Mathematics Curriculum Intent

Department Philosophy:

The WHSG Mathematics Department's principal focus is to develop the mathematical confidence of all our students and to cultivate an ethos of intellectual curiosity and a love of learning throughout their course. The curriculum is designed to encourage young people into becoming logical thinkers, able problem solvers and lifelong mathematicians as a product of stimulating and reflective teaching. Our team of enthusiastic Mathematics specialists strive to promote interest, curiosity and enjoyment in the learning of Mathematics by providing a supportive yet challenging environment, where all students believe they can achieve and are able to develop their ability to articulate technical language and analytical skills.

By the end of Key Stage 3 and 4 our students will know how to:		By the end of Key Stage 5 our students will know how to:	
1. Apply the four operations to integers, decimals and fractions 2. Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals 3. Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple and prime factorisation. 4. Calculate with roots, and with integer and fractional indices (positive and negative) 5. Calculate exactly with fractions, surds and multiples of *π including* rationalise denominators 6. Identify and work with fractions in ratio problems including changing recurring decimals to fractions. 7. Calculate with and interpret standard form 8. Estimate answers, round numbers and measures to an appropriate degree of accuracy and use inequality notation to specify simple error intervals due to truncation or rounding	21. Factorise and solve linear and quadratic equations using a variety of methods including linear and quadratic simultaneous equations. 22. Rearrange formulae to change the subject 23. Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs 24. Where appropriate, interpret simple expressions as functions with inputs and outputs; interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function' 25. Plot and interpret linear, quadratic, cubic, reciprocal and exponential graphs 26. Identify key features of linear graphs including parallel and perpendicular, gradients and y intercept. 27. Identify and interpret roots, intercepts and turning points of quadratic functions including using completing the square.	1. Structure, use and apply different methods of proof. 2. Apply the laws of indices and laws of logarithms 3. Manipulate polynomials algebraically; use factor theorem and decomposition of rational functions into partial fractions 4. Sketch graphs of different functions, including modulus, understanding the effects of transformations; use to interpret algebraic solutions 5. Use various functions in modelling, including consideration of limitations and refinements of the models 6. Use the coordinate geometry of straight line models and circles in a variety of contexts 7. Use parametric equations of curves in modelling in a variety of contexts and be able to convert between Cartesian and parametric forms 8. Apply the binomial expansion of $(a+bx)^n$ for any rational n; understanding the link to binomial probabilities, validity and its use for approximations 9. Work with sequences and series including arithmetic, geometric and recurrence relations, to solve problems and in modelling	19. Integrate a range of functions using various methods and evaluate definite integrals to find areas between curves 20. Differentiate and integrate simple functions and relations defined implicitly or parametrically 21. Construct and solve simple differential equations in pure mathematics and in context, interpreting the solution 22. Use numerical methods to locate roots of functions, solve equations and problems in context, recognising their limitations 23. Understand and use numerical integration of functions, including the use of the trapezium rule 24. Use vectors in two and three dimensions to solve problems in pure mathematics and in context, including forces and kinematics 25. use calculator technology efficiently including to compute summary statistics 26. Use, select and critique sampling techniques in the context of solving a statistical problem 27. Select and interpret data presentation techniques for single and bivariate data

9. Apply and interpret limits of accuracy, including upper and lower bounds 10. Calculate simple probabilities and solve more complex problems using Venn and tree diagrams and the product rule for counting. 11. Understand conditional probability and independent and dependent events. 12. Use appropriate charts and diagrams to analyse and interpret data appropriately. 13. Use appropriate sampling methods and justify their use. 14. Use data to make predictions, follow trends with interpolation and extrapolation and identify the dangers of doing so. 15. Use of compound measures 16. Confidently apply geometric reasoning to angle problems, circle theorems and proof. 17. Apply transformations effectively including the use of invariance 18. Effectively use the rules of similarity and congruency. 19. Understand and apply the concepts of Pythagoras' Theorem and trigonometry to right angled triangle, and trigonometry to non right angled triangles. 20.Simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions)	28. Sketch translations and reflections of given functions 29. Calculate gradients and areas under graphs and interpret distance time graphs, velocity time graphs and graphs in financial contexts. 30. Use the equation of a circle with centre at the origin. 31. Find approximate solutions to an equation using iteration 32. Solve linear and quadratic inequalities algebraically and graphically including set notation. 33. Recognise linear and non linear sequence patterns. 34. Confidently use ratio to solve problems in a variety of different contexts. 35. Use direct and inverse proportion accurately 36. Work confidently with percentages including solving problems including percentage change, increase/decrease and calculating interest. 37. Confidently calculate area and volume of 2 and 3d shapes 38. Use vectors to construct geometric arguments and proofs. 39. Confidently use all maths skills learnt to answer open ended unstructured problems with an application to real life. 40. Be able to use multiplicative reasoning across topics.	10. Understand and use the sine, cosine and tangent functions and graphs. and relationship to their reciprocals 11. Work with radian measure, including use of small angle approximations 12. Apply trigonometry functions and identities to solve equations, construct proofs and solve problems in context, including those involving vectors, kinematics and forces 13. Recognise and work with exponential and logarithmic functions and their graphs including solving equations and estimating parameters 14. Use exponential growth and decay to model real life situations appreciating why exponential models are suitable, any limitations and refinements needed. 15. Differentiate, including from first principles, and interpret derivatives in connection to sections of curves and as a rate of change 17. Differentiate a range of functions using various methods to solve problems including those involving tangents, stationary points, connected rates of change and inverse functions 18. Know and use the Fundamental Theorem of Calculus and appreciate differentiation as a rate of change and integration as the limit of a sum	28. Calculate and interpret measures of central tendency and variation. 29. Work efficiently with large data sets 30. Model with probability and link to discrete and continuous distributions. 31. Understand and use the Normal distribution and simple, discrete probability distributions including the binomial distribution in context 32. Use the correct language of statistical hypothesis testing and conduct various statistical hypothesis tests interpreting the results in context. 33. Recognise and use fundamental and derived quantities and units in the S.I. system 34. Derive and use the formulae for constant acceleration for motion in a straight line and interpret graphs in kinematics 35. Use calculus in kinematics for motion in a straight line and model motion under gravity in a vertical plane using vectors; projectiles. 36. Know and apply Newton's laws for motion in a straight line to problems including resolving forces, pulleys, equilibrium and dynamics 37. Understand and use the $F \leq R$ model for friction; coefficient of friction; limiting friction and statics. 38. Use moments in simple static contexts.

At WHSG our curriculum intent is ambitious but always inclusive, composed of powerful knowledge and cultural capital, coherent and well-sequenced, and broad only specialising when necessary