DIXONS NEWALL GREEN ACADEMY

Subject: Mathematics

Curriculum Principles

Our uniting 'sentence' is: "The mathematics department at Dixons Newall Green allowed students to question and explore the beauty of mathematics, leading to the development of resilient and analytical problem solvers."

By the end of Year 11, a student of mathematics at Dixons Newall Green will:

- Know the fundamental skills in mathematics which allow students to understand how to use this knowledge in future learning and employment. These include money management; reading timetables; discovering and understanding patterns in data and being able to solve problems.
- Recognise the beauty in sophisticated mathematical methods; be analytical thinkers and have a thirst for mathematical reasoning.
- On leaving Dixons Newall Green, students will have developed fluency in procedures and be keen problem solvers.

In order to achieve a true understanding of mathematics, topics have been intelligently sequenced based on the following rationale:

- The overall aim of the all-through mathematics curriculum is to provide students with the knowledge they need to increase their cultural capital and be successful in their lives beyond the academy. The schemes of work sequence topics in an order closely following that set out by the Dixons Trust 'Mathematics Mastery Programme'. Adopting a spiral curriculum, in which topic areas are revisited and extended on a yearly basis, this sequence of learning promotes a deeper understanding of the mathematical concepts being taught, both in-line with the National Curriculum and in the wider domain.
- Within the classroom, all through, lessons roughly follow a six-part lesson format: Do Now, New Learning, Talk Task, Develop Learning, Independent Task, Plenary. There is a focus on 'understanding' using manipulatives and mastery before the knowledge is secured with Independent Practice to provide students with applied practice, underpinned by real life contexts. As students move towards Upper Peak and GCSE's, exam questions are a regular part of independent practice. In accordance with the curriculum overview, each year promotes a slight variation in pedagogy suitable to the students' developmental stage, whilst continuing to promote ambitious expectations for all pupils and educational equality throughout.
- The concept of interrupting the forgetting process permeates the all-through the schemes of work (SOW). Interleaving and spaced learning are utilised in several ways. Across each year, new learning is split into units of work, each beginning with quick revision, then focussing on extension and application of similar learning the year before. As a result, students will consistently revisit topics (spaced learning) and interleave concepts throughout their mathematics career. Twice a week during the schools Morning Meet there is a focus on numeracy to maintain fluency. Every lesson also begins with a 'Do Now', which promotes recall of integral knowledge, along with applied practice, from topics in the previous unit of work, allowing for spaced practice of up to six weeks. In addition, each topic taught has a mini-test and consolidation or extension re-test attached to assess understanding. Staff analyse re-tests and gaps in learning are addressed through global feedback, with opportunity for targeted additional practice. These tests ensure learning is visited repeatedly to help interrupt the forgetting process.
- Homework is compulsory and uses the significant benefits of Sparxs Maths. Every student has an individual homework plan based on a combination of reinforcing new learning, closing previous identified gaps and consolidation to ensure previous secured learning is maintained.

The mathematics curriculum will address social disadvantage by addressing gaps in students' knowledge and skills:

- All students access the same curriculum, and we have the highest expectations of all. We teach to the top with scaffolding and support for those who need it in order to allow all students to achieve and experience the very best. We do not believe in a separate foundation curriculum which can set low expectations too early in a student's education.
- The spiral nature of the mathematics curriculum is designed with the most vulnerable student in mind, assuming a basic mathematical understanding from previous learning, each year builds the students' knowledge. Key stage 3 in particular is used to ensure fluency in fundamental mathematics by closing any knowledge gaps evidenced in assessment, whilst also providing suitable extension.
- Within the first few weeks of starting all Y7 students complete a baseline test to identify current level and gaps. Students working significantly below the nationally expected level are immediately targeted by a 6-week intervention programme. Throughout the year, intervention is targeted using information from mini-test scores, question level analysis from cycle assessments and in-class effective formative assessment. Intervention includes but is not limited to - immediate in class responsive teaching, targeted Do Now tasks, individual changes to Sparxs homework and longer term intervention through Mountain Rescue.

- Double staffing is used in the classes most in need and this resource is used specifically to help and support those who require intervention. This can include one to one help through to splitting of the class to provide specific additional intervention.
- A weekly Sparx homework club is run after school to ensure all students have access to required IT and support if needed - this is particularly important for the most disadvantaged students. Research by Cambridge University has shown that students that complete 100% Sparx homework every week achieve at least 2 grades higher in their GCSE. We strongly believe that every student must complete 100% of the Sparx homework and ensuring that there are no barriers to achieving this a priority.

At KS3 and KS4, our belief is that homework should be interleaved-revision of powerful knowledge that has been modelled and taught in lessons. This knowledge is recalled and applied through a range of low-stakes quizzing and practice.

Opportunities are built in to make links to the world of work to enhance the careers, advice and guidance that students are exposed to:

- Regular careers spotlights highlight careers that utilise mathematics to showcase to students how they can use mathematics knowledge and qualifications in the workplace
- Regularly referencing different career opportunities linked to different areas of the curriculum is also crucial to developing student understanding of the world of work relating to mathematics

We fully believe mathematics can contribute to the personal development and cultural capital of all students.

- Being a universal language, and having phenomena developed all over the world, lends mathematics to promoting cultural capital. Discussion when introducing many topics, such as place value, time, Fibonacci sequences, Pythagoras and Trigonometry to name a few, allows cultural influences to be explored. For example, in Y7 students will recap telling the time and its Babylonian origins, explore where our place value systems came from and be introduced to Fibonacci and the 'Golden Ratio'. In Y8, students will discover Venn diagrams and the nuances of interest rates through percentages. Y9 and Y10 offer an insight into the history of Pythagoras Theorem and the origins of Trigonometry. Whilst not strictly appearing on the GCSE specification, providing this additional information will allow students to build their cultural capital and deepen their understanding into the true beauty behind the mathematics they learn.
- Opportunities are built into the curriculum to make links to the world of work to enhance the careers, advice and guidance that students are exposed to:
- The mathematics curriculum provides students with opportunities to consider the world of work and how mathematics leads to successful careers. Each learning intention has a purpose attached for all students to see and, where relevant, the SoW refers to how the skill in question relates to specific careers or a future life context. For example, when teaching constructions, reference can be made to any form of design work or navigational career.
- Every unit of work also contains a careers spotlight where students are introduced to a variety of careers, which utilise the learning of the unit. Information about qualifications needed, salaries and career progression are also referenced.

Our pedagogical approach is based on the latest research to ensure access for all.

- The Dixons Trust Calculation Policy is used to ensure the latest maths pedagogy approach is exploited. The calculation policy is continually updated and discussed across all Dixon Trust Schools ensuring the policy is peer reviewed and links to the very latest research.

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. The curriculum is planned vertically and horizontally giving thought to the optimum knowledge sequence for building secure schema.

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	Cycle 2	Cycle 3
YEAR 7 Formalisation and	**New Knowledge**	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	Unit 3: Geometry Reading scales, powers of 10, unit conversions, identify, draw & measure angles, properties of 2D shapes, angle facts, tessellation Unit 4: Fractions	Unit 5: Percentages Fraction/decimal/% conversions, ordering fractions/decimals/%, % of (calculator and non-calculator), expressing %, % increase and decrease

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
		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	Fractions of amounts, converting improper fractions and mixed numbers, simplifying including algebraic fractions, equivalent fractions, four operations including algebraic fractions, comparing, ordering	
	CEAIG	Careers in animation (Unit 1: linear sequences) and interior design (Unit 2: perimeter)	Careers in astronomy (Unit 3: angles) and catering (Unit 4: fractions of amounts)	Careers in accountancy (Unit 5: % increase/decrease)
YEAR 8 Formalisation and consolidation	**New Knowledge**	Unit 1: 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 2: Number Index laws, powers and roots, Pythagoras' theorem, standard form, prime factorisation for HCF and LCM, set notation, Venn diagrams including problem solving	Unit 3: 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 4: 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 5: 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 Unit 6: 3D Geometry Properties of 3D shapes, nets, plans and elevations, volume of prisms, pyramids and cones, surface area
	CEAIG	Careers in medicine (Unit 1: statistical diagrams) and ecology (Unit 2: index laws)	Careers in cryptoanalysis (Unit 3: forming and solving) and fashion design (Unit 4: area)	Careers in space travel (Unit 5 : speed, distance, time) and architecture (Unit 6 : plans and elevations)
YEAR 9 Consolidation	**New Knowledge**	. Unit 1: Statistics 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 Unit 2: Graphs and Proportion Coordinates, mid-points, linear graphs, equation of a straight line, direct/inverse proportion, scales and scale drawing	Unit 3: Algebraic Expressions 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 Unit 4: 2D Geometry Perpendicular and angle bisectors, loci problems, mixed angle fact problems, angles in polygons, congruence and similarity, similar shapes lengths/areas/volumes, arc lengths, sector areas, geometric proof	Unit 5: Algebra - Graphs Solve linear functions graphically, form and solve inequalities graphically, simultaneous equations, simultaneous equations graphically, quadratic/cubic/reciprocal/ exponential graphs Unit 6: Geometry – Triangles and Transformations Pythagoras, 3D Pythagoras, trigonometry introduction, trigonometric functions, trigonometric graphs, transformations including enlargement by negative and fractional scale factors
	CEAIG	Careers in data analysis (Unit 1 : MMMR from tables) and land surveyence (Unit 2: scales)	Careers in computer game design (Unit 3: sequences) and network coverage (Unit 4: loci)	Careers in meteorology (Unit 5: construct and solve inequalities)and surveyance and cartography (Unit 6: Pythagoras)

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
YEAR 10 Sophisticated mastery	**Exam Spec**	Unit 1: 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 2: 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 3: 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 4: 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 5: 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 Unit 6: Algebra Solving harder quadratic equations through factorising and the quadratic formula, complex algebraic fractions, non-linear simultaneous equations including graphically, function notation Bespoke revision LTP for Foundation path
	CEAIG	Careers in medicine (Unit 1: probability) politics (Unit 2: algebraic argument)	Careers in graphic design (Unit 3: 3D shapes) and market research (Unit 4: sampling)	Careers in meteorology (Unit 5: construct and solve inequalities)and surveyance and cartography (Unit 6: Pythagoras)
YEAR 11 Nuanced manipulation	**New learning**	Unit 1: 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 2: 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	
	CEAIG	Careers in nautical navigation (Unit 1: bearings) and statistical modelling (Unit 2: Iteration and recurrsion)		

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).