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Mathematics

Curriculum overview

All children are entitled to a curriculum and to the powerful knowledge which will open doors and maximise their life chances. Below is a high-level overview of the critical knowledge children will learn in this subject, at each key stage from Year 11 through to Year 13, in order to equip students with the cultural capital they need to succeed in life. The curriculum is planned vertically and horizontally giving thought to the optimum knowledge sequence for building secure schema.

Review of topics is a continual process; every lesson has a Do Now that recaps knowledge covered in the previous units. All through, these reviews are an opportunity to close gaps of specific students identified through intervention planning and continual effective formative assessment.

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
YEAR 7 **Formalisation and consolidation**	**New learning**	**Unit 1: Algebra** Order of operations, algebraic notation, simplifying including expanding and factorising single brackets, negative numbers, substituting, forming expressions, solving 1, 2 and 3-step equations, common sequences, nth term **Unit 2: Number** Place value, inequalities, comparing numbers, +/- methods, decimals, money calculations, factors & multiples, HCF & LCM, product of prime factors, x/÷ methods, decimals, estimation, rounding, perimeter and area including compound shapes, time	**Unit 3: Geometry** Reading scales, powers of 10, unit conversions, identify, draw & measure angles, properties of 2D shapes, angle facts, tessellation **Unit 4: Fractions** Fractions of amounts, converting improper fractions and mixed numbers, simplifying including algebraic fractions, equivalent fractions, four operations including algebraic fractions, comparing, ordering	**Unit 5: Percentages** Fraction/decimal/% conversions, ordering fractions/decimals/%, % of (calculator and non-calculator), expressing %, % increase and decrease
YEAR 8 **Formalisation and consolidation**	**New learning**	**Unit 6: Probability and Statistics** Averages, probability scale, sample space and listing outcomes, single event probability, probability 'not', frequency trees, pictograms, bar graphs, line graphs, pie charts **Unit 7: Number** Index laws, powers and roots, Pythagoras' theorem, standard form, prime factorisation for HCF and LCM, set notation, Venn diagrams including problem solving	**Unit 8: Algebra** Inequalities, complex simplifying including algebraic fractions, formulae, transposing formulae, solving equations involving brackets and with variables on both sides, forming and solving from worded and geometric problems, expanding binomials, factorising quadratics, fractional sequences, problem solving with linear sequences, plotting linear functions from a table **Unit 9: 2D Geometry** Constructions including triangles, angle facts involving parallel lines, conversions of units including squared and cubed units, composite shapes, area of specific quadrilaterals, circumference and area of circles and part circles	**Unit 10: Proportional Reasoning** % increase/decrease, percentage change, repeated percentage change, simple and compound interest, reverse percentage, rates and ratio, speed/distance/time, density/mass/volume, pressure/force/area
YEAR 9 **Application and extension**	**New learning**	**Unit 11: 3D Geometry** Properties of 3D shapes, nets, plans and elevations, volume of prisms, pyramids and cones, surface area **Unit 12: Statistics**	**Unit 13: Graphs and Proportion** Coordinates, mid-points, linear graphs, equation of a straight line, direct/inverse proportion, scales and scale drawing **Unit 14: Algebraic Expressions**	**Unit 15: 2D Geometry** Perpendicular and angle bisectors, loci problems, mixed angle fact problems, angles in polygons, congruence and similarity, similar shapes lengths/areas/volumes, arc

		Cycle 1	Cycle 2	Cycle 3
YEAR 10 Application and extension		Representing data, comparing data sets, scatter graphs, time series and moving averages, MMMR from tables, frequency diagrams including polygons and simple histograms, identifying errors from statistical diagrams	Arithmetic and geometric sequences nth term, algebraic fractions, transposing formulae involving fctorisation, bionmials, polynomials, factorising quadratics to solve them, difference of two squares, form and solve inequalities	lengths, sector areas, geometric proof **Unit 16: Algebra - Graphs** Solve linear functions graphically, form and solve inequalities graphically, simultaneous equations, simultaneous equations graphically, quadratic/cubic/reciprocal/ exponential graphs
	New learning	**Unit 17: Geometry – Triangles and Transformations** Pythagoras, 3D Pythagoras, trigonometry introduction, trigonometric functions, trigonometric graphs, transformations including enlargement by negative and fractional scale factors **Unit 18: Probability and Statistics** Probability of combined events, AND/OR rules in probability, theoretical/experimental probabilities and expected frequency. grouped data, compare data sets, compound measures, SDT graphs	**Unit 19: Algebra - Graphs** Lengths of line segments, equation of a straight line not from a graph, parallel/perpendicular lines, sketching quadratic functions, area under curves, gradient of curves **Unit 20: 3D Geometry and Limits** Estimate complex calculations including roots and in context, error intervals, plans and elevations, 3D shapes surface area and volume, cones and spheres, limits of accuracy, upper/lower bounds, percentage error	**Unit 21: Statistics and Probability** Product rule for counting, sampling methods, capture re-capture, bias, probability from Venn diagrams, combined and conditional probability, cumulative frequency, interquartile range, box plots **Unit 22: Number** Comples index laws including equations, calculating with standard form, simple and compound interest, growth/decay, estimating roots, surds, ratio problems, converting recurring decimals and fractions
YEAR 11 Application and extension	**Application and extension of key knowledge**	**Unit 23: Algebra** Solving harder quadratic equations through factorising and the quadratic formula, complex algebraic fractions, non-linear simultaneous equations including graphically, function notation **Unit 24: 2D Geometry** Loci problems, bearings, similarity and scale factors, column vectors, vector geometry, 3D trigonometry, exact trigonometric values, sine and cosine rules, sine rule for area	**Unit 25: Number and Algebra:** Itteration and recursion, graphing proportion, circle theorems including proof, algebraic and geometric proof, circle functions and tangents, quadratic nth term, transformation of functions, quadratic inequalities **Bespoke revision LTP for each class**	
Year 12 Application and problem solve	**Application of knowledge**	**Pure Mathematics - Algebra and functions** Algebraic expressions, Quadratic functions, Equations, Inequalities Graphs, Transformations. **Pure Mathematics – Coordinate geometry in (x,y) plane** Straight-line graphs, parallel/perpendicular, length and area problems **Pure Mathematics – Further algebra** Algebraic division, factor theorem and proof, the binomial expansion	**Pure Mathematics – Trigonometry** Radians (exact values), arcs and sectors, trigonometric identities and equations **Pure Mathematics – Vectors (2D)** Magnitude/direction, addition, scalar multiplication, position vectors, distance between two points, geometric problems **Pure Mathematics – Differentiation** Differentiating polynomials, second derivatives, gradients, tangents, normals, maxima & minima **Statistics- regression and correlation** **Statistics – Data presentations and interpretation** Calculation and interpretation of measures of location and variation, Coding. Interpret diagrams for single-variable data, scatter diagrams and	**Statistics – Statistical distribution** Use discrete distributions to model real-world situations **Pure Mathematics – Integration** opposite of differentiation, indefinite integrals of x^n. Definite integrals and areas under curves **Pure Mathematics – Exponentials and logarithms** Exponential functions and natural logarithms **Mechanics – quantities and units in mechanics** Introduction to mathematical modelling and standard S.I. units of length, time and mass. Force, velocity, speed, acceleration and weight and displacement.

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
			regression lines; Recognise and interpret outliers. **Statistics Probability**	**Mechanics – Kinematics (Constant acceleration)** Graphical representation of velocity, acceleration, and displacement Motion in a straight line under constant acceleration; suvat formulae for constant acceleration; Vertical motion under gravity **Mechanics – Forces and Newton's laws** Newton's first law, force diagrams, equilibrium, i, j system Newton's second law, 'F = ma', connected particles Newton's third law: equilibrium, problems involving smooth pulleys **Mechanics – Kinematics (Variable acceleration)** Variable force; Calculus to determine rates of change for kinematics Use of integration for kinematics problems
Year 13 **Application and problem solve**	**Application of knowledge**	**Pure Mathematics – Proof** **Pure Mathematics – Algebraic and partial fractions** Simplifying algebraic fractions Partial fractions **Pure Mathematics – Functions and modelling** Modulus function Composite and inverse functions Transformations Modelling with functions **Pure Mathematics – Series and sequences** Arithmetic and geometric progressions. Sigma notation, recurrence and iterations **Pure Mathematics – The binomial theorem** Expanding $(a + bx)^n$ for rational n; knowledge of range of validity Expansion of functions by first using partial fractions **Pure mathematics – Trigonometry** Radians, arcs, sectors, small angles, secant, cosecant and cotangent Inverse trigonometrical functions; Inverse trigonometrical functions Compound and double (and half) angle formulae Proving trigonometric identities Solving problems in context **Pure mathematics - Parametric equations**	**Pure mathematics - Differentiation** Differentiating sin x and cos x from first principles Exponentials, logarithms, products, quotients, implicit and parametric functions. Second derivatives (rates of change of gradient, inflections) Rates of change problems **Pure mathematics - Numerical Methods** Location of roots Solving by iterative methods Newton-Raphson method Problem solving **Pure mathematics - Integration** Integrating x^n, exponentials and trigonometric functions. Integrating functions defined parametrically. 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. Areas under curves expressed parametrically The trapezium rule Differential equations **Pure mathematics - Vectors (3D)** Use of vectors in three dimensions. **Statistics - Regression and correlation** Change of variable, correlation coefficients, statistical hypothesis testing for zero correlation **Statistics - Probability**	**Mechanics - Moments and Forces at any angle** Forces' turning effect, resolving forces, friction forces (including coefficient of friction μ) **Mechanics - Applications of kinematics** Projectiles **Mechanics - Applications of forces** Equilibrium and statics of a particle Dynamics of a particle **Mechanics - Further kinematics** Constant acceleration, variable acceleration **Bespoke revision LTP for each class**

	Knowledge, skills and understanding to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
	Converting between parametric and Cartesian forms Curve sketching and modelling	Set notation for probability Conditional probability Questioning assumptions in probability **Statistics - The Normal distribution** Normal distribution Normal distribution as an approximation to the binomial distribution Selecting the appropriate distribution Statistical hypothesis testing for the mean of the Normal distribution	

See link to GCSE mathematics specification:

https://qualifications.pearson.com/content/dam/pdf/GCSE/mathematics/2015/specification-and-sample-assesment/gcse-maths-2015-specification.pdf

*A powerful, knowledge-rich curriculum teaches both **declarative knowledge** (facts; knowing that something is the case; what we think about) and non-declarative or **procedural knowledge** (skills and processes; knowing how to do something; what we think with). There are no skills without bodies of knowledge to underpin them.

In some subjects, a further distinction can be made between substantive knowledge (the domain specific knowledge accrued e.g. knowledge of the past) and disciplinary knowledge (how the knowledge is accrued e.g. historical reasoning).

Please refer to the DBA Mathematics Curriculum Principles, published on our website, for further information about how we have designed our curriculum.