



Wallington
County Grammar School

The Mathematics Curriculum

Whole School Curriculum Intent:	<p>Wallington County Grammar School is a highly academic but pastorally minded school which delivers a curriculum that enables all students to embody our motto - <i>Per Ardua ad Summa</i>, Through Difficulties to the Heights. Each Subject Leader has autonomy over their own curriculum and its intent, i.e. its subject content, skills content, sequencing and assessment schedule. This is vital to ensure the academic curriculum is designed by highly qualified subject experts. The intentions behind whole school approach to curriculum design taken by senior leaders are to provide:</p> <ul style="list-style-type: none">● Breadth - We intend to provide a broad, academic and liberal curriculum that equips students with the body of human knowledge and different ways of thinking necessary to succeed in and enjoy their education, careers and wider lives.● Depth - We do not want our students to simply study the national curriculum and examination specifications with grades being our sole focus. We aim for our students to become true scholars of the disciplines that they are learning so that they achieve a deep and sophisticated level of knowledge and understanding.● Values - We aim for our students to develop our four core values: commitment, courage, compassion and creativity.● Democracy - We aim for all our students to have the necessary knowledge and confidence, not just to participate in the democracy of the United Kingdom, but to lead it.
Subject Curriculum Intent:	<p>The intent of the Mathematics curriculum is to provide a high level of academic challenge. Since a large number of students go on to study STEM subjects at University, we aim to develop the problem-solving skills students will need for studies beyond school and the wider world.</p> <p>We deliver a curriculum that enables students to:</p> <ul style="list-style-type: none">● Solve many challenging problems, allowing them to apply their previous knowledge to new or unfamiliar contexts.● Encourage curiosity, creativity, and independence in learning.● Develop intellectual curiosity, autonomy, and the ability to apply knowledge in nuanced ways.● Engage with real-world contexts and to develop problem solving skills to allow them to thrive in a technological world. <p>Additional challenge comes from entry to UKMT Mathematics competitions as well as the ability to study an extra qualification at Key Stage 4 - open to pupils in Sets 1 to 4. At Key Stage 5 there is the option to study Further Mathematics - a very challenging and rewarding course for those with a passion for mathematics.</p>
Subject Curriculum Aims:	<p>The curriculum aims are to allow students to develop the skills they need to thrive in a technological and ever changing world. Academic rigour and the ability to communicate complex ideas to others are essential skills which are developed as students study more material.</p> <p>We deliver a curriculum that enables students to:</p>

	<ul style="list-style-type: none"> ● Develop a fluent understanding of mathematical fundamentals- number, algebra, geometry, statistics, and their interconnections—through varied and regular practice, fostering quick, accurate, and flexible application of knowledge. ● Cultivate the ability to think and reason mathematically by exploring patterns, constructing logical arguments and proofs, using appropriate mathematical language, and communicating ideas with clarity. ● Develop competence in applying mathematics to both routine and non-routine problems—breaking tasks into manageable steps, making connections across different areas of the subject, and persisting in seeking solutions. ● Strengthen spoken and written mathematical communication skills by using precise vocabulary, visual representations (e.g. diagrams and graphs), and constructing coherent justifications or explanations, particularly in questions requiring proofs. ● Build a robust foundation of skills and understanding to support progression in further academic study (e.g. A Level), vocational education, and practical applications in society and the world of work. ● Instil confidence and enjoyment in mathematics, inspiring pupils to appreciate its elegance, power, and relevance in everyday life, society, and future career pathways.
Exam Boards	<p>GCSEs: Pearson A Levels: Pearson</p>

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Y7	<i>A more detailed breakdown of the y7 topics can be found in the student's progress booklets.</i>					
	Geometry 1 - perimeter and area/units of measure Number 1 - written methods/ negative numbers/ mixed numbers/ Bidmas Statistics 1 - averages	Algebra 1 - simplifying expressions/ substitution/ expanding brackets Geometry 2 - Angles on parallel lines	Algebra 2 - solving equations/ inequalities Geometry 3 - constructing triangles/ transformations	Statistics 2 - probability Number 2 - conversions of fractions, decimals and percentages/ percentage change/ ratio	Geometry 4 - circumference and area of circles/ volume/ plans and elevations Algebra 3 - straight line graphs	Statistics 3 - Analysing data Algebra 4 - sequences Number 3 - rounding
	Assessment 1 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far.		Assessment 2 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far.	
Y8	<i>A more detailed breakdown of the y8 topics can be found in the student's progress booklets.</i>					
	Number 4 - prime factors/ hcf and lcm Geometry 5 - Pythagoras' theorem Geometry 6 - angles in polygons	Number 5 - recurring decimals/ compound interest/ ratio and proportion Statistics 4 - probability	Algebra 5 - parallel and perpendicular lines/ nonlinear graphs Geometry 7 - arcs and sectors/ surface area and volume/ similar shapes/ congruents	Number 6 - standard form Algebra 6 - expanding brackets/ factorising and solving quadratic equations	Statistics 5 - real-life graphs/ cumulative frequency/ boxplots/ stem and leaf diagrams/ comparing sets of data Geometry 8 - trigonometry	Geometry 9 - enlargement/ constructions and loci Algebra 7 - simultaneous equations
	Assessment 1 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (including Y7 content).		Assessment 2 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (including Y7 content).	
Y9	The units below are taught to all sets across the year, roughly in the order and timings below. Sets 1 and 2 will do extension topics in addition. A more detailed breakdown can be found in the student's progress booklets.					
	Taught before Christmas: Number 1 – ratio / fractions / percentages work / index notation / standard form Algebra 1 - straight line & curved graphs / linear equations / linear inequalities Number 2 - surds Geometry 1 – circles / surface area and volume of 3-D shapes			Taught after Christmas: Algebra 2 – expanding brackets / factorising and solving Quadratics with and without Quadratic formula Probability and Statistics 1 - discrete data & grouped continuous data / averages / scatter graphs / frequency polygons Algebra 3 – solving linear simultaneous equations graphically & algebraically / solving linear & non-linear simultaneous equations graphically / iteration Geometry 2 – angles / angles in polygons / using circle theorems / bearings		

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Assessment 1 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).		Assessment 2 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).	
	The units below are taught to sets 3, 4, 5 across the year, roughly in the order and timings below. A more detailed breakdown can be found in the student's progress booklets. Sets 1 and 2 will cover what they were not taught in Year 9 (along with content from Year 11), and then move onto OCR Add Maths and AQA L2 FM respectively.					
Y10	Taught before Christmas: Algebra 4 – algebraic fractions Geometry 3 - 3D trig & Pyth, area & vol scale factors, congruence, Trig standard triangles and exact values Algebra 5 - algebraic linear / non-linear simultaneous equations, equation of a circle, equation of a tangent to a circle, direct and inverse proportion formula, exponential growth & decay, geometric and quadratic sequences			Taught after Christmas: Geometry 4 – non-right-angled triangles - sine & cos rules, area of a triangle using sine, area of segment; trig graphs including solving basic trig equations using graphs Algebra 6 – functions, graph transformations (all types) and identities using completing the square, trig graphs and other functions Probability and Statistics 2 - cumulative frequency graphs, box plots, stem & leaf, tree diagrams, histograms, time series graphs Geometry 5 – vectors and transformations (include enlargement negative s.f. and translation vector notation) and point(s) of invariant, constructions and loci Geometry 6 – proof of circle theorems		
	Assessment 1 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).		Assessment 2 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).	
Y11	The units below are taught to sets 3, 4, 5, across the year, roughly in the order of topics below. A more detailed breakdown can be found in the student's progress booklets. Sets 1 and 2 will work through OCR Add Maths and AQA L2 FM respectively.					

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Taught before Christmas: Algebra 7 - quadratic inequalities, adding a line to a graph to solve a connected equation, using tangent meeting curve to get the context of a velocity time graph, use of trapezium rule for area under curve. Probability and Statistics 3 - venn diagrams, set notation, product rule for counting, stratified sampling, capture / recapture method			After Christmas: Revision for maths public examinations		
	Mock Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).		Assessment 2 Format:	Two written papers. One non-calculator and one calculator paper, based on content covered so far (will include topics from previous years).	
OCR Add Maths (Y10/11)	<p>This content is covered by Set 1, across Years 10 and 11.</p> <p>Algebra - Algebraic Manipulation, Applications of equations, Inequalities, Recurrence relationships Enumeration - Binomial expansion, Representation, Product Rule, Permutations, Combinations, Applications Coordinate Geometry (two dimensions only) - The straight line, The coordinate geometry of circles, Graphs, Applications in linear programming Pythagoras' Theorem and Trigonometry - Ratios of any angles, Trigonometric identities, Trigonometric equations, Applications in modelling Calculus - Differentiation, Integration, Application to kinematics Numerical Methods - Solving equations, Gradients of tangents, Area under a curve, Applications of Numerical methods Exponentials and logarithms - Properties of the exponential function, Properties of the logarithmic function, Reduction to linear form, Equations involving exponentials</p>					
AQA L2 FM (Y10/11)	<p>This content is covered by Sets 2, 3 and 4 at different points in Year 10 and 11 depending on the set.</p> <p>Number - The product rule for counting, Manipulation of surds Algebra - Functions, Expanding brackets, Expand $(a + b)^n$ for positive integer n, Factorising, Manipulation of rational expressions, Use of the factor theorem, Completing the square, Drawing and sketching of functions Interpretation of graphs, Solution of linear and quadratic equations, Algebraic and graphical solution of simultaneous equations in two unknowns (linear and non-linear), Algebraic solution of linear equations in three unknowns, Inequalities, Index laws, Algebraic proof, Nth terms of linear and quadratic sequences Coordinate Geometry (two dimensions only) - The straight line, The coordinate geometry of circles Calculus - Differentiation Matrix transformations - Multiplication of matrices, The identity matrix I, Transformations of the unit square in the x–y plane, Combination of transformations Geometry - Geometric proof, Trigonometry in triangles, Pythagoras' theorem (2-D and 3-D), Ratios of angles and their graphs</p>					

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
L6th Maths	<p>Quadratics - the discriminant and modelling with quadratics</p> <p>Graphs & Transformations - translations, reflections and stretches of graphs</p> <p>Trigonometry - the sine and cosine rules, Pythagorean identities and the solution of trigonometric equations</p> <p>The Binomial Expansion - $(ax + b)^n$ using binomial coefficients and Pascal's Triangle</p>	<p>Proof - proof by determination, exhaustion and counter-example</p> <p>Differentiation - the gradient function, differentiation from first principles. Differentiation of polynomials, the equations of tangents and normals to curves, stationary points, optimisation</p> <p>Vectors - i and j notation, vectors in geometric proofs</p> <p>Logs & Exponentials - exponential functions, logarithms, the natural exponential, the natural logarithm, modelling with the exponential, solution to equations with exponentials and logarithms</p> <p>Sampling - methods of sampling and the Large Data Set</p> <p>Statistical Measures - quartiles, deciles, percentiles, outliers, variance and standard deviation, coding</p>	<p>Statistical Measures - box plots, histograms, linear regression</p> <p>Kinematic Graphs - distance-time and velocity-time graphs</p> <p>Kinematics - the SUVAT equations</p> <p>Log Graphs - linearisation of exponential functions</p> <p>Integration - antidifferentiation, definite integration, the area under a curve</p> <p>Probability - Venn diagrams, mutually exclusive events, independent events, discrete probability distributions</p> <p>Differentiation - the chain and product rules</p>	<p>Differentiation - the quotient rule, connected rates of change, the derivatives of log and trig functions, concavity</p> <p>Sequences - arithmetic sequences, geometric series, sigma</p> <p>Variable Acceleration - kinematic models as functions of time</p> <p>Partial Fractions - reduction of algebraic fractions to partial fractions</p> <p>Binomial Distribution - probabilities using the binomial distribution including with tables and calculators</p>	<p>Binomial Expansion - the general binomial expansion</p> <p>Hypothesis Testing with the Binomial Distribution</p> <p>Forces - Newton's Laws</p> <p>Trigonometry - small angle approximations and reciprocal trigonometry</p>	<p>Forces - Newton's Laws with connected particles</p> <p>Trigonometry - the inverse trig functions, compound angles, double angles, the R-alpha form, modelling with the R-alpha form, proofs and differentiation trig functions from first principles</p> <p>Numerical Methods - the Trapezium Rule</p> <p>Vectors - i, j and k notation, vectors in geometric proofs</p>
	Assessment 1 Format:	Two written papers. Pure + Mechanics and Pure + Stats paper, based on content covered so far	Assessment 2 Format:	Two written papers. Pure + Mechanics and Pure + Stats paper, based on content covered so far		

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
L6th Further Maths	<p>All of L6th Maths and U6 Maths content plus:</p> <p>Matrices - calculations with matrices including calculating the inverses of 2x2 and 3x3 matrices, the solution of systems of 3 simultaneous equations and their geometric significance</p> <p>Complex Numbers - calculations with complex numbers, the Argand diagram, modulus-argument form, loci on the Argand diagram</p> <p>Sequences - using standard sums in proofs</p> <p>Roots of Polynomials - recognising the links between coefficients of polynomial equations and their roots</p> <p>Proof - proof by induction of sequences, matrices and divisibility</p> <p>Linear Transformations using Matrices - perform transformations using matrices, find the equations of invariant lines and lines of invariant points</p> <p>Volumes of Revolution - the volume of a solid by rotation around the x- or y-axis</p> <p>Vectors - vector equations of lines in 2D and 3D, vector equations of planes, the scalar product, the vector product, the intersections of lines/planes and the angles between lines/planes</p>					
	Assessment 1 Format:	Additional written paper based on Further Maths content covered so far			Assessment 2 Format:	Additional written paper based on Further Maths content covered so far

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
U6th Maths	<p>Integration - substitution, reverse chain rule, trig functions, partial fractions, integration by parts, areas between curves</p> <p>Forces - resolving forces in 2D, the coefficient of friction</p> <p>Functions - the modulus function, solution to equations with the modulus</p> <p>Parametric Equations - converting between parametric and cartesian equations, sketching parametric curves, modelling with parametrics, differentiation of parametrics, integration of parametrics</p> <p>Numerical Methods - fixed point iteration, cobweb & staircase diagrams, the Newton-Raphson method</p>	<p>Forces - connected particles in 2D</p> <p>Implicit Differentiation</p> <p>Moments - resolving moments, uniform and non-uniform rods</p> <p>Differential Equations</p> <p>Projectiles - definition in cartesian and vector form, formation of equations of trajectory</p> <p>Probability - conditional probabilities, set notation</p> <p>Regression - the product moment correlation coefficient, hypothesis testing with correlation</p>	<p>Variable Acceleration - kinematic models as functions of time including vectors</p> <p>Normal Distribution - the normal distribution, standardising with the normal distribution, hypothesis testing with the mean and normal distribution, approximating a binomial distribution</p> <p>Proof - Proof by Contradiction</p>		Public Examinations	
	Mock Format:	Two written papers. Pure + Mechanics and Pure + Stats paper, based on content covered so far		Assessment 2 Format:	Complete set of past papers	

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
U6th Further Maths	<p>Complex Numbers - De Moivre's Theorem, the exponential form, roots of unity, complex series</p> <p>Series - Maclaurin series, Method of Differences</p> <p>Methods in Calculus - Improper Integration, Inverse trigonometric integration</p> <p>Volumes of Revolution - using more complicated integration</p>	<p>Polar Curves - definition of polar curves, conversion between cartesian and polar form, the area included within a polar curve, tangents and normals to polar curves</p> <p>Hyperbolic Functions - definitions, proofs, differentiation and integration with hyperbolic functions</p> <p>Differential Equations - solutions of 1st ODE using integrating factors, solutions of 2nd ODE homogeneous and non-homogeneous equations</p>	<p>Models with Differential Equations - Simple Harmonic Motion, Damped Harmonic Motion, coupled 1ODE and 2ODE</p>			
	<p>Additional Modules:</p> <p>Further Mechanics 1 - momentum and impulse, work, energy and power, elastic strings and elastic energy, elastic collisions in 1D and 2D</p> <p>Further Mechanics 2 - circular motion, centres of mass, variable force, kinematics where acceleration is a function of time, displacement or velocity</p> <p>Further Statistics 1 - calculation of mean and variance of discrete probability distributions, Poisson & binomial distributions, geometric and negative binomial distributions, central limit theorem, chi squared tests, probability generating functions, quality of tests</p> <p>Further Statistics 2 - linear regression, continuous probability distributions, correlation calculations (PMCC, SRCC), combinations of random variables, estimation, confidence and interval tests, confidence intervals and the t-distribution</p> <p>Further Decision 1 - algorithms and graph theory, Prim's, Kruskal's, Dijkstra's and Floyd's algorithms, route inspection, critical path analysis, linear programming</p> <p>Further Pure 1 - further trigonometry with t-formulae, Taylor series, L'Hôpital's Rule, Weierstrass substitution, Taylor series integration, conic sections., Vector product, scalar triple product, numerical solutions to 1ODE and 2ODE, Solutions to rational inequalities</p>					
	Mock Format:	Additional written paper based on Further Maths Core Pure content covered so far. A written paper in whatever additional modules are studied.		Assessment 2 Format:	Complete set of past papers	

Key Vocabulary

Key vocabulary can be found here - <https://www.study23.io/blog/glossary-of-gcse-maths-terms/>

Suggested Reading List

KS3:

Gary Rimmer: Football Freaking: Surreal Sums Behind the Beautiful Game
Kjartan Poskitt: Murderous Maths (various titles)

KS4:

Rob Eastaway: Why do Buses Come in Threes
Marcus du Sautoy: The Number Mysteries
Alex Bellos: Alex's Adventures in Numberland
Simon Singh: Fermat's Last Theorem
Ian Stewart: Cabinet of Mathematical Curiosities
(each author above has written a number of books that would also be suitable)
David Acheson: 1089 and all that

KS5:

Historical and general Maths Texts

Makers of Mathematics S. Hollingdale (Penguin, 1989)
A Russian Childhood S. Kovalevskaya (trans. B. Stillman) (Springer, 1978)
Alan Turing, the Enigma A. Hodges (Vintage, 1992)
The Man Who Knew Infinity R. Kanigel (Abacus, 1992)
A Mathematician's Apology G.H. Hardy (CUP, 1992)
Littlewood's Miscellany (edited by B. Bollobas) (CUP, 1986)
The man who loved only numbers Paul Hoffman (Fourth Estate, 1999)
Surely You're Joking, Mr Feynman R.P. Feynman (Arrow Books, 1992)
Simon Singh Fermat's Last Theorem (Fourth Estate)
Marcus du Sautoy The Music of the Primes (Harper-Collins, 2003)
Marcus Du Sautoy Finding Moonshine: a mathematician's journey through symmetry (Fourth Estate, 2008)
J. McLeish Number (Bloomsbury, 1991)
Flatland: A Romance of Many Dimensions", A. Edwin (1884)

Readable Mathematics

From Here to Infinity Ian Stewart (OUP, 1996)

What's Happening in the Mathematical Sciences B. Cipra (AMS, 1993, '94, '96,'99, '02)
Archimedes' Revenge P. Hoffman (Penguin, 1991)
The Mathematical Experience P.J. Davis & R. Hersh (Penguin, 1990)
Beyond Numeracy J. A. Paulos (Penguin, 1991)
The Penguin Dictionary of Curious and Interesting Numbers D.Wells (Penguin,1997)
New Applications of Mathematics C. Bondi (ed.) (Penguin, 1991)
Reaching for Infinity S. Gibilisco (Tab/McGraw-Hill, 1990)
The New Scientist Guide to Chaos N. Hall (ed.) (Penguin, 1991)
Chaos J. Gleick (Minerva/Random House, 1997)
Fractals. Images of Chaos H. Lauwerier (Penguin, 1991)

Readable Theoretical Maths/Physics

Hidden Unity in Nature's Laws John C. Taylor (CUP, 2001)
QED: The Strange Story of Light and Matter R.P. Feynman (Penguin, 1990)
The Cosmic Onion Frank Close (Heinemann, 1983)
The Quantum Universe T. Hey & P. Walters (CUP, 1987)
Was Einstein Right? C.M. Will (Basic Books, 1988)
The Accidental Universe P.C.W. Davies (CUP, 1982)

Readable Maths Textbooks

Advanced Problems in Mathematics S.T.C. Siklos (1996 and 2003)
Mathematical Methods for Science Students G. Stephenson (Longman, 1973)
Mathematical Methods for Physics and Engineering K F Riley, M P Hobson & S J Bence (Cambridge University Press 1998)
A Concise Introduction to Pure Mathematics Martin Liebeck (Chapman & Hall/CRC Mathematics)
What is Mathematical Analysis? John Baylis (MacMillan, 1991)
Groups: A Path to Geometry R.P. Burn (CUP, 1987)
A First Course in Mechanics Mary Lunn (OUP, 1991)
Algorithmics — The Spirit of Computing D. Harel (Addison-Wesley, 1992)