Springwood High School Maths Curriculum Plan

Our Vision:

We aim to ensure all pupils have opportunities to:

- become fluent in the fundamentals of mathematics, by developing pupils conceptual understanding as well as being able to recall and apply knowledge rapidly and accurately.
- develop a broad range of skills in using and applying mathematics.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing difficulty, including breaking down problems into a series of simpler steps and persevering in seeking solutions.
- Understand how Mathematics is an interconnected subject and are able to move fluently between representations of mathematical ideas. Cross-curricular links are integrated within the scheme of learning.
- Embrace the value of learning and feel confident to be able to take risks and comfortable making mistakes and learning from them
- Are independent and think for themselves and are prepared to persevere when faced with challenges, showing a confidence that they will succeed.
- Use Mathematical language and symbols accurately in their work and in discussions.
- Have a broad curriculum which also looks at the history and development of mathematics throughout the years as well as the use of maths in real-life.
- develop a sense of curiosity, passion and commitment to the subject

Exam boards: GCSE - AQA. Additional maths qualification – OCR. A-level - Edexcel.

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Brief overview of topics, themes, skills or key questions for each term:

Key Stage 3

Why are we teaching a knowledge-rich curriculum; how is it different?

We have a knowledge-rich curriculum as we are focusing on the building blocks of knowledge that are required in order for students to have a deep and secure understanding so that students remember what they have been taught and see success every lesson.

We focus on teaching so that they are fluent and can recall concepts quickly and accurately first, whilst also ensuring the work is sufficiently challenging. Once the knowledge is secure, we then look at how to apply this knowledge to more complex tasks which involve using problem-solving skills, method selection and other prior learning that has been interleaved within the task.

Our curriculum is continuously evaluated as a department and as a Trust, and changes are made if necessary.

Why are we teaching this content, in this order?

Our curriculum is put together so that the interconnected nature of mathematics is prevalent, and topics are not simply taught in a stand-alone manner. Our spiralling curriculum bases future teaching on previously taught building blocks, including knowledge that has been taught at KS2, which allows students to deepen their understanding, frequently revisit content and apply their mathematics to a variety of new contexts to ensure mastery of all skills. Our curriculum is a mastery curriculum which has been designed using research from across the mathematical community, as well as drawing on the experience and knowledge of staff within the department. We complete a pre-requisite assessment prior to starting a topic in order to establish the starting point and addressing any issues with the prior knowledge first before then building on this and teaching new content. At the end of each topic, students complete a topic test. This informs staff whether students have a secure understanding of the topic taught and whether they need to move on, correctively teach or if individual students need further intervention.

How does our curriculum match the ambition of the National Curriculum?

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Our curriculum is mapped to the National curriculum. We cover the ambition of the national curriculum however we omit trigonometry. This is as we follow a mastery curriculum and study topics in depth, rather than breadth. Additional topics have been covered at KS3 to ensure a greater understanding prior to beginning trigonometry in KS4.

How does the curriculum build on that from Key Stage 2?

Our curriculum takes the KS2 objectives and builds on them. Students cover them in greater depth whilst also learning new content in the KS3 curriculum in small steps, linking new content to knowledge that they are already secure with as well as interleaving where possible. KS2 objectives are incorporated into our SOW, and we have provided CPD for staff, so that they understand students' experience of maths prior to Year 7. Students' KS2 scores and QLAs (where available) are shared with staff.

By the end of Key Stage 3, what key knowledge should pupils need to remember and be able to apply in this subject?

By the end of Key stage 3, students should be fluent in the objectives covered as well as being able to apply these skills to a variety of problems as well as being able to justify their reasons for their answers. They should have a secure understanding of the foundations of mathematics that underpin the GCSE course so that they can build on this in years 10 and 11.

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
7	Consolidation of KS2 Sequences intro Place value Addition and subtraction	Multiplication and Division, Factors & Multiples, Order of operations	Geometry: properties of shapes and angles Fractions	Algebraic expressions Percentages	Primes and indices Rounding and estimation	Algebraic expressions Statistics (used for Smoothie Super learning day) Ratio and proportion (used for smoothie Super learning day)

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8	Consolidation of Yr 7 Linear equations Angles	Area and perimeter Percentages Ratio and proportion	Fractions 2D geometry 3D geometry	3D geometry Statistics	Statistics Probability Percentages 3 Algebraic expressions 3	Linear equations 2
9	Percentages 3 Algebraic expressions 3 Linear equations 2	Linear equations 2 Ratio Proportion	Standard form Sequences Straight line graphs Real life graphs	Transformations Inequalities	Quadratic equations Graphs + cubic, reciprocal and exponential Probability 2	Right-angled triangles – Pythagoras and Trigonometry

Key Stage 4

10	**Foundation** Sampling. Averages. Charts and Graphs **Higher** Indices, roots and surds Recurring decimals to fractions Changing the subject	**Foundation** Pie charts. Scatter graphs. Properties of shapes, parallel lines and angle facts. Interior and exterior angles of polygons **Higher**	**Foundation** Quadratic equations: expanding and factorising and graphs Pythagoras' Theorem. Perimeter and area **Higher** Data handling Averages and range Representing data	**Foundation** Surface area and volume. Probability Compound measures. **Higher** Pythagoras' Theorem and trigonometry in right angled triangles.	**Foundation** Constructions and loci Perimeter, area and volume. **Higher** Accuracy and bounds Constructions, loci and bearings.	**Foundation** Similarity and congruency **Higher** Similarity and congruency. Further Trig Vectors

	Linear graphs and coordinate geometry	Quadratic equations and expressions. Simultaneous equations Direct and inverse proportion	Properties of shapes, parallel lines and angle facts. Interior and exterior angles of polygons	Perimeter and area Surface area and volume.	Probability Compound measures.	
11	**Foundation** Similarity and congruency. Vectors Simultaneous equations. Proof **Higher** Further trigonometry. Vectors Quadratic inequalities .	**Foundation** Revision **Higher** Sequences - quadratic Circle Theorems Geometry – circles Functions.	**Higher** Functions. Transformations of graphs. Inequalities - graphing Algebraic fractions.	**Higher** Proof Iterations Gradient and area under a curve Growth and decay	Revision	

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Key Stage 5

	Pure lessons	Pure and Mechanics lessons	Pure and Statistics lessons
12	Quadratic functions – factorising, solving, graphs and the discriminants Equations – quadratic/linear simultaneous The intersection of a line and a curve Inequalities – linear and quadratic (including graphical solutions) Graphs – cubic, quartic, factorised polynomials and reciprocal Transformations – transforming graphs – f(x) notation Circles – equation of a circle, geometric problems Algebraic division, factor theorem and proof Examples including proof by deduction and proof by contradiction The binomial expansion Trigonometric ratios and graphs Trigonometric identities and equations Radians (exact values), arcs and sectors Use of trigonometry in triangles Definitions, magnitude/direction, addition and scalar multiplication Position vectors, distance between two points, geometric problems	Algebraic expressions – basic algebraic manipulation, indices and surds Introduction to mathematical modelling and standard S.I. units of length, time and mass Definitions of force, velocity, speed, acceleration and weight and displacement; Vector and scalar quantities Graphical representation of velocity, acceleration and displacement Motion in a straight line under constant acceleration; suvat formulae for constant acceleration; Vertical motion under gravity Newton's first law, force diagrams, equilibrium, introduction to i, j system Newton's second law, 'F = ma', connected particles; Newton's third law: equilibrium, problems involving smooth pulleys Resolving forces Friction forces (including coefficient of friction μ) Variable force; Calculus to determine rates of change for kinematics Use of integration for kinematics problems	Straight-line graphs, parallel/perpendicular, length and area problems Introduction to sampling terminology; Advantages and disadvantages of sampling Understand and use sampling techniques; Compare sampling techniques in context Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems Probability: Mutually exclusive events; Independent events Using set notation for probability Questioning assumptions in probability Statistical distributions: Use discrete distributions to model real-world situations; Identify the discrete uniform distribution;

	Definition, differentiating polynomials, second derivatives Gradients, tangents, normals, maxima and minima Definition as opposite of differentiation, indefinite integrals of x^n Definite integrals and areas under curves Exponential functions and natural logarithms Secant, cosecant and cotangent (definitions, identities and graphs); and inverse trig functions Compound (including proof) and double (and half) angle formulae *geometric proofs expected Proving trigonometric identities The form Rcos(x+a), Rsin(x+a) etc Proof by contradiction Simplifying algebraic fractions Partial fractions Modulus function Composite and inverse functions Transformations Modelling with functions - may be Trigonometric, exponential, reciprocal etc.		Calculate probabilities using the binomial distribution (calculator use expected) Language of hypothesis testing; Significance levels Carry out hypothesis tests involving the binomial distribution

13	Expanding (a + bx)n for rational n; knowledge of range of validity Expansion of functions by first using partial fractions Arithmetic and geometric progressions (proofs of 'sum formulae') Sigma notation Recurrence and iterations Differentiating sin x and cos x from first principles Chain Rule Differentiating exponentials and logarithms Differentiating products, quotients, implicit differentiation Second derivatives (rates of change of gradient, inflections) Rates of change problems (including growth and kinematics) Integrating xn (including when n = –1), exponentials and trigonometric functions Using the reverse of differentiation, and using trigonometric identities to manipulate integrals Integration by substitution Integration by parts Use of partial fractions Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation) The trapezium rule	Forces' turning effect Applications of kinematics: Projectiles Applications of kinematics: Projectiles Equilibrium and statics of a particle (including ladder problems) Dynamics of a particle Constant acceleration (equations of motion in 2D; the i, j system) Variable acceleration (use of calculus and finding vectors r and r' at a given time)	Change of variable Understand and use the Normal distribution Use the Normal distribution as an approximation to the binomial distribution Statistical hypothesis testing for the mean of the Normal distribution

	Differential equations (including knowledge of the family of solution curves) Definition and converting between parametric and Cartesian forms and Curve sketching and modelling Differentiating parametric functions Integrating parametric functions Use of vectors in three dimensions; knowledge of column vectors and i, j and k unit vectors Location of roots Solving by iterative methods (knowledge of 'staircase and cobweb' diagrams) Newton-Raphson method Numerical methods: Problem solving		

Enrichment Activities:

Additional Learning: Year 7 - Smoothie making. Year 8 - Bridge building.

Competitions: Senior Maths challenge (November), Intermediate maths challenge, Junior Maths challenge. Team Maths challenges. The Michaelmas Symposium (Year 12 in November). Trust maths competitions. Year 6 maths competition (July). Year 10 Maths feast and year 9 summer snacks with AMSP.

Trips: Disneyland Paris.

Clubs & Support: After school revision on Tuesdays, Wednesdays and Thursdays in B8. Stem club. Hegarty maths, Sparx maths, Corbett Maths