OCL Maths Curriculum: Statement of Intent

Department vision

We believe every child can succeed to meet their fullest potential and to develop a lifelong appreciation for Mathematics. This is reinforced by the confidence and a belief that you can be fluent at solving mathematical problems.

Purpose of study

The OCL Maths Curriculum is designed in conjunction with Mathematics Mastery. This means that pupils are given a "thorough understanding of mathematical concepts, rather than a set of techniques or routines to get to the right answer" (EEF). We want our students to be curious learners who can apply their knowledge and skills to the real world. We enable them with the powerful knowledge that allows them to acquire fluency in crucial mathematical procedures and means they can master and retain key concepts which in turn will result in all students fulfilling their academic potential in maths.

We value character, competence and community in our curriculum:

- **Character:** Our Maths lessons ensure that all students develop confidence in Maths, and identify as "good at Maths". Through talk tasks to check for understanding, the participation of all students in articulating mathematical ideas is a key feature of our teaching. Students are taught to interact with each other with patience, honesty, and independence through opportunities for structured self-reflection throughout the lesson: in self and peer assessment, exit tickets, and mastery matrices.
- **Competence**: Developing pupils' competence in Maths is at the heart of our curriculum. We build strong foundations by taking every opportunity to develop our students' numeracy skills: in lessons, and in structured interventions. In our curriculum, we draw on research from cognitive science to accelerate our students learning. We connect new knowledge to existing knowledge, to expand students' schemas, and develop their skills in the core concepts of Maths.
- **Community:** Through an engaging, relevant Maths curriculum, students are exposed to the story and history of mathematical ideas. In this way students develop respect for others and an appreciation of diversity and inclusivity, and learn how to challenge and question. Students also have the opportunity to develop their passion, their identity, and their sense of belonging, through success in Maths, and through trips and after-school clubs, in different forms across the trust.

Core concepts and principles of progression

The Oasis Maths curriculum is carefully planned so that core mathematical skills, knowledge and understanding are developed over time. Mathematical knowledge is understood and built on cumulatively, and in the context of applying this knowledge to develop skills. These core mathematical skills build on the "big ideas" of the OCL Primary curriculum, and exceed the objectives of the Maths national curriculum for KS3/4. They are laid out below:

- **Mathematical fluency**. This builds on the OCL Primary Maths curriculum's big idea of "fluency".
  - Developed when we teach procedures.
  - Developed when we teach facts, and test students on their knowledge organisers.
- **Mathematical representation, language, and notation.** This builds on the OCL Primary Maths curriculum's big idea of "representation and structure".
  - Multiple representations are used during new learning, we introduce definitions and new language explicitly.
  - Teachers model and insist that students use this taught mathematical language. Teachers and students also use mathematical notation correctly at all times, in order to prepare students for future mathematical study, to ready learners for the application of Maths to other subjects, and to avoid embedding misconceptions.
  - Definitions and mathematical language are also in our knowledge organisers, and we use the spaced testing effect to embed this knowledge.
- **Mathematical thinking.** This builds on the OCL Primary Maths curriculum's big idea of "mathematical thinking".
  - Analytical thinking
    - Students are taught to observe carefully, and to comprehend all the information in a question, and reorganise it into a diagram, or a "simpler problem".
    - Students are taught to think logically and systematically about the different possible ways to approach the problem, and how to decide on a way forwards.
  - Proportional thinking
    - Students are taught to be able to handle problems in ratio and proportion, and understand topics like percentages, fractions of amounts, direct/inverse proportion, sequences, and ratios as a related schema (bar models are used to make this pictorial).
  - Statistical thinking
    - Students are taught to understand how measures of central tendency and measures of spread can help us to draw inferences about populations.
    - Students encounter large sets of data, and understand how to collect, represent, and interpret it.
- **Mathematical reasoning**. This builds on and further extends the OCL Primary Maths curriculum's big idea of "mathematical thinking".
  - Students are taught to reason abstractly, to understand cause and effect through "if, then" relationships, as well as "if and only if" relationships.
  - Abstract reasoning, such as solving equations, and finding missing values is taught explicitly, and builds on the fundamental skills of mathematical fluency, mathematical language and notation, and mathematical thinking.
  - The disciplinary knowledge of deductive proof, and formal mathematical argument is taught later in the curriculum, as it requires students to have gained mastery in many other areas, and to have acquired automaticity in many mathematical processes. Example curriculum areas are: area and perimeter problems, algebraic methods, circle theorems, proof.

- **Problem-solving.**
    - Students are taught to experiment and form hypotheses.
    - Students are also taught explicit problem-solving techniques, like ‘drawing a picture’, asking a related simpler problem, and “trying out numbers”.
    - Students are shown typical problems and taught to relate unseen problems to those they have encountered before.
- **Conceptual understanding**. This builds on the OCL Primary Maths curriculum’s big idea of “variation”.
    - Conceptual understanding is developed by showing examples and non-examples, by having students articulate their knowledge, and by activating prior knowledge and embedding new knowledge in these contexts, so that students are supported to create connected schemas in their minds.

Aims and Outcomes

The aim of our curriculum is to inspire in our students a love of Maths, and a confidence in applying it in their lives. We want our students to understand the history of our subject as one which has developed over millennia of collective human endeavour, and which is embedded in every facet of our civilisation. We also want our students to identify as being “good” at Maths, and feel confident in applying the ideas they have learnt to any field or pursuit they engage with.

Through our carefully sequenced and ambitious curriculum we intend that our students will be able to:

1. **Develop fluency** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
2. **Reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
3. **Solve problems** by applying their mathematics to a variety of routine and non- routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

OCL MATHS LONG TERM PLAN

YEAR 7 (MATHS MASTERY 2021/22 SoL)					
In this year we reinforce and build on the knowledge and skills students have developed in the primary curriculum, and begin to extend the big ideas from the Primary curriculum into our core concepts. In Autumn 1, we use **multiple representations** to build **conceptual understanding** of number and number properties in students schemas. Moving through to Autumn 2, for many students this is the first time they will be introduced to algebra formally. In their Primary education they will have seen and understood the idea of a "missing number" or "unknown", and may have seen inequality signs, but tier 2 and tier 3 language like "co-efficient, variable, equation, inequality, expression, term, constant" will be new, so careful attention to modelling **mathematical language and notation**, and a focus on building **fluency** in basic algebra skills will be crucial. Moreover, a **conceptual understanding** of algebra as a generalised version of arithmetic will develop by building on the work done in Autumn 1. In Spring 1 and Spring 2 students learn about Geometry for the first time at Secondary. They build on their understanding of shape, space, and basic transformations to understand more formal ideas like the Cartesian plane. In this term students will properly encounter many of the of the higher-level core concepts like **mathematical reasoning** and **problem-solving**. In Summer 1, students build on the **conceptual understanding** that was built in Y7 Autumn 1 to develop **fluency** in operations on fractions. Finally, in Summer 2, students' **mathematical thinking** is focused on, as students are required to **think proportionally** in different scenarios, and with different **mathematical language and notation**.					
Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Topic: Making generalisations about the number system (1) **Number** **Knowledge and skills covered:** Unit 1 – numbers and numerals Unit 2 – axioms and arrays Unit 3 – factors and multiples Unit 4 – order of operation	**Topic: Making generalisations about the number system (2)** **Algebra** **Knowledge and skills covered:** Unit 5 – positive and negative numbers Unit 6 – expressions, equations, inequalities	**Topic: 2D Geometry** Geometry **Knowledge and skills covered:** Unit 7 – angles Unit 8 – classifying 2D shapes Unit 9 – constructing triangles and quadrilaterals	**Topic: The Cartesian plane** Geometry **Knowledge and skills covered:** Unit 10 – co-ordinates Unit 11 – area of 2D shapes Unit 12 – transforming 2D figures	**Topic: Fractions** **Number** **Knowledge and skills covered:** Unit 13 – prime factor decomposition Unit 13 – equivalent fractions Unit 14 – all operations acting on fractions	**Topic: Ratio and proportion** **Ratio and Proportion** **Knowledge and skills covered:** Unit 15 – ratio Unit 16 - percentages

YEAR 8 (MATHS MASTERY 2021/22 SoL)					
In year 8, we build on the strong foundations of **fluency** and **conceptual understanding** built in Y7 to explore some of the more advanced core concepts, and brand-new mathematical ideas. In Autumn 1, students explore sequences, and develop their **conceptual understanding** of algebra as a generalised arithmetic, by understanding how to algebraically describe the number sequences they encountered in their Primary education. Later in the half term, students build on the fluency in algebra they built in Y7 Autumn 2 to *form* and solve equations and inequalities, and in doing so build their **mathematical reasoning**, and **problem-solving** abilities. In Autumn 2, students' schemas around algebra are extended to include geometric interpretations of the equations they have been solving so far. This unit is also an application of the knowledge they have about the cartesian plane from Y7 Spring 2. In teaching students how to link these ideas, **mathematical language, representation and notation** will be crucial, as will a **conceptual understanding** of graphs as an infinity of individual coordinates. In Spring 1, students revisit the core concept of **proportional thinking** (from Y7 Summer 2), and apply the knowledge about graphs they have just learned in Y8 Autumn 2, to come to develop their **mathematical reasoning** in the arena of direct and inverse proportion. As with many units concerning ratio and proportion, fluency in the fundamental skills will be an important 'barrier to entry'. To support with this, the use of **multiple representations**, a focus on **mathematical language**, to build **conceptual understanding** will be important to teaching. In Spring 2, students encounter the curriculum area of probability and statistics for the first time in their lives. This is no longer covered in the Primary curriculum, and therefore, an extreme clarity in the **mathematical language** we introduce will be crucial to developing strong foundational understanding. Finally, in Summer 1 and Summer 2, students build on the 2 half-terms of geometry they learned in Y7, deepening their **fluency** and **mathematical thinking**, and extending these ideas to yet more formal contexts. This term will be an important term in developing students **problem-solving** skills, and supporting students to present their work in a way that supports clarity in their **mathematical reasoning.**					
Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Topic: Equations and inequalities **Number + Algebra** **Knowledge and skills covered:** Unit 1 – Sequences Unit 2 - Forming and Solving Equations Unit 3 – forming and solving inequalities *NB: The sequences unit here should cover everything needed on the KS3 curriculum, as the Y9 unit was removed due to repetition.	**Topic: Graphs** **Algebra** **Knowledge and skills covered:** Unit 4 – linear graphs and identify key features of linear graphs Unit 5 – accuracy and estimation Unit 13 – Prime factor decomposition (year 7)	**Topic: Proportional Reasoning** **Ratio and Proportion** **Knowledge and skills covered:** Unit 6 – ratio Unit 7 - Real life graphs and rate Unit 8 – direct and inverse proportion	**Topic: Representations and reasoning with data** **Probability & Statistics** **Knowledge and skills covered:** Unit 9 – univariate data (construct and interpret charts and graphs, mean, mode, median, range) Unit 10 – bivariate data (scatter graphs)	**Topic: Angles** **Geometry** **Knowledge and skills covered:** Unit 11 – angles in parallel lines and polygons Unit 12 – transformation (year 7) Unit 12 – bearings	**Topic: Area, volume and surface area** **Geometry** **Knowledge and skills covered:** Unit 13 – circles and composite shapes Unit 14 – volume of prisms Unit 15 – surface area of prisms.

YEAR 9 (OCL SoL 2021-22)					
In year 9, students have spent 2 years developing a **conceptual understanding** of many of the central ideas in number, algebra, and ratio, as well as **fluency** in many of the skills necessary to achieve at KS4. This year, this knowledge and these skills are utilised to explore more advanced and 'exotic' areas of Mathematics, as students prepare to begin studying the formal Mathematics of GCSE Maths next year. In Autumn 1, students are exposed to a variety of curriculum areas which cement their **fluency** and **conceptual understanding** in preparation for the more advanced ideas in the rest of Y9. In Autumn 2, students' understanding of algebra is deepened and extended as they reason with purely abstract ideas, including changing the subject, and algebraic factorisation. In this half term, **mathematical thinking** and **mathematical reasoning** feature prominently. These algebraic ideas are built on in Spring 2, when graphs are studied as an alternative **representation** of the equations and inequalities they have come to manipulate **fluently**. In Spring 1, and Summer 1, students' build on the large maps of geometry knowledge they have built over their education to encounter more nuanced **problem-solving** in spring 1, including forming and solving equations, before brand new ideas are introduced in Trigonometry. Students need to **reason mathematically** and have a **fluent, conceptual understanding** of many previous areas of the curriculum to access this well – including congruence and similarity from Y9 Spring 1, equations and algebraic manipulation from Y9 Autumn 2, and on all occasions before that as their algebraic skills developed, and number skills from across Y7 and Y8. Finally, in Summer 2, students' meet mathematical Probability for the first time. They build on their understanding of data from Y8 Spring 2 to develop a **conceptual understanding** of the difference between experimental and theoretical probability, and develop **fluency** in using the different tables and graphs which **represent** the data.					
Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Topic: Coordinates, Linear Graphs, Proportion, and Standard Form **Number + Algebra** **Ratio and Proportion**	**Topic: Algebraic Expressions** **Algebra**	**Topic: 2D geometry** **Geometry**	**Topic: Equations and Inequalities** **Algebra**	**Topic: Trigonometry** **Geometry**	**Topic: Statistics** **Probability & Statistics**
Knowledge and skills covered: Unit 3 – Direct, Inverse Proportion Unit 1 – Coordinates Unit 2 – Linear Graphs Unit 4 – Standard Form	**Knowledge and skills covered:** Unit 3 – forming and solving inequalities (year 8) Unit 6 – Expanding and Factorising Unit 7 – Algebraic Manipulation *NB: Unit 5: Sequences was originally here, but I have replaced it with algebra recap, as sequences is covered in Y8.	**Knowledge and skills covered:** Unit 8 – Constructions Unit 9 – Congruence and Similarity Unit 10 – Triangles and Quadrilaterals Unit 10 – angles in polygons (year 8)	**Knowledge and skills covered:** Unit 12 – Linear equations and Inequalities Unit 13 – Simultaneous Equations Unit 14 – Quadratic and other Graphs	**Knowledge and skills covered:** Unit 15 – Pythagoras Unit 16 – Trigonometry Unit 11 – bearings (year 8) Unit 17 – Proof	**Knowledge and skills covered:** Unit 18 – Probability Unit 19 – Mean from Grouped Data Unit 20 – Comparing Distributions Unit 21 – Cumulative Frequency and Box Plots *NB: We switched out scatter graphs for the unit on cumulative frequency and box plots, as scatter graphs is a repeat from Y8.

YEAR 10 (OCL SoL 2021-22)						
In Y10, students enter the first year of formal study for their GCSE. In many schools, students have been tiered into foundation or higher according to how well they fared with the more advanced topics in Y9. For students on both tiers, but particularly those on the foundation tier, core knowledge and skills are revisited, to ensure that students have the **fluency** and **conceptual understanding** necessary to access the entire KS4 curriculum. Having revisited knowledge and skills from KS3, students are equipped to fully explore the core concepts of **mathematical thinking**, **mathematical reasoning**, and **problem-solving**. This is done in every half term, as students build up to answering exam-style questions, and teachers model **mathematical language and notation** which is suitably formal for KS4.						
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
FOUNDATION	**Topic: Number** **Number** **Knowledge and skills covered:** Unit 1 – factors, multiples and primes Unit 2 – powers and roots Unit 3 – indices Unit 4 – standard form Unit 6 - sequences	**Topic: Algebra** **Algebra** **Knowledge and skills covered:** Unit 6 – algebra (KS3 review) Unit 7 – quadratics Unit 8 – quadratic graphs Unit 9 – simultaneous equations	**Topic: Percentages and probability** **Number + Probability & Statistics** **Knowledge and skills covered:** Unit 10 – fractions, decimals and percentages Unit 11 – percentages Unit 12 – probability, sets and Venn diagrams	**Topic: Geometry** Geometry **Knowledge and skills covered:** Unit 13 – transformations Unit 14 – 2D shapes including circle geometry Unit 15 – 3D shapes Unit 16 – volume and surface area	**Topic: Similarity** **Ratio and Proportion** + Geometry **Knowledge and skills covered:** Unit 17 – ratio review Unit 18 – compound measure and direct and indirect proportion Unit 19 – Pythagoras' Theorem review Unit 20 – similarity and Trigonometry	**Topic: Data handling** **Probability & Statistics** **Knowledge and skills covered:** Unit 21 – averages and range Unit 22 – data collection and sampling Unit 23 – presenting data including scatter graphs
HIGHER	**Topic: Number** **Number** **Knowledge and skills covered:** Unit 1 – powers and roots Unit 2 – surds and irrational numbers Unit 3 – indices Unit 4 – standard form Unit 5 – sequences	**Topic: Algebra** **Algebra** **Knowledge and skills covered:** Unit 6 – quadratics Unit 7 – quadratic graphs Unit 8 – algebraic fractions Unit 9 – simultaneous equations	**Topic: Percentages and probability** **Number + Probability & Statistics** **Knowledge and skills covered:** Unit 10 – fractions, decimals and percentages Unit 11 – percentages Unit 12 – probability, sets and Venn diagrams	**Topic: Geometry** Geometry **Knowledge and skills covered:** Unit 13 – transformations Unit 14 – upper and lower bounds Unit 15 – 2D shapes including circle geometry Unit 16 – 3D shapes Unit 17 – volume and surface area	**Topic: Similarity** **Ratio and Proportion** + Geometry **Knowledge and skills covered:** Unit 18 – ratio review Unit 19 – compound measure and direct and indirect proportion Unit 20 – Pythagoras' Theorem review Unit 21 – similarity and Trigonometry Unit 22 – 3D Trigonometry and Pythagoras	**Topic: Data handling** **Probability & Statistics** **Knowledge and skills covered:** Unit 23 – averages and range Unit 24 – data collection and sampling Unit 25 – presenting data including scatter graphs Unit 26 – further statistical diagrams
	End of Year exam: AQA November 2020 Paper 1, 2 and 3 (FOUNDATION or HIGHER)					

YEAR 11 (OCL SoL 2021-22)						
In our students' final year of study, we begin by drawing on all of the knowledge and skills they have developed over their 4 years with us to introduce some the most challenging GCSE content, including vectors, construction and loci, and geometric reasoning at foundation tier, and trigonometric graphs, algebraic proof, and functions at higher tier. Students are now refining and fully developing their **problem-solving** and **mathematical reasoning** skills in preparation for their exam. In the periods of revision that are scheduled, teachers identify gaps in knowledge and underdeveloped skills in their students, and revisit elements of the KS4 curriculum accordingly. Often, these areas of weakness will not be in **fluency**, but in students' ability to **reason mathematically** with the knowledge they have, or **problem-solve** in unseen situations. They will use this time to hone these core concepts fully.						
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
FOUNDATION	**Topic: Reasoning and Proof** Geometry **Knowledge and skills covered:** Unit 24 – vectors Unit 25 – geometric reasoning Unit 26 – bearings Unit 27 – congruence Unit 28 – construction and loci	**Topic: Inequalities and graphs** **Algebra** **Knowledge and skills covered:** Unit 29 – linear inequalities Unit 30 – linear graphs Unit 31 – non-linear graphs	**Topic: REVISION**	**Topic: REVISION**	**Topic: REVISION**	
HIGHER	**Topic: Reasoning and Proof** Geometry **Knowledge and skills covered:** Unit 27 - vectors Unit 28 – geometric reasoning Unit 29 – circle theorems Unit 30 – bearings Unit 31 – congruence Unit 32 – construction and loci	**Topic: Inequalities and graphs** **Algebra** **Knowledge and skills covered:** Unit 33 – linear inequalities Unit 34 – linear graphs Unit 35 – non-linear graphs Unit 36 – trigonometric graphs	**Topic: Algebra and graphs** **Algebra** **Knowledge and skills covered:** Unit 37 – algebraic proof and reasoning Unit 38 – recurrence relations Unit 39 – functions Unit 40 – transformation of graphs Unit 41 – further graphs	**Topic: REVISION**	**Topic: REVISION**	

Schemes which include teaching of computing.

Content which relates to careers teaching.