Subject: Mathematics

Curriculum Principles

By the end of their all-through education, 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, 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. With this in mind, throughout both Primary and Secondary, the schemes of work sequence topics in an order closely following that set out by the 'mathematics Mastery Programme'[1]. 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, lessons roughly follow a six-part lesson format: Do Now, New Learning, Talk Task, Develop Learning, Independent Task, Plenary[1]. In key stage 3 and 4 students spend more time on practice and application to promote resilience and independence. Secondary lessons in key stage 3 synthesise knowledge learned in a lesson with an exam question and there is a greater emphasis on this in key stage 4 to provide students with applied practice, underpinned by real life contexts. In accordance with the curriculum overview, each stage throughout Primary and Secondary 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[2] permeates the all-through mathematics long term plan (LTP) and 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. In Secondary, every lesson 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. The 'Do Now' also includes prerequisite knowledge of upcoming topics, to allow for a smooth transition into a new topic and a reduction of cognitive load. In addition, each topic taught has a mini-test and consolidation or extension re-test attached to assess understanding. Staff mark all re-tests and gaps in learning are addressed through global feedback, with opportunity for targeted additional practice. These tests ensure learning is visited repeatedly. Spaced learning through retrieval practice and brain dumps in morning meetings and recall homework from knowledge organisers, are supplementary ways in which the forgetting process is interrupted, leading to true mastery of the mathematical curriculum.

The threshold concepts in our subject are:

Knowledge of **Number** and place value including decimals, fractions, integer powers and roots, equivalent terminating decimals, fractions, and percentages

Knowledge of **Ratio and Proportion**, e.g. ratio of amounts, proportionality, volume and compound units, e.g. speed and density

Knowledge of **Algebra** terms to include expression, equation, inequality, term, factor, variable, function, solution, substitute, gradient, intercept, root, expand, functions and sequences both arithmetic and geometric.

Knowledge of **Shape** properties and formulae which include area and perimeter of triangles, parallelograms, trapezia, circles; volume and surface area of cuboids and prisms. In addition, properties of transformations, congruent and similar shapes

Knowledge of **Geometry** facts which include circle definitions, angles at a point, at a point on a straight line, in a triangle, vertically opposite, alternate and corresponding; in any polygon, interior and exterior angles; Pythagoras' Theorem and trigonometric ratios in right-angled triangles.

Knowledge of **Probability:** 0-1 probability scale, independent events, equally and unequally likely outcomes, possible outcomes sum to one

Knowledge of **Statistics**: Representing and analysing discrete, continuous, and grouped data, calculating averages mean, median, mode, range

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

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 stage 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.

On entry, students in Year 7 working below the nationally expected level are immediately targeted in interventions such as 'Morning Meet' sessions. Priority is given to students recognised as disadvantaged and topics covered in these sessions are identified through baseline testing. Throughout the year, attendance and topics covered in intervention sessions are altered according to mini-test scores, question level analysis from cycle assessments and in-class effective formative assessment. In order to meet the needs of all students, additional staff from the Tutor Trust[4], an Ofsted accredited charity, are employed to deliver additional small group tutoring to address knowledge gaps. Again, priority is given to disadvantaged students for this additional intervention.

Students with special educational needs or disabilities have additional support. Over timetabling and double staffing are used, where possible, all through to target this cohort in order to help close any gaps. Such students also receive further intervention through 'Morning Mastery'. 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 of what has been thought and said.

We fully believe mathematics can contribute to the personal development of students:

Students will be encouraged to develop socially in mathematics lessons through the celebration of making mistakes and setting high expectations. This helps students to develop listening and speaking skills. Taking part in 'The Maths Challenge' and 'Grade 9 Conference' events also encourages teamwork in problem solving. Self-awareness is developed through self-assessment, which enables students to have an accurate understanding of their strengths and weaknesses, to accept them and the understand how to learn from them. Additionally, students are encouraged to tutor other students in homework club, developing further their social interaction skills in a professional manner.

Developing morality is evident in much of the mathematics curriculum where there is reference to real life contexts and students are encouraged to make decisions thus developing an understanding that certain choices may have different consequences and outcomes. One example where this applies is in percentages where comparing interest rates occurs and the role of 'loan sharks' can be discussed. Additionally, topics such as tracking and how the media use misleading statistical diagrams are also addressed.

Encouraging students to question how mathematics impacts the way the world works promotes the spiritual growth of our students. Referring to 'big issues' such as the gender pay gap, birth and death rates, gambling through probability and global warming within contextual questions allows students to have a concrete understanding of where mathematics fits into the bigger picture. Teaching a variety of strategies that allow creativity to blossom (i.e. tessellation, construction and symmetry) and incorporating enrichment tasks during Maths Week such as money management and sport investigations allow students to develop more than just their problem solving skills in this subject.

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.

At Key Stage 3 and Key Stage 4, 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:

The mathematics curriculum provides students with opportunities to consider the world of work and how mathematics leads to successful careers. Each LI 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. Additionally, custom displays have been made for the mathematics department indicating a large but not exhaustive list of the many careers mathematics lends itself to.

Students have the opportunity to visit, and be visited by, mathematics specialists such as Dr Katie Chicot and mathematicians from companies such as Explore Learning through the ongoing collaborative work of the Dixons Group Maths Leads. Additionally, map and scale reading skills developed as part of the Duke of Edinburgh Award, which further develops mathematical skill.

A true love of mathematics involves learning about various cultural domains. We teach beyond the specification requirements, but do ensure students are well prepared to be successful in GCSE examinations:

Built into each Secondary SOW is content that will benefit students in their understanding of the wider impact of mathematics. For example, in Year 7 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 Year 8, students will discover Venn diagrams and the nuances of interest

rates through percentages. Year 9 and Year 10 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.

Overview of the curriculum

The table below shows the order of topics that are taught in Years 7 to 11. We recognise the importance of intelligently sequencing knowledge to develop secure schema, so in mathematics topics have been meticulously planned and ordered to ensure that students are always building on and deepening their previous learning.

	Cycle 1	Cycle 2	Cycle 3
Year 7	**Unit 1: Algebra** **Unit 2: Number CTD**	**Unit 2: Number CTD** **Unit 3: Geometry**	**Unit 4: Fractions** **Unit 5: Percentages**
Year 8	**Unit 6: Probability and Statistics** **Unit 7: Number**	**Unit 8: Algebra** **Unit 9: 2D Geometry**	**Unit 10: Proportional Reasoning** **Unit 11: 3D Geometry**
Year 9	**Unit 12: Statistics** **Unit 13: Graphs and Proportion**	**Unit 14: Algebraic Expressions** **Unit 15: 2D Geometry**	**Unit 16: Algebra – Graphs** **Unit 17: Geometry – Triangles and Transformations**

Mapping powerful knowledge in Mathematics

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 powerful knowledge children will learn in this particular subject, from Year 7 through to Year 11. The curriculum is planned vertically and horizontally giving thought to the optimum sequence for building secure schema.

	YEAR 7 Knowledge to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
Substantive knowledge introduced	**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 CTD** 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 4: Fractions** Fractions of amounts, converting improper fractions and mixed numbers, simplifying including algebraic fractions, equivalent fractions, four operations including algebraic fractions, comparing, ordering.
Substantive knowledge revisited & embedded	**Pre-requisites:** Students must be able to use the four operations confidently (Primary) Order of operations (Primary) **Future application:** Forming and solving linear equations (Y7 Unit 1/Y8 Unit 8) Substitution (Y7 Unit 1/Y8 Unit 8) Speed, distance, time calculations (Y8 Unit 10) Generating sequences (Y8 Unit 8) Expanding double brackets (Y8 Unit 8) Index laws (Y8 Unit 7) Solving equation with variables on both sides (Y8 Unit 8) Solving linear inequalities (Y8 Unit 8) Using nth term (Y8 Unit 8) Find and generate quadratic nth term (Y9 Unit 14)	**Pre-requisites:** Students must be able to use the four operations (Primary) Understand algebraic notation (Y7 Unit 1 LI1) Multiply and divide negative numbers (Y7 Unit 1 LI2) Multiplying and Dividing (Y7 U2 LI2) Place value (Y7 Unit 2) Adding (Primary) Solving equations (Y7 Unit 1 LI4) **Future application:** Standard form (Y8 Unit 7) Speed, distance, time calculations (Y8 Unit 9) Generating sequences (Y8 Unit 8) Factorising binomials (Y8 Unit 8) Estimation of calculations (Y10 Unit 20) Fermi problems (Core maths courses and university) Applied geometry problems Trigonometry	**Pre-requisites:** Understand that a fraction such as 3/5 represents "3 out of 5" (Primary) Multiplication and division facts to 12x12 (Primary) Students should know multiplication and division facts to 12x12 (Primary) Dividing using bus stop method (Primary/Y7 Unit 2) Finding the HCF of two or more numbers (Y7 Unit 2) Multiplication facts up to 12x12 (Primary) Grid multiplication and bus stop division (Y7 Unit 2) Understanding that fractions are parts of a whole that is split into equal parts (Primary/Y7 Unit 3 LI3) Students must have a sound understanding of equivalent fractions by finding multiples and by simplifying (Y7 Unit 3 LI3) Students must be able to use the four operations confidently (Primary/ Y7 C1) **Future application:** FDP Conversions (Y7 Unit 5) Ratio (Y8 Unit 10)

	YEAR 7 Knowledge to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
			Probability (Y8 Unit 1/Y9 Unit 12/Y10 Unit 21) Calculating with fractions (Y7 Unit 4) FDP conversions (Y7 Unit 5) Probability tree calculations for combined events (Y10 Unit 21) Conditional probability calculations (Y10 Unit 21) FDP conversions (Y7 Unit 5) Compound measures (Y8 Unit 10) Probability calculation problems (Y8 Unit 1, Y10 Unit 21)
Substantive knowledge introduced	**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 5: Percentages** Fraction/decimal/% conversions, ordering fractions/decimals/%, % of (calculator and non-calculator), expressing %, % increase and decrease.
Substantive knowledge revisited & embedded	**Pre-requisites:** Students must be able to use the four operations (Primary) Understand algebraic notation (Y7 Unit 1 LI1) Multiply and divide negative numbers (Y7 Unit 1 LI2) Multiplying and Dividing (Y7 U2 LI2) Place value (Y7 Unit 2) Adding (Primary) Solving equations (Y7 Unit 1 LI4) **Future application:** Standard form (Y8 Unit 7) Speed, distance, time calculations (Y8 Unit 10) Generating sequences (Y8 Unit 8) Factorising binomials (Y8 Unit 8) Estimation of calculations (Y10 Unit 20) Fermi problems (Core maths courses and university) Applied geometry problems Trigonometry	**Pre-requisites:** multiplying and dividing by powers of 10 (Y7 Unit 2) Knowledge of conversion between units (Primary) know that 90 degrees is a right angle (Primary) know that a half turn is 180 degrees (Primary) know that a full turn is 360 degrees (Primary) Knowledge of common polygons up to dodecagon (Primary) Name given polygons including regular and irregular – i.e. show a picture of a star and name it as an irregular decagon (Primary) Common angle types/sizes (Y7 Unit 3, LI2) Knowledge of how to measure angles (Y7 Unit 3, LI2) Knowledge of properties of triangles and quadrilaterals (Y7 Unit 3, LI3) **Future application:** Statistics units: scatter graphs, histograms (Y8 Unit 6) Converting square and cubic units (Y8 Unit 9) drawing pie charts (Y8 Unit 6) Angles in parallel lines (Y8 Unit 9) Vector geometry (Y11 Unit 24) Angles in parallel lines (Y8 Unit 9) Angles in polygons (Y9 Unit 15) Angles in polygons (Y9 Unit 15) Circle theorems (Y11 Unit 25)	**Pre-requisites:** Understanding percentages are out of 100 and proportion is showing an amount of a whole (Primary) Be able to calculate equivalent fractions (Y7 U4) Understand place value columns (Y7 U2) Dividing by 100 (Y7 Unit 2) Simplifying fractions (Y7 U4) Factors and multiples (Y7 Unit 2) FDP (Y7 Unit 5) Percentage of amounts (Y7 Unit 5) FDP conversion (Y7 Unit 5) Multiplying decimals (Y7 Unit 2) **Future application:** Proportional reasoning (Y8 Unit 10) Proportional reasoning including reverse percentage and interest calculations (Y8 Unit 10) Proportional Reasoning, Percentage Increase and decrease, Reverse Percentages, Interest and Ratio (Y8 Unit 10) Simple and compound Interest (Y8 Unit 10)
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)
Disciplinary knowledge introduced, revisited & embedded	**Students will learn to:** interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning solve complex calculation problems, including multi-step problems relate the language of ratios and the associated calculations to fractions and linear functions make connections between number relation-ships and their algebraic and graphical representations model situations by translating them into algebraic expressions or formulae or by using graphs make and test conjectures about patterns and relationships; look for proofs and counterexamples select appropriate methods to apply to unfamiliar and non-routine problems and interpret		

	YEAR 8 Knowledge to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
Substantive knowledge introduced	**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 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 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.
Substantive knowledge revisited & embedded	**Pre-requisites:** Simple probability (Primary) Four Operations (Y7 Unit 1) Algebraic notation (Y7 Unit 1) Algebraic notation (Y7 Unit 1) Simple statistical diagrams (Primary) Four operations (Primary / Y7 Unit 2 LI2) Reading tables (Primary) Drawing Angles (Y7 Unit 3) Calculating with fractions (Y7 Unit 4) **Future application:** Complex algebraic probability problems Probability trees (Y10 Unit 21) MMMR from grouped data (Y10 Unit 18) Histograms (Y9 Unit 12) Interpreting statistical representations (Y9 Unit 12)	**Pre-requisites:** Students should be able to identify if a quantity is more than, less than or equal to another quantity (primary) Students should be able to use a number line (primary) Students should understand algebraic notation (Y7 Unit 1) Understand algebraic notation (Y7 Unit 1) Fractions (Y7 U3) Solve simple algebraic equations (Y7 Unit 1) Algebraic manipulation (Y7 Unit 1) Multiplying terms (Y7 Unit 1, Y8 Unit 8) Expanding single brackets and simplifying (Y7 Unit 1, Y8 Unit 8) Important sequences (Y7 Unit 1) Nth term rule (Y7 Unit 1) **Future application:** Forming and solving inequalities (Y9 Unit 14) Estimation in calculations (Y10 Unit 20) Speed, distance, time calculations (Y8 Unit 10) Trigonometric functions (Y10 Unit 17) Solve more complex algebraic equations (Quadratics) (Y10 Unit 5) Solve simultaneous equations (Y9 Unit 2) Sketching quadratic functions (Y11 Unit 23) Solving harder quadratics and algebraic fractions (Y1 Unit 23) Find and generate quadratic nth term (Y9 Unit 14)	**Pre-requisites:** Multiply and divide numbers by 100 (Y7 Unit 2) Know that fractions, decimals and percentages have equivalents. (Y7 Unit 5) Multiply and divide numbers by 100 (Y7 Unit 2) Know that fractions, decimals and percentages have equivalents. (Y7 Unit 5) Multiply and divide numbers by 100 (Y7 Unit 2) Know that fractions, decimals and percentages have equivalents. (Y7 Unit 5) Share an amount using bar modelling. (Primary) Divide two numbers using short division. (Primary/Y7 Unit 2) Be familiar with units of distance and time. (Y7 Unit 1) Convert minutes into fractions of an hour. (Y7 Unit 1) **Future application:** Growth and decay (Y10 Unit 22) Probability (Y9 Unit 6) Ratio problems (Y10 Unit 22)
Substantive knowledge introduced	**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 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 11: 3D Geometry** Properties of 3D shapes, nets, plans and elevations, volume of prisms, pyramids and cones, surface area histograms, identifying errors from statistical diagrams.
Substantive knowledge revisited & embedded	**Pre-requisites:** Write a number given to a power as a repeated multiplication (Primary/Y7 Unit 2) Use multiplication facts up to 12 x 12 (Primary) Understand the place value of digits in terms of powers of 10 (Y7 Unit 3) Know when a number is prime (Y7 Unit 2) Recall prime numbers between 1 and 20 (Y7 Unit 2) **Future application:** Algebraic use of index laws (Y8 Unit 7) Complex algebraic use of index laws including equations (Y11 unit 23) Pythagoras' theorem (Y10 Unit 17) Surds (Y10 Unit 22) Calculating with standard form (Y10 Unit 22) Probability from Venn diagrams (Y10 Unit 21) Probability from Venn diagrams (Y10 Unit 21)	**Pre-requisites:** Measure/draw angles accurately to the nearest degree (Y7 Unit 3) Measure/draw lines accurately to the nearest millimeter (Primary) Know the angle sum for a straight line, around a point and in triangles and quadrilaterals (including special cases) and use these facts to calculate the value of unknown angles (Y7 Unit 3) Identify angles using angle notation, such as knowing angle ABC is formed by the junction of the lines AB and BC (Y7 Unit 3) Know the angle sum for a straight line, around a point and in triangles and quadrilaterals (including special cases) and use these facts to calculate the value of unknown angles (Y7 Unit 3) Recognise different metric units of measure for length, mass and capacity/volume (Y7 Unit 3) Multiply and divide integers and decimals by powers of 10 (Y7 Unit 3) Calculate the area of rectangles, triangles, parallelograms and simple compound shapes (Y7 Unit 3) Calculate the perimeter and area of 2D shapes (Y7 Unit 3) **Future application:** Loci problems (Y9 Unit 15 and Y11 Unit 24) Angles in polygons (Y9 Unit 15) Bearings (Y11 Unit 24) Similar shape areas and volumes (Y9 Unit 15) L-shaped prism volume (Y9 Unit 11) Volume of cylinders (Y9 Unit 11) Area and circumference problems including arc lengths and sector areas (Y9 Unit 15)	**Pre-requisites:** Name common solids. (Primary) Sketch rectilinear shapes. (Primary) Area of 2D shapes (Y8 Unit 9) **Future application:** Surface area and volume (Y8/Unit 5) Pythagoras' Theorem in 3D shapes (Y10 Unit 17) Proportion and scale (Y9 Unit 13) Pythagoras and trigonometry (Y10 Unit 17)
CEAIG	Careers in medicine (Unit 6: statistical diagrams) and ecology (Unit 7: index laws)	Careers in cryptoanalysis (Unit 8: forming and solving) and fashion design (Unit 9: area)	Careers in space travel (Unit 10 : speed, distance, time) and architecture (Unit 11: plans and elevations)
Disciplinary knowledge introduced,	**Students will learn to:** interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning		

	YEAR 8 Knowledge to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
revisited & embedded	solve complex calculation problems, including multi-step problems relate the language of ratios and the associated calculations to fractions and linear functions. make connections between number relation-ships and their algebraic and graphical representations model situations by translating them into algebraic expressions or formulae or by using graphs find approximate solutions to contextual problems from graphs of a variety of functions make and test conjectures about patterns and relationships; look for proofs and counterexamples select appropriate methods to apply to unfamiliar and non-routine problems and interpret		

	YEAR 9 Knowledge to be gained at each stage*		
	Cycle 1	**Cycle 2**	**Cycle 3**
Substantive knowledge introduced	**Unit 12: Statistics** Representing data, comparing data sets, scatter graphs, time series and moving averages, MMMR from tables, frequency diagrams including polygons and simple.	**Unit 14: Algebraic Expressions** Arithmetic and geometric sequences nth term, algebraic fractions, transposing formulae involving factorisation, binomials, polynomials, factorising quadratics to solve them, difference of two squares, form and solve inequalities.	**Unit 16: Algebra - Graphs** Solve linear functions graphically, form and solve inequalities graphically, simultaneous equations, simultaneous equations graphically, quadratic/cubic/reciprocal/ exponential graphs.
Substantive knowledge revisited & embedded	**Pre-requisites:** Order numbers (Y7 Unit 2) Add and subtract integers (Y7 Unit 2) Understand MMMR (Y8 Unit 6) Plot coordinates (Primary) Reading scales (Y7 Unit 3) Calculating MMMR (Y8 Unit 6) Plot coordinates (Y8 Unit 6). Read statistical diagrams (Y8 Unit 6) **Future application:** More complex methods of representing data (Y10 Unit 18) Complex histogram statistics (Y10 Unit 18). Further statistics (Y10 Unit 18)	**Pre-requisites:** Deduce and use nth term of an arithmetic sequence (Y8 Unit 8) Recognise different types of sequence (Y7 Unit 1) Multiplying terms (Y7 Unit 1, Y8 Unit 8) Expanding single brackets and simplifying (Y7 Unit 1, Y8 Unit 8) HCF of numbers (Y8 Unit 7) Divide terms (Y8 Unit 8) Solving linear equations (Y8 Unit 8) Factorising quadratics (Y8 Unit 8) Form and evaluate expressions (Y8 Unit 8) Simple rearranging of formulae (Y8 Unit 8) **Future application:** Different algebraic graphs (Y10 Unit 19) Sketching quadratic functions (Y10 Unit 19) Solving harder quadratics and algebraic fractions (Y11 Unit 23) Graphing quadratic functions (Y10 Unit 19) Factorising quadratics (Y11 Unit 23) Graphing inequalities (Y9 Unit 16) Quadratic inequalities (Y11 Unit 23) Solving equations graphically which are not equal to zero (Y9 unit 16) Algebraic and geometric proof (Y11 Unit 25)	**Pre-requisites:** Measure and draw lines taking into account a given scale (Y9 Unit 13). Construct triangles accurately (Y8 Unit 9). Area of 2D shapes (Y8 Unit 9) **Future application:** Transformations of shapes (Y10 Unit 17) Loci problems (Y11 Unit 24) Proportion and scale (Y9 Unit 13) Pythagoras and trigonometry (Y10 Unit 17)
Substantive knowledge introduced	**Unit 13: Graphs and Proportion** Coordinates, mid-points, linear graphs, equation of a straight line, direct/inverse proportion, scales and scale drawing.	**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 lengths, sector areas, geometric proof.	**Unit 17: Geometry – Triangles and Transformations** Pythagoras' theorem, Pythagoras' theorem inc. 3D, Reflection, rotation, translation, enlargement (inc. negative and fractional), Mixed transformations and describing.
Substantive knowledge revisited & embedded	**Pre-requisites:** Plot coordinates in the first quadrant (Y8 Unit 6 & Primary) Simple Pythagoras theorem (Y8 Unit 7) 2D shape properties (Y7 Unit 3) Plot coordinates (Y9 C1a) Transposing formulae/equations (Y8 Unit 8) Use the unitary/box method for proportional relationships (Y8 Unit 10) Use scales (Y7 Unit 3) Convert between units of measure (Y7 Unit 3, Y8 Unit 9) **Future application:** More complex line-segments (Y10 Unit 19) Vector geometry (Y11 Unit 24) Equation of a line from a point and the gradient/to points (Y10 Unit 19) Parallel and perpendicular lines (Y10 Unit 19) Graphing proportion (Y11 Unit 25) Loci problems involving scales (Y11 Unit 24)	**Pre-requisites:** Measure and draw lines taking into account a given scale (Y9 Unit 9). Construct triangles accurately (Y8 Unit 3). Know and use angle facts, including those in parallel lines (Y7 Unit 3/ Y8 Unit 9) Understand ratio as a proportion of one amount of another (Y8 Unit 10) Converting units for area and volume (Y7 Unit 10) Area and circumference of circles (Y8 Unit 9) **Future application:** Transformations of shapes (Y10 Unit 17) Loci problems (Y11 Unit 24) Circle theorems (Y11 Unit 25) Similar shape areas and volumes (Y10 Unit 20) Surface area and volume of cones and spheres (Y10 Unit 20)	**Pre-requisites:** Squares and roots (Y8 Unit 7) 2D shapes and properties, Unit conversions (Y7 Unit 3) Pythagoras (Y8 Unit 7) **Future application:** GCSE Exams
CEAIG	Careers in data analysis (Unit 12: MMMR from tables) and land surveyence (Unit 13: scales)	Careers in computer game design (Unit 14: sequences) and network coverage (Unit 15: loci)	Careers in meteorology (Unit 16: construct and solve inequalities) and surveyance and cartography (Unit 17: Pythagoras)
Disciplinary knowledge introduced, revisited & embedded	**Students will learn to:** interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning solve complex calculation problems, including multi-step problems relate the language of ratios and the associated calculations to fractions and linear functions. make connections between number relation-ships and their algebraic and graphical representations model situations by translating them into algebraic expressions or formulae or by using graphs find approximate solutions to contextual problems from graphs of a variety of functions make and test conjectures about patterns and relationships; look for proofs and counterexamples select appropriate methods to apply to unfamiliar and non-routine problems and interpret		

References

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3 https://learning.wellingtoncollege.org.uk/independent-learning-week-3-desirable-difficulties-part-2/

4 https://www.thetutortrust.org/

Further information

Unit skill mapping

Long term plans

Knowledge organisers

Schemes of work

All through overview

WTD Curriculum – weekly sequencing

WTD Mathematics Assessment

Curriculum introduction PPT