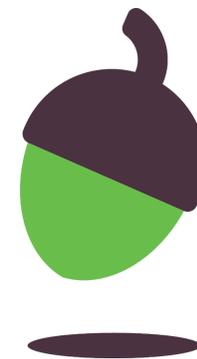


Mathematics

Secondary: Key Stage 3

Curriculum plan 2020-21



OAK
NATIONAL
ACADEMY

1. Curriculum Principles

As mathematics teachers we want our pupils to reach fluency in what we are teaching them. In mathematics, fluency requires a deep understanding of concepts and the ability to apply them flexibly and with automaticity. The mathematics curriculum uses multiple representations to help make connections across concepts to help build a deep conceptual understanding. By making consistent use of the same core representations we will scaffold pupils' thinking to help them understand abstract mathematical concepts. The curriculum will also include intelligent practice that is designed to help pupils develop automaticity in their mathematics.

We also aim for our pupils to be able to use the precise language of mathematics, that is distinct from everyday language. The curriculum will do this by explicitly teaching mathematical vocabulary and introducing core sentence structures with which to communicate, express, connect, reason with and apply mathematical structures and ideas.

Finally, we also aim for our pupils to be able to think mathematically. The tasks and activities used in the curriculum teach pupils the components of mathematical thinking: to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.

Below are the set of principles we have used to build this curriculum, with these ambitions for our pupils in mind:



Coherence and flexibility

We strive to support schools by offering a maths curriculum that can fit alongside a range of existing structures. However, complete flexibility over unit ordering is impossible due to the cumulative nature of mathematics and the importance of prior knowledge.

We have grouped lessons into units: coherent sequences of 5 or more lessons. Although each lesson can be accessed individually, explicit connections are made to earlier lessons and later lessons in the same unit. This is because the connections between mathematical concepts are so vital to deepening understanding.

Knowledge organisation

The units in the maths curriculum are grouped as appropriate for each key stage, with a suggested route organised within year groups.

Knowledge selection

Our mathematics lessons cover the full scope of the National Curriculum. We have given more time (both in number of lessons and number of units) to those concepts within the National Curriculum that the evidence tells us are foundational to success in maths.



Inclusive and ambitious

We know the difference it makes when children believe they “can do” maths. We are guided by the principles of the National Curriculum to ensure that every pupil, regardless of starting point, develops their fluency, reasoning and problem solving. Our activities are scaffolded so all children can succeed. Pupils are offered frequent opportunities to be and feel successful in their maths education.

We develop conceptual understanding by always building new understanding on what pupils already know, by representing concepts in different ways, and by making connections between concepts. The mathematics curriculum makes consistent use of the same core representations across year groups to help pupils connect prior learning to new learning. These representations are selected to make key mathematical structures and ideas accessible to all pupils, no matter what their starting points.

To support every child to communicate mathematically, pupils are introduced to core sentence structures with which to express, connect, reason with and apply mathematical structures and ideas.

Pupil engagement

You learn maths by thinking about maths. Our lessons include mathematical tasks which have multiple solutions. Mathematical thinking is woven into the units using scaffolds and prompts such as ‘what is the same and what’s different?’, ‘is it sometimes, always or never true?’ and ‘which could be the odd one out?’. Throughout the curriculum, all pupils have opportunities to sort and classify, compare and contrast, specialise and generalise, to make conjectures and to prove them.



Motivation through learning

We believe that mathematics is inherently interesting and that all children are entitled to a genuine experience of mathematics. The tasks and activities that pupils engage with harness innate ways of thinking and develop the habits of mind that are drawn upon when being mathematical. Problem solving is at the heart of every lesson with opportunities to investigate, explore and reason.



2. Subject structure overview

Developing deep conceptual understanding requires building on what has been previously understood to develop understanding within a concept and of new concepts. Constructing the curriculum with this principle in mind results in careful sequencing within units, strands, year groups and across key stages to create a coherent progression for pupils. The subject structure shows how knowledge and skills are built up within each strand. The prior knowledge required to access the concepts within each unit will help ensure coherence is maintained when parts of the curriculum are used out of the sequence presented in the following table. Units that are foundational across different strands appear multiple times in the subject structure.

	Unit title and description	Length of unit	Prior knowledge required
Number			
7.1	Numbers and numerals Developing understanding of a base 10 place value system and exploring number systems with different bases	1 week	N/A
7.2	Axioms and arrays Understand how commutativity, associativity and distributivity underpin our number system and use arrays to represent multiplicative relationships	2 weeks	N/A



7.3	Factors and multiples Explore the composition of integers and use this to understand the idea of factors and multiples	2 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers
7.4	Order of operations Establish a hierarchy for the four operations and use index notation	1 week	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers • Understanding of commutativity, associativity and distributivity
7.5	Positive and negative numbers Use positive and negative numbers with all four operations	3 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers • Understanding of commutativity, associativity and distributivity 7.4 Order of operations <ul style="list-style-type: none"> • Understanding and applying the hierarchy of operations
7.13	Prime factor decomposition Formalise understanding of the composition of integers	1 week	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers 7.3 Factors and multiples <ul style="list-style-type: none"> • Expressing integers as a product of two factors • Finding a common multiple of two numbers • Geometric representations of integers
7.14	Conceptualising and comparing fractions	2 weeks	7.2 Axioms and arrays:



	Develop understanding of fractions and represent them in different ways		<ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers • Use of diagrams to represent multiplication and division
7.15	Manipulating and calculating with fractions Extend understanding of applying the four operations on integers to fractions and decimal fractions	3 weeks	7.2: <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent fractions 7.14: <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Equivalent fractions
7.17	Percentages Build on understanding of fractions to include percentages. Extend methods developed for calculating with fractions to percentages	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Representing fractions including on a number line • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations
8.5	Accuracy and estimation Rounding to the nearest power of 10 and significant figures. Use rounding for estimation. Upper and lower bounds and represent inequalities on a number line	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Decimal notation • Representing fractions and decimals on a number line
9.9	Surds and trigonometry Using surd notation and applying all operations on surds	3 weeks	7.3 Factors and multiples: <ul style="list-style-type: none"> • Square numbers 7.4 Order of operations <ul style="list-style-type: none"> • Applying the square root function
9.12	Indices and standard form Index notation and rules	3 weeks	7.4 <ul style="list-style-type: none"> • Using index notation up to a power of 3



	including fractional indices Comparing and calculating in standard form		7.14 <ul style="list-style-type: none"> Representing fractions and decimals on a number line
Algebra			
7.2	Axioms and arrays Understand how commutativity, associativity and distributivity underpin our number system and use arrays to represent multiplicative relationships	2 weeks	N/A
7.4	Order of operations Establish a hierarchy for the four operations and use index notation	1 week	7.2 Axioms and arrays <ul style="list-style-type: none"> Understanding of the relationship between division and multiplication Use of arrays to represent integers as a product of two numbers Commutativity, associativity and distributivity
7.5	Positive and negative numbers Use positive and negative numbers with all four operations	3 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> Understanding of the relationship between division and multiplication Use of arrays to represent integers as a product of two numbers Commutativity, associativity and distributivity 7.4 Order of operations <ul style="list-style-type: none"> Understanding and applying the hierarchy of operations
7.6	Expressions, equations and inequalities Use algebraic notation to generalise additive and multiplicative relationships. Form equations and inequalities	3 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> Understanding of the relationship between division and multiplication Use of arrays to represent integers as a product of two numbers Commutativity, associativity and distributivity 7.4 Order of operations <ul style="list-style-type: none"> Understanding and applying the hierarchy of operations



8.1	Sequences Use algebraic notation to express term to term and position to term rules	2 weeks	7.6 Expressions, equations and inequalities <ul style="list-style-type: none"> Using algebraic notation in different contexts Generating sequences from geometric patterns
8.2	Forming and solving equations Expressions, equations, unknowns, variables. Using algebraic notation to investigate perimeter problems	2 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> Use of arrays to represent integers as a product of two numbers Commutativity, associativity and distributivity 7.6 Expressions, equations and inequalities <ul style="list-style-type: none"> Using algebraic notation in different contexts 7.11 Area of 2-D shapes <ul style="list-style-type: none"> Area and perimeter of rectilinear shapes
8.3	Forming and solving inequalities Inequality notation and using algebraic methods to solve inequalities	2 weeks	7.6 Expressions, equations and inequalities <ul style="list-style-type: none"> Using algebraic notation in different contexts, including inequality notation 8.2 Forming and solving equations <ul style="list-style-type: none"> Forming and solving linear equations derived from different contexts
8.4	Linear graphs Inequalities on a cartesian plane. Labelling and plotting linear graphs. Familiarity with $y = mx + c$	3 weeks	8.1 Sequences <ul style="list-style-type: none"> Expressing position to term rules algebraically 7.10 Coordinates <ul style="list-style-type: none"> Using (x,y) notation to describe position on a coordinate grid
9.3	Solving linear simultaneous equations algebraically Using algebraic methods to solve simultaneous equations	4 weeks	8.2 Forming and solving equations <ul style="list-style-type: none"> Solving linear equations 8.4 Linear graphs <ul style="list-style-type: none"> Plotting, sketching and interpreting graphs of linear functions
9.4	Solving linear simultaneous equations graphically Setting up and solving simultaneous equations graphically	2 weeks	9.3 Solving linear simultaneous equations algebraically <ul style="list-style-type: none"> Using algebraic methods to solve simultaneous equations



9.10	Quadratic expressions Creating quadratic expressions. Expanding and factorising binomials, plotting quadratic graphs	3 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> Applying the distributive property 7.6 Expressions, equations and inequalities <ul style="list-style-type: none"> Using algebraic notation in different contexts, including inequality notation 7.10 Coordinates <ul style="list-style-type: none"> Using (x,y) notation to describe position on a coordinate grid 8.4 Linear graphs <ul style="list-style-type: none"> Plotting, sketching and interpreting graphs of linear functions
9.11	Quadratic equations Solving quadratic equations. Completing the square and turning points	3 weeks	9.10 Quadratic expressions <ul style="list-style-type: none"> Manipulating quadratic expressions 8.3 Forming and solving equations <ul style="list-style-type: none"> Forming and solving linear equations derived from different contexts
Ratio and proportion			
7.2	Axioms and arrays Understand how commutativity, associativity and distributivity underpin our number system and use arrays to represent multiplicative relationships	2 weeks	
7.14	Conceptualising and comparing fractions Develop understanding of fractions and represent them in different ways	2 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> Understanding of the relationship between division and multiplication Use of arrays to represent integers as a product of two numbers Use of diagrams to represent multiplication and division
7.15	Manipulating and calculating with fractions	3 weeks	7.2: Axioms and arrays <ul style="list-style-type: none"> Understanding of the relationship between division and multiplication



	Extend understanding of applying the four operations on integers to fractions and decimal fractions		<ul style="list-style-type: none"> • Use of arrays to represent fractions 7.14: Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Equivalent fractions
7.16	Ratio Explore different contexts in which ratio appears and develop use of ratio notation	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations
7.17	Percentages Build on understanding of fractions to include percentages. Extend methods developed for calculating with fractions to percentages	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Representing fractions including on a number line • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations
8.7	Ratio, real life graphs, and rates of change Building proportional reasoning in a variety of contexts	2 weeks	7.16 Ratio <ul style="list-style-type: none"> • Ratio notation 8.4 Linear graphs <ul style="list-style-type: none"> • Finding the gradient and y-intercept of a linear graph
8.8	Direct and indirect proportion Direct proportion and links to linear graphs and ratio. Inverse proportion in different contexts	2 weeks	7.16 Ratio <ul style="list-style-type: none"> • Ratio notation 8.4 Linear graphs <ul style="list-style-type: none"> • Finding the gradient and y-intercept of a linear graph
9.8	Similarity and enlargement Similarity and ratio. Area and volume of similar shapes	2 weeks	7.12 Transforming 2-D figures <ul style="list-style-type: none"> • Enlarging a shape by a given scale factor 7.16 Ratio



			<ul style="list-style-type: none"> Expressing multiplicative relationships using fractions
9.9	Surds and trigonometry Using trigonometric ratios to solve problems	3 weeks	7.3 Factors and multiples <ul style="list-style-type: none"> Square numbers 7.4 Order of operations: <ul style="list-style-type: none"> Square root function
9.13	Growth and decay Exponential growth and decay including compound percentage change and reverse percentage change	2 weeks	7.17 Percentages <ul style="list-style-type: none"> Calculating with percentages Percentage increase and decrease 9.11 Indices and standard form <ul style="list-style-type: none"> Use index notation and apply index rules
Geometry			
7.7	Angles Develop understanding of angle as a measure of turn. Derive geometric properties involving angles and use these to solve problems	2 weeks	N/A
7.8	Classifying 2-D shapes Using geometric properties to sort and classify 2-D shapes	2 weeks	7.7 Angles <ul style="list-style-type: none"> Angle rules including angles around a point, angles in a straight line and angles in parallel lines
7.9	Constructing triangles and quadrilaterals Develop understanding of angle properties and 2-D shapes to construct triangles and quadrilaterals	2 weeks	7.7 Angles <ul style="list-style-type: none"> Angle rules including angles around a point, angles in a straight line and angles in parallel lines 7.8 Classifying 2-D shapes <ul style="list-style-type: none"> Properties of special triangles and quadrilaterals
7.10	Coordinates Extend understanding of coordinate systems into all four quadrants	2 weeks	7.5 Positive and negative numbers <ul style="list-style-type: none"> Representing negative numbers using a number line 7.8 Classifying 2-D shapes <ul style="list-style-type: none"> Properties of special triangles and quadrilaterals
7.11	Area of 2-D shapes	2 weeks	7.2 Axioms and arrays



	Understand area as a measure of surface and formalise methods for finding the area of different 2-D shapes		<ul style="list-style-type: none"> Representing integers as a product of two factors using an array 7.8 Classifying 2-D shapes <ul style="list-style-type: none"> Properties of special triangles and quadrilaterals
7.12	Transforming 2-D figures Rotations, reflections, translations and enlargements on a coordinate grid	2 weeks	7.7 Angles <ul style="list-style-type: none"> Understand angle as a measure of turn 7.10 Coordinates <ul style="list-style-type: none"> Plotting points on a coordinate grid in all four quadrants
8.12	Angles in straight edges Using the sum of interior angles of a triangle to explore other polygons. Generalising for interior and exterior angles of polygons	4 weeks	7.7 Angles <ul style="list-style-type: none"> Angle rules including angles around a point, angles in a straight line and angles in parallel lines 7.8 Classifying 2-D shapes <ul style="list-style-type: none"> Properties of special triangles and quadrilaterals
8.13	Bearings Conventions and notation of bearings. Calculating with bearings	2 weeks	7.7 Angles <ul style="list-style-type: none"> Angle rules including angles around a point, angles in a straight line and angles in parallel lines 7.8 Classifying 2-D shapes <ul style="list-style-type: none"> Properties of special triangles and quadrilaterals
8.14	Circles Relationships between diameter and circumference. Area and perimeter of circles including composite shapes	2 weeks	7.11 Area of 2-D shapes <ul style="list-style-type: none"> Area as a measure of surface
8.15	Volume and surface area of prisms Calculating volume of prisms, composite solids. Conversions between units of volume	3 weeks	7.11 Area of 2-D shapes <ul style="list-style-type: none"> Area as a measure of surface



9.5	Constructions, congruence, and loci Ruler and compass constructions. Congruence and loci	2 weeks	7.8 Classifying 2-D shapes <ul style="list-style-type: none"> • Properties of special triangles and quadrilaterals 7.9 Constructing triangles and quadrilaterals <ul style="list-style-type: none"> • Use ruler, compasses and protractor to construct triangles and quadrilaterals
9.6	Pythagoras's theorem Investigation on tilted squares. Introduction to surd notation and finding missing sides	2 weeks	7.11 Area of 2-D shapes <ul style="list-style-type: none"> • Finding the area of triangles and rectilinear shapes
9.8	Similarity and enlargement Similarity and ratio. Area and volume of similar shapes	2 weeks	7.12 Transforming 2-D figures <ul style="list-style-type: none"> • Enlarging a shape by a given scale factor 7.16 Ratio <ul style="list-style-type: none"> • Expressing multiplicative relationships using fractions
9.9	Surds and trigonometry Using trigonometric ratios to solve problems	3 weeks	7.16 Ratio <ul style="list-style-type: none"> • Expressing multiplicative relationships using fractions
Statistics and probability			
7.14	Conceptualising and comparing fractions Develop understanding of fractions and attach represent them in different ways	2 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent integers as a product of two numbers • Use of diagrams to represent multiplication and division
7.15	Manipulating and calculating with fractions Extend understanding of applying the four operations on integers to fractions and decimal fractions	3 weeks	7.2 Axioms and arrays <ul style="list-style-type: none"> • Understanding of the relationship between division and multiplication • Use of arrays to represent fractions 7.14 Conceptualising and comparing fractions: <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Equivalent fractions
7.16	Ratio	2 weeks	7.14 Conceptualising and comparing fractions



	Explore different contexts in which ratio appears and develop use of ratio notation		<ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations
7.17	Percentages Build on understanding of fractions to include percentages. Extend methods developed for fractions to percentages	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Representing fractions including on a number line • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations
8.9	Univariate data Understanding mean, median, mode and range in different contexts and using different representations. Exploring collection of discrete and continuous data	3 weeks	7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations 7.16 Ratio <ul style="list-style-type: none"> • Expressing multiplicative relationships using fractions
8.10	Bivariate data Constructing scatter graphs and analysing shape, including examining clusters, outliers, and correlation	2 weeks	8.4 Linear graphs <ul style="list-style-type: none"> • Plotting, sketching and interpreting graphs of linear functions 8.8 Univariate data <ul style="list-style-type: none"> • Calculating statistical measures of univariate data including mean, mode, median and range
9.1	Probability Theoretical and experimental probability. Probability of single and combined events	2 weeks	7.14 Conceptualising and comparing fractions <ul style="list-style-type: none"> • Knowledge of the different contexts in which a fraction can result • Representing fractions including on a number line • Equivalent fractions 7.15 Manipulating and calculating with fractions <ul style="list-style-type: none"> • Calculating with fractions using all four operations



9.2	Sets and Venn and diagrams Venn diagrams, samples spaces, two-way tables and tree diagrams	3 weeks	9.1 Probability <ul style="list-style-type: none"> Expressing the probability of a single event and combined events using fractional notation
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3. Suggested sequence

The following tables show our suggested sequence of the curriculum across year 7 to 9. This sequencing ensures that knowledge and skills are built up according to the progression within each strand while also giving opportunities for pupils to engage with a variety of mathematics within each year group. The sequencing within each strand in the previous section shows how units can be taken out of this suggested sequence and the prior knowledge required indicates dependencies between the different strands.

Year 7

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Making generalisations about the number system 1						Making generalisations about the number system 2					
	7.1 Numbers and numerals	7.2 Axioms and arrays		7.3 Factors and multiples		7.4 Order of operations	7.5 Positive and negative numbers			7.6 Expressions, equations and inequalities		
Spring	2-D geometry						The Cartesian plane					
	7.7 Angles		7.8 Classifying 2-D shapes		7.9 Constructing triangles and quadrilaterals		7.10 Coordinates		7.11 Area of 2-D shapes		7.12 Transforming 2-D figures	
Summer	Fractions						Ratio and proportion					
	7.13 Prime factor decomposition		7.14 Conceptualising and comparing fractions		7.15 Manipulating and calculating with fractions			7.16 Ratio		7.17 Percentages		7.18 Different number systems



Year 8

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Equations and inequalities 1						Equations and inequalities 2					
	8.1 Sequences		8.2 Forming and solving equations		8.3 Forming and solving inequalities		8.4 Linear graphs		8.5 Accuracy and estimation		8.6 Mixed algebra problems	
Spring	Proportional reasoning						Representations and reasoning with data					
	8.7a Ratio	8.7 Ratio, real life graphs and rate of change		8.8 Direct and inverse proportion		8.9 Univariate data		8.10 Bivariate data		8.11 Famous maths problems		
Summer	Angles						Area, volume and surface area					
	8.12 Angles in straight edges				8.13 Bearings		8.14 Circles and composite shapes		8.15a Area review	8.15 Volume and Surface area of prisms		



Year 9

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Probability						Linear simultaneous equations					
	9.1a FDP review	9.1 Probability			9.2 Sets and Venn diagrams		9.3 Solving algebraically			9.4 Solving graphically		
Spring	Geometry of triangles						Ratio and proportion					
	9.5a Angle review	9.5 Constructions, congruence and loci		9.6 Pythagoras' Theorem		9.7 Famous maths problems	9.8a Ratio review	9.8 Similarity and enlargement		9.9 Surds and trigonometry		
Summer	Quadratics						Reasoning with number					
	9.10 Quadratic expressions			9.11 Quadratic equations			9.12 Indices and standard form			9.13 Growth and decay		9.13b Finance

