error intervals due to truncation or rounding. Including the relationships between lengths, areas and volumes in similar figures. Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)		
	Faith	***Learning*** ***Attitude***	***Mutual Respect*** ***Enrichment***	
Year 11 Foundation	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle*** Perimeter, area and volume: students need to be able to calculate area, perimeter of circles, rectilinear shapes and compound shapes. Students need to be able to calculate, using formula, the volume of a number of 3D shapes, including cones and spheres. Indices; students need to be able to simplify and evaluate powers and roots. Vectors: students need to understand column vector notation, how to draw vectors and arithmetic. Standard form: students need to be able to convert between standard form and ordinary numbers, as well as calculating with numbers in standard form, both with and without a calculator Fractions: students need to be able to complete all 4 operations of proper fractions and mixed numbers.	***Focus of Cycle*** Transformations, similarity and congruence: students need to be able to perform and describe reflections, translations, rotations and enlargements Retrieval: Algebra Students need to be able to simplify, solve, factorise and expand algebraic expressions and equations. Retrieval: Geometry students need to be able to work with angles in polygons, parallel lines and circles. Students should be able to use Pythagoras' theorem in various situations.	***Focus of Cycle: Bespoke revision for the class based on assessments and gaps in knowledge***	***The ability to…** To achieve grade 5, candidates will be able to: • perform routine single- and multi-step procedures effectively by recalling, applying and interpreting notation, terminology, facts, definitions and formulae • interpret and communicate information effectively • make deductions, inferences and draw conclusions • construct chains of reasoning, including arguments • generate strategies to solve mathematical and non-mathematical problems by translating them into mathematical processes, realising connections between different parts of mathematics • interpret results in the context of the given problem • evaluate methods and results
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Calculate the perimeter of rectilinear shapes. Apply perimeter formulae in calculations involving the perimeter of composite 2D shapes. Apply area formulae in calculations involving the area of composite 2D shapes. Calculate the surface area and volume of cuboids and other right prisms (including cylinders). Calculate the surface area and volume of spheres, cones and simple composite solids (formulae will be given). Calculate positive integer powers and exact roots. Use negative integer indices to represent reciprocals. Understand addition, subtraction and scalar multiplication of vectors. Represent a 2-dimensional vector as a column vector, and draw column vectors on a square or coordinate grid. Interpret and order numbers expressed in standard form. Convert numbers to and from standard form. Use a calculator to perform calculations with numbers in standard form. Add, subtract, multiply and divide simple fractions (proper and improper), including mixed numbers and negative fractions.	Use a column vector to describe a translation of a simple shape and perform a specified translation. Reflect a simple shape in a given mirror line and identify the mirror line from a shape and its image. Rotate a simple shape clockwise or anti-clockwise through a multiple of 90c about a given centre of rotation. Enlarge a simple shape from a given centre using a whole number scale factor, and identify the scale factor of an enlargement. Solve linear equations in one unknown algebraically. Rearrange formulae to change the subject, where the subject appears once only. Simplify algebraic expressions by multiplying a single term over a bracket. Simplify algebraic expressions by collecting like terms.		
Year 11 Higher	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**

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What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle:*** Apply and use **circle theorems** Apply and prove: the angle subtended by an arc at the centre is twice the angle at the circumference; two angles in the same segment are equal; a radius or diameter bisects a chord if and only if it is perpendicular to the chord; for a point P on the circumference, the angle between the tangent and a chord through P equals the angle subtended by the chord in the opposite segment; the opposite angles of a cyclic quadrilateral are supplementary **Equation of a circle** graph and tangents to those graphs **Indices**, including fractional and negative or combinations of both **Vectors** Understand addition, subtraction and scalar multiplication of vectors. Use vectors in geometric arguments and proofs.	***Focus of Cycle:*** For set 1 the majority of the content has been covered by this point. They need to be able to find the nth term of a quadratic sequences. The also need to be able to complete and interpret velocity time graphs. They will then follow a revision SOL which the teacher can use the mocks to help inform or follow the one in the STP. Set 2 **Equation of a circle** graph and tangents to those graphs **Indices**, including fractional and negative or combinations of both **Vectors** Understand addition, subtraction and scalar multiplication of vectors. Use vectors in geometric arguments and proofs. Use and apply formula for non-right-angled triangles, such as sine rule and cosine rule.	***Focus of Cycle: Bespoke revision for the class based on assessments and gaps in knowledge***	***The ability to…** To achieve grade 9, candidates will be able to: • perform procedures accurately • interpret and communicate complex information accurately • make deductions and inferences and draw conclusions • construct substantial chains of reasoning, including convincing arguments and formal proofs • generate efficient strategies to solve complex mathematical and non-mathematical problems by translating them into a series of mathematical processes • make and use connections, which may not be immediately obvious, between different parts of mathematics • interpret results in the context of the given problem • critically evaluate methods, arguments, results and the assumptions made.
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Recognise and use the equation of a circle with centre at the origin. Use angle facts in more formal proofs of geometrical results, for example circle theorems. Represent a 2-dimensional vector as a column vector and draw column vectors on a square or coordinate grid. Simplify algebraic products and quotients using the laws of indices.	Set 2: Represent a 2-dimensional vector as a column vector and draw column vectors on a square or coordinate grid. Simplify algebraic products and quotients using the laws of indices.		**Bridging into Y12** Pupils provided with a bridging unit which focuses on higher level content from GCSE

Faith ***Learning*** ***Attitude*** ***Mutual Respect*** ***Enrichment***

A-level Year 12	**Cycle 1**	**Cycle 2**	**Cycle 3 (Mocks & Work Experience)**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle:*** **PURE:** Algebra & functions, including equations and inequalities, quadratics, and expressions Binomial expansion Factor theorem and polynomial division Differentiation **APPLIED – STATISTICS:** Sampling and the large data set. Measure of spread and location Data representation and interpretation Regression Probability Statistical distributions, including the binomial distribution.	***Focus of Cycle:*** **PURE:** Integration, including area under curves Coordinate geometry, including straight line graphs, circle graphs and tangents Trigonometry which includes sine and cosine rules, trigonometric identities and solving trig equations. Further equations and inequalities Y1 & 2 Vectors (taught by applied teacher) **APPLIED – STATISTICS:** Hypothesis testing **APPLIED – MECHANICS:** Modelling in mechanics Kinematics; constant acceleration	***Focus of Cycle:*** **PURE:** Graphs and transformations Exponentials and logarithms, including modelling, log laws and working with natural logs. Sequences and series (from Y2) both arithmetic and geometric sequences, sum to infinity and use of sigma notation. **APPLIED: MECHANICS:** Forces and motion, including connected particles. Variable acceleration, maxima and minima problems.	***The ability to…** Recall or recognise most of the mathematical facts, concepts, techniques, and standard models required and often select appropriate ones to apply to a variety of contexts. Manipulate mathematical expressions with good accuracy and use graphs, sketches and diagrams appropriately. Use mathematical language and notation confidently. proceed logically through some extended arguments and proofs. Make correct deductions and inferences, draw correct conclusions and recognise incorrect reasoning. devise and implement a solution strategy in previously unseen unstructured challenging problems. sometimes notice and correct errors made in calculations or logic. Recall or recognise most standard models and select appropriate ones to apply to a variety of situations in the real world. Refer the results of problem solving back to the given context and, as required, make interpretations, comments, evaluations or predictions and note limitations. Make reasoned, sometimes correct comments on modelling assumptions, outcomes and limitations, evaluate and suggest possible refinements to the model.

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Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Mastering linear, quadratic, and simultaneous equations is crucial. Proficiency in simplifying and manipulating algebraic expressions is essential. Understanding measures of central tendency (mean, median, mode) and dispersion (range, standard deviation) Understanding basic probability concepts (e.g., probability of an event, independent events).	Proficiency in geometric concepts, including coordinate geometry, vectors, and spatial reasoning, is necessary. Being able to work with function notation (e.g., f(x), g(x)) is essential. Understanding sine, cosine, and tangent and their relationships in right-angled triangles. Mastering techniques for solving trigonometric equations. Understanding the concept of integrals and applying integration rules (e.g., power rule, integration by substitution).	Understanding different types of sequences and series and their properties is important. A solid understanding of indices and logarithms is necessary for solving more complex equations and problems.	**Bridging into Y13** Independent bridging units given to pupils to complete over the summer holidays, to be returned in September of Y13
Year 13	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** **PURE:** Partial fractions and algebraic division Use of radians in trigonometry, including using sec, cosec and cot. As well as learning to use and manipulate the double angle formula. Further differentiation which includes the chain, product and quotient rule **APPLIED – STATISTICS:** Regression, correlation and hypothesis testing. Probability including set notation, formulae, tree and Venn diagrams. Finding probabilities using the Normal distribution. Standard normal distribution including approximating the binomial and hypothesis testing.	***Focus of Cycle :*** **PURE:** Integration, including integrating trig functions, reverse chain rule, partial fractions and solving differential equations. Proof. Functions and modelling; Modulus function, mapping composite, sketching and combining transformations. Binomial expansion, including partial fractions Further use of radians. **APPLIED – MECHANICS:** Moments. Forces and friction Applications of kinematics, with a focus on projectiles. Applications of forces, including modelling with statics, dynamics and planes and connected particles.	***Focus of Cycle :*** **PURE:** Trigonometry including proving trig identities ad modelling with trig functions. Parametric equations to include modelling and differentiation. Numerical methods such as trapezium rule, iteration and Newton-Raphson method. **APPLIED – MECHANICS:** Further kinematics to include variable acceleration and differentiating and integrating vectors. Bespoke revision for external exams	***The ability to…** To achieve grade A, candidates will be able to: Recall or recognise most of the mathematical facts, concepts, techniques, and standard models required and often select appropriate ones to apply to a variety of contexts. Manipulate mathematical expressions with good accuracy and use graphs, sketches and diagrams appropriately. Use mathematical language and notation confidently. proceed logically through some extended arguments and proofs. Make correct deductions and inferences, draw correct conclusions and recognise incorrect reasoning. devise and implement a solution strategy in previously unseen unstructured challenging problems. sometimes notice and correct errors made in calculations or logic. Recall or recognise most standard models and select appropriate ones to apply to a variety of situations in the real world. Refer the results of problem solving back to the given context and, as required, make interpretations, comments, evaluations or predictions and note limitations. Make reasoned, mostly correct comments on modelling assumptions, outcomes and limitations, evaluate and suggest possible refinements to the model.
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Mastering algebraic manipulation, solving equations and inequalities, and working with polynomials and functions are essential. Being able to construct and understand mathematical proofs is a key skill. The ability to analyse and interpret data, and to present it effectively, is a valuable skill.	Understanding differentiation and integration, including their applications in finding areas, volumes, and rates of change, is crucial. Understanding the concept of derivatives and applying differentiation rules (e.g., power rule, product rule, quotient rule). A solid grasp of trigonometric functions, identities, and their applications in solving triangles and modelling periodic phenomena is vital.	Understanding Newton's Laws of Motion and their applications is important.	
	Faith	***Learning***	***Attitude***	***Mutual Respect*** ***Enrichment***
Further Maths Year 12	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle:*** **PURE:** Complex numbers to include solving cubic and quartic equations. Argand diagrams, including being able to represent loci and regions. Matrices which include inversion and solving systems of equations. **FURTHER STATISTICS:** Modelling with the Poisson and Binomial distributions and solving problems. Discrete probability distributions	***Focus of Cycle:*** **PURE:** Linear transformations including matrices, Series including sums of squares and cubes, Roots of polynomials including cubic and quartic equations, Proof by induction including divisibility and matrices, Vectors including 3D planes and scalar product **FURTHER STATISTICS:** Hypothesis testing including goodness of fit **FURTHER MECHANICS:** Momentum, Kinetic and potential energy, Work and Power including the work-energy principle	***Focus of Cycle:*** **PURE:** Vectors including points of intersection, Volumes of revolution (integration) including around x and around y axis, further complex numbers (Y2) including De Moivre's theorem **FURTHER MECHANICS:** Direct impact including Newton's law of restitution, Collisions including successive impacts, Momentum as a vector (Y2)	***The ability to…** Recall or recognise most of the mathematical facts, concepts, techniques and standard models required and often select appropriate ones to a variety of contexts Manipulate mathematical expressions with good accuracy and use graphs, sketches and diagrams appropriately Use mathematical language and notation confidently Proceed logically through some extended arguments and proofsMake correct deductions and inferences, draw correct conclusions and recognise incorrect reasoning Devise and implement a solution strategy in previously unseen unstructured challenging problems Sometimes notice and correct errors made in calculations or logic

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				Recall or recognise standard models and select appropriate ones to apply to a variety of situations in the real world Refer the results of problem solving back to the given context and, as required, make interpretations, comments, evaluations or predictions and note limitations Make reasoned, sometimes correct comments on modelling assumptions, outcomes and limitations, evaluate and suggest possible refinements to the model
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Add, subtract and multiply conformable matrices. Multiply a matrix by a scalar. Understand and use the complex conjugate. Know that nonreal roots of polynomial equations with real coefficients occur in conjugate pairs. Convert between the Cartesian form and the modulus argument form of a complex number. Use complex roots of unity to solve geometric problems. Calculation of the mean and variance of discrete probability distributions. Extension of expected value function to include E(g(X)) Students will be expected to use this distribution to model a real-world situation and to comment critically on the appropriateness. Students will be expected to use their calculators to calculate probabilities including cumulative probabilities. The use of the Poisson distribution as an approximation to the binomial distribution.	Transform matrices following the rules of reflections, rotations, enlargement and stretches. These are supported using the formula booklet Using the summation results to expand series especially squares and cubes Understand the rules of roots (without proof) and use them to solve problems Use proof by induction steps Degrees of freedom. Students will be expected to determine the degrees of freedom when one or more parameters are estimated from the data. Cells should be combined when Ei < 5 Students will be expected to obtain p-values from their calculator or use tables to find critical values. Momentum and impulse. The impulse-momentum principle. The principle of conservation of momentum applied to two spheres colliding directly. The principle of conservation of mechanical energy. Problems involving motion under a variable resistance and/or up and down an inclined plane may be set.	Calculate angles between lines and planes and use to solve problems Understand the basics of integration and use within a complex problem Direct impact of elastic spheres. Newton's law of restitution. Loss of kinetic energy due to impact. Students will be expected to know and use the inequalities $0 \leq e \leq 1$ (where e is the coefficient of restitution). Successive direct impacts of spheres and/or a sphere with a smooth plane surface.	**Bridging into Y13** Independent bridging units given to pupils to complete over the summer holidays, to be returned in September of Y13
Year 13	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** **PURE:** Hyperbolic functions including differentiating and integrating, Polar coordinates including sketching curves, finding areas and tangents, Series including the method of differences **FURTHER STATISTICS:** Geometric and negative binomial distributions including mean and variance, Hypothesis testing including finding critical regions, Central limit theorem	***Focus of Cycle :*** **PURE:** Series including Maclaurin series and series expansion, Calculus including inverse trig functions and partial fractions, Volumes of revolution including parametric curves, Differential equations including second order **FURTHER STATISTICS:** Probability generating functions including mean and variance, Quality of tests including errors **FURTHER MECHANICS:** Elastic strings and springs including Hooke's law and elastic energy	***Focus of Cycle :*** **PURE:** Modelling with differential equations including harmonic motion **FURTHER MECHANICS:** Elastic collisions in 2D including successive impacts Bespoke revision for external exams	***The ability to…** Recall or recognise most of the mathematical facts, concepts, techniques and standard models required and often select appropriate ones to a variety of contexts Manipulate mathematical expressions with good accuracy and use graphs, sketches and diagrams appropriately Use mathematical language and notation confidently Proceed logically through some extended arguments and proofsMake correct deductions and inferences, draw correct conclusions and recognise incorrect reasoning Devise and implement a solution strategy in previously unseen unstructured challenging problems Sometimes notice and correct errors made in calculations or logic Recall or recognise standard models and select appropriate ones to apply to a variety of situations in the real world Refer the results of problem solving back to the given context and, as required, make interpretations, comments, evaluations or predictions and note limitations Make reasoned, mostly correct comments on modelling assumptions, outcomes and limitations, evaluate and suggest possible refinements to the model
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Understand the definitions of hyperbolic functions sinh x, cosh x and tanh x, including their domains and ranges, and be able to sketch their graphs. Understand and be able to use the definitions of the inverse hyperbolic functions and their domains and ranges. Understand and use the relationship between the cases when the discriminant of the auxiliary equation is positive,	Recognise and use the Maclaurin series for ex, ln(1+ x), sin x, cos x and (1+ x) n, and be aware of the range of values of x for which they are valid (proof not required). Integrate functions and be able to choose trigonometric substitutions to integrate associated functions Definitions, derivations and applications. Use of the probability generating function for the negative	Solve the equation for simple harmonic motion and relate the solution to the motion. Analyse and interpret models of situations with one independent variable and two dependent variables as a pair of coupled first order simultaneous equations and be able to solve them, for example predator-prey models	

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	zero and negative and the form of solution of the differential equation. Model damped oscillations using second order differential equations and interpret their solutions. Mean and variance of a geometric distribution with parameter p Applications of the Central Limit Theorem to other distributions	binomial, geometric, binomial and Poisson distributions. Calculation of the probability of a Type I or Type II error. Use of Type I and Type II errors and power function to indicate effectiveness of statistical tests. Problems using the work-energy principle involving kinetic energy, potential energy and elastic energy	Successive direct impacts of spheres and/or a sphere with a smooth plane surface. Students will be expected to know and use the inequalities $0 \leq e \leq 1$ (where e is the coefficient of restitution). The spheres may be modelled as particles.	
	Faith	***Learning*** ***Attitude***	***Mutual Respect*** ***Enrichment***	
Core Maths Year 12 & 13	**Cycle 1**	**Cycle 2**	**Cycle 3**	**Exceptional performance/links to end points**
What do students need to know and understand by the end of each cycle to progress to the next stage?	***Focus of Cycle :*** Paper 1 topics: Analysis of data to include sampling techniques, averages and being able to construct and interpret various statistical diagrams. Maths for personal finance including percentages, bank statements and spreadsheets, savings and borrowing, taxes and VAT. Estimation to include simple and Fermi (longer) estimations.	***Focus of Cycle :*** Paper 1 topics: Critical analysis and being able to spot misleading graphs and information. Paper 2 topics: Normal distribution in order to understand and use standard deviation. Probabilities and confidence intervals using the standard normal distribution. Correlation and regression, including calculating the regression line and product moment correlation coefficient.	***Focus of Cycle :*** Understanding and use of the pre release materials. Bespoke revision for external exams.	***The ability to…** Students demonstrate a good understanding and knowledge of the mathematical facts, concepts and techniques that are needed, drawing on the full range of defined and assumed content to carry out set tasks successfully. Students manipulate mathematical expressions and use graphs, sketches, tables and diagrams, all with high accuracy and skill. They use mathematical language and symbols correctly and effectively in representing situations mathematically. When confronted with unstructured problems, they can often devise and implement an effective solution strategy, communicating it appropriately and effectively. If errors are made in their calculations or logic, these are sometimes noticed and corrected. Students recall or recognise almost all the standard models and techniques that are needed and select appropriate ones to represent a wide variety of situations in the real world. They correctly refer results from calculations using the model to the original situation; they give sensible interpretation of their results in the context of the original situation. Their responses include mathematical justifications, explaining their solutions to problems involving several features or variables. They make intelligent comments on the modelling assumptions and suggest possible refinements to the model. Students understand how almost all situations presented in the examination may be translated into mathematics. They correctly refer the results of calculations back to the given context and usually make sensible comments or predictions. They can distil the essential mathematical requirements from given data or other mathematical information. Students make appropriate and efficient use of contemporary calculator technology and other permitted resources and are aware of any limitations to their use. They present results to an appropriate degree of accuracy without prompting.
Ambition for all: what non-negotiable knowledge must all students learn, regardless of their starting points?	Students need to be able to: - Calculate with percentages - Use ratio and proportion to solve problems - Calculate all averages from data given in multiple formats - Be able to interpret and construct box plots, histograms, CF graphs and stem and leaf diagrams. - Complete interest and tax calculations - Make reasonable estimates using assumptions. - Solve real world problems logically	Students need to be able to: - Understand and use standard deviation and quartiles. - Interpret summary statistics and reports - Be able to identify misleading graphs, bias and manipulation.		

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