

Mathematics Age Related Expectations Years 7-9

Overview

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject. Here it Littleport we believe and want to instil in our students that Maths is Beautiful, Maths is Useful

Aims

High-quality teaching of mathematics in the classroom is, of course, what really makes a difference to students' learning. For maximum impact, all teachers need to work with this agreed curriculum which is written in conjunction with NCETM: This curriculum:

- Offers a clear sequencing of mathematical ideas, concepts, knowledge, and techniques both within each year and across years so that new ideas are built on the firm foundations of existing ones.
- Gives a coherent view of mathematics that highlights important unifying ideas and links between them so that students experience mathematics not as a collection of disparate topics but as a connected whole.

The National Curriculum for mathematics sets out a broad statutory overview and curriculum content entitlement for all students. It is for Littleport and East Cambridgeshire Academy to define our own curriculum to meet these statutory requirements that is implemented in our classrooms with our students. This document gives guidance about what makes for a rigorous, coherent and connected Key Stage 3 mathematics curriculum. It is arranged by year group, which includes a detailed termly breakdown of the knowledge, skills and understanding required for Key Stage 3 mathematics.

The following principles are particularly important for coherent curriculum design:

- Certain images, techniques and concepts are important precursors to later ideas; sequencing these correctly is an important aspect of planning and teaching.
- When introducing new ideas, it is important to make connections with earlier ideas that are already well understood.
- When something has been deeply understood and mastered, it can and should be used in the next steps of learning.

Rationale

- Our age related expectations consist of national curriculum objectives within the key stage two and three programme of study. In addition, we have included appropriate objectives from the GCSE specifications. Using this map, the following documents outline where pupils should be at the end of year 7, 8 and 9 in relation to that 5-year journey.
- Our schemes of learning are designed to achieve the aims of the national curriculum. The programme of study suggests 'pupils should make rich connections across mathematical ideas'. In order to support this point, we have split our AGE Related Expectations into 15 behaviours.
- These behaviours include at least two mathematics topics.
- These topics can then be interrelated to encourage pupils to make connections between maths ideas.

In a nutshell

- The expectation is that pupils complete 5 units per term.
- Each unit should be allocated approximately 2 academic weeks.
- This provides departments with 9 flexible weeks in any given calendar year to assign to assessment, revision, other topics or for pupils to spend longer for specific units.
- By the end of year 9 pupils completing the core programme of study will have completed the key stage 3 syllabus and be foundation tier ready.
- By the end of year 9 pupils completing the higher programme of study will have completed all the requirements of the key stage 3 syllabus including links and introductions to higher tier GCSE topics; as such these pupils will be higher tier ready.

YEAR 7

Autumn Term	Number and Algebra				Geometry and Measures
	1. Investigating Number Systems	2. Pattern Sniffing	3. Solving Calculation Problems	4. Generalising Arithmetic	5. Exploring Shape

Spring Term	Geometry and Measures	Number and Algebra			Statistics
	6. Reasoning with Measures	7. Discovering Equivalence	8. Reasoning and Fractions	9. Solving Number Problems	10. Investigating Statistics

Summer Term	Geometry	Number and Algebra		Geometry and Measures	
	11. Visualising shape	12. Exploring Change	13. Proportional Reasoning	14. Describing Position	15. Measuring and Estimating

Year 7 Overview

Unit	Summary of Key Content
1. Investigating Number Systems	<ul style="list-style-type: none"> Place value (with very large or very small numbers, and when calculating with decimals); Round numbers and measures as desired; order positive/negative integers & decimals.
2. Pattern Sniffing	<ul style="list-style-type: none"> Generate a sequence from a term-to-term rule; Triangular, square and cube numbers, simple arithmetic progressions. Prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple; Positive integer powers and associated roots; recognise powers of 2, 3, 4, 5
3. Solving Calculation Problems	<ul style="list-style-type: none"> Four operations, including formal written methods, for integers and decimals; Order of operations, including brackets; Use of the symbols =, ≠, <, >, ≤, ≥; Estimate answers; Check calculations using approximation and estimation Substitute into formulae and expressions; Use standard mathematical formulae; Concepts and vocabulary of expressions, equations, formulae and terms; Use and interpret algebraic notation.
4. Generalising Arithmetic	<ul style="list-style-type: none"> Recognise and use relationships between operations, including inverse operations Simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket; Use and interpret algebraic notation.
5. Exploring Shape	<ul style="list-style-type: none"> Identify properties of the faces, surfaces, edges and vertices of 3D shapes. Use conventional geometrical terms and notations and standard labelling conventions for the sides and angles of triangles Angles at a point, angles at a point on a straight line, vertically opposite angles Properties of special types of quadrilaterals, triangles and other plane figures
6. Reasoning with Measures	<ul style="list-style-type: none"> Calculate perimeters of 2D shapes; Calculate area of triangles, parallelograms, trapezia; Calculate volume of cuboids.
7. Discovering Equivalence	<ul style="list-style-type: none"> Define percentage as 'number of parts per hundred'; Interpret percentages and percentage changes as a fraction or a decimal, including multiplicatively; Express one quantity as a percentage of another; Compare two quantities using percentages; Solve problems involving percentage change. Interpret fractions and percentages as operators; order positive and negative integers, decimals and fractions. Express one quantity as a fraction of another

8. Reasoning with Fractions	<ul style="list-style-type: none"> • Four operations for fractions and mixed numbers; express an amount as a fraction of another • Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees; Apply ideas of randomness, fairness and equally likely events; Relate relative expected frequencies to theoretical probability; Construct sample spaces and use these to calculate theoretical probabilities
9. Solving Number Problems	<ul style="list-style-type: none"> • Solve linear equations in one unknown algebraically
10. Investigating Statistics	<ul style="list-style-type: none"> • Interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data. • Interpret, analyse and compare the distributions of data sets through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range)
11. Visualising Shape	<ul style="list-style-type: none"> • Draw diagrams from written description • Measure line segments and angles in geometric figures • Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference
12. Exploring Change	<ul style="list-style-type: none"> • Coordinates – 4 quadrants; Solve geometrical problems on coordinate axes; Use and understand lines parallel to the axes and $y = x/y = -x$.
13. Proportional Reasoning	<ul style="list-style-type: none"> • Use ratio notation, including reduction to simplest form • Divide a given quantity into two parts in a given part:part or part:whole ratio
14. Describing Position	<ul style="list-style-type: none"> • Identify, describe and construct congruent shapes by considering rotation, reflection and translation; Describe translations as 2D vectors
15. Measuring and Estimating	<ul style="list-style-type: none"> • Use standard units of mass, length, capacity, area time, money and other measures (including standard compound measures) using decimal quantities where appropriate • Convert between related standard units • Convert between miles and kilometres and apply this to solve problems

Year 7 Age Related Expectations

Term 1

Unit 1: Investigating Number Systems

- understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)
- order positive and negative integers and decimals
- round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)

Unit 2: Pattern Sniffing

- generate terms of a sequence from a term-to-term rule; recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions
- use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple
- use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5
- apply the four operations, including formal written methods, to integers and decimals

Unit 3: Solving Calculation Problems

- use conventional notation for priority of operations, including brackets
- use the symbols =, ≠, <, >, ≤, ≥
- estimate answers; check calculations using approximation and estimation, including answers obtained using technology
- substitute numerical values into formulae and expressions
- understand and use standard mathematical formulae
- understand and use the concepts and vocabulary of expressions, equations, formulae and terms
- use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a/b in place of $a \div b$, brackets

Unit 4: Generalising Arithmetic

- recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)
- simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket
- use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a/b , brackets (continued from Unit 3)
- understand and use the concepts and vocabulary of expressions, equations, formulae and terms (continued from Unit 3)

Unit 5: Exploring Shape

- identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres
- use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries
- use the standard conventions for labelling and referring to the sides and angles of triangles
- apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language

Term 2

Unit 6: Reasoning with Measures

- calculate perimeters of 2D shapes
- know and apply formulae to calculate area of triangles, parallelograms, trapezia
- know and apply formulae to calculate volume of cuboids
-

Unit 7: Discovering Equivalence

- order fractions
- express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1
- define percentage as 'number of parts per hundred'
- interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively
- express one quantity as a percentage of another
- compare two quantities using percentages
- solve problems involving percentage change, including percentage increase/decrease
- interpret fractions and percentages as operators
-

Unit 8: Reasoning with Fractions

- apply the four operations, including formal written methods, to simple fractions (proper and improper) and mixed numbers
- record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees
- apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments
- relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale
- construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities

Unit 9: Solving Problems with Number

- solve linear equations in one unknown algebraically
- use the symbols =, ≠, <, >, ≤, ≥

Unit 10: Investigating Statistics

- interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range)

Term 3**Unit 11: Visualising Shape**

- measure line segments and angles in geometric figures
- draw diagrams from written description
- identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference
- use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries
- use the standard conventions for labelling and referring to the sides and angles of triangles

Unit 12: Exploring Change

- work with coordinates in all four quadrants
- solve geometrical problems on coordinate axes
- (understand and use lines parallel to the axes, $y = x$ and $y = -x$)

Unit 13: Proportional Reasoning

- use ratio notation, including reduction to simplest form
- divide a given quantity into two parts in a given part:part or part:whole ratio

Unit 14: Describing Position

- identify, describe and construct congruent shapes, including on coordinate axes, by considering rotation, reflection and translation
- describe translations as 2D vectors

Unit 15: Measuring and Estimating

- use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate
- use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)
- change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts

➤ convert between miles and kilometres and apply this to solve problems

YEAR 8

Autumn Term	Number and Algebra				Geometry and Measures
	1. Investigating Number Systems	2. Pattern Sniffing (3)	3. Solving Calculation Problems	4. Generalising Arithmetic	5. Exploring Shape (1)
Spring Term	Geometry and Measures	Number and Algebra			Statistics
	6. Reasoning with Measures (2)	7. Discovering Equivalence (4)	8. Reasoning and Fractions (5)	9. Solving Number Problems (6)	10. Investigating Statistics (7)
Summer Term	Geometry	Number and Algebra		Geometry and Measures	
	11. Visualising shape (8)	12. Exploring Change (9)	13. Proportional Reasoning (10)	14. Describing Position (11)	15. Measuring and Estimating (12)

Stage 8 Year Overview

Unit	Approx Learning Hours	Summary of Key Content
1. Investigating Number Systems	2	Round numbers to appropriate accuracy (including dp and sf)
2. Pattern Sniffing	10	Generate a sequence from a term-to-term rule and position-to-term rule; nth term of linear sequences Prime numbers, highest common factors, lowest common multiples, prime factorisation, product notation and unique factorisation theorem. Positive integer powers.
3. Solving Calculation Problems	8	<ul style="list-style-type: none"> ● Apply four operations to integers and decimals; use conventional order of operations for these calculations ● Substitute into formulae; change the subject of a formula; use algebraic notation.
4. Generalising Arithmetic	8	<ul style="list-style-type: none"> ● Write expressions and inequalities; Simplify and manipulate algebraic expressions by factorising; simplify expressions involving sums, differences and products including the laws of indices.
5. Exploring Shape	6	<ul style="list-style-type: none"> ● Angles on parallel lines ● Derive and use sum of angles in a triangle; interior and exterior angles of regular polygons
6. Reasoning with Measures	11	<ul style="list-style-type: none"> ● Calculate perimeters of 2D shapes including circles; ● Calculate areas of circles and composite shapes; ● Know and apply formulae to calculate volumes of right prisms and cylinders
7. Discovering Equivalence	9	<ul style="list-style-type: none"> ● Work with percentages greater than 100%; ● Solve percentage change problems including original amount and simple interest problems; ● Work interchangeably with terminating decimals and their fraction equivalents
8. Reasoning with Fractions	12	<ul style="list-style-type: none"> ● Apply four operations to fractions; Calculate exactly with fractions ● Apply the property of probabilities summing to 1 ● Enumerate sets, outcomes etc systematically using tables, grids and Venn diagrams ● Construct theoretical possibility spaces and use them to calculate theoretical probabilities
9. Solving Number Problems	7	<ul style="list-style-type: none"> ● Solve linear equations with unknown on both sides

10. Investigating Statistics	6	<ul style="list-style-type: none"> ● Use and interpret scatter graphs; Recognise correlation ● Interpret, analyse and compare the distributions of data sets through appropriate graphical representation (discrete, continuous and grouped data). ● Interpret, analyse and compare the distributions of data sets through appropriate measures of central tendency and spread ● Apply statistics to describe a population
11. Visualising Shape	10	<ul style="list-style-type: none"> ● Measure line segments and angles in geometric figures, including interpreting scale drawings and maps ● Use bearings ● Standard ruler and compass constructions (perpendicular bisector, perpendicular from/at a given point, angle bisector) ● Use constructions to solve loci problems ● Interpret plans and elevations of 3D shapes
12. Exploring Change	11	<ul style="list-style-type: none"> ● Plot graphs of equations that correspond to straight line graphs ● Solve linear equations using a graph ● Identify and interpret gradients and intercepts of functions graphically and algebraically ● Recognise, sketch and interpret graphs of linear and quadratic functions
13. Proportional Reasoning	10	<ul style="list-style-type: none"> ● Recognise a ratio problem; apply ratio to real problems; Express a multiplicative relationship as a ratio or fraction; Understand and use proportion as equality of ratios; Relate ratio to fractions and to linear functions; Compare lengths, areas and volumes using ratio notation; Use scale factors, scale diagrams and maps; identify and work with fractions in ratio problems; solve problems involving direct and inverse proportion using graphical and algebraic representations. ● Find approximate solutions to linear equations using a graph
14. Describing Position	8	<ul style="list-style-type: none"> ● Identify, describe and construct similar shapes (including on coordinate axes) using enlargement
15. Measuring and Estimating	8	<ul style="list-style-type: none"> ● Use compound units; change freely between compound units in numerical contexts ● Plot and interpret graphs of non-standard functions in real contexts and use to solve simple kinematic problems

Year 8 Age Related Expectations

Term 1

Unit 1: Investigating Number Systems

- round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)

Unit 2: Pattern Sniffing

- generate terms of a sequence from either a term-to-term or a position-to-term rule
- deduce expressions to calculate the nth term of linear sequences
- use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem
- calculate with positive integer indices

Unit 3: Solving Calculation Problems

- apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative
- use conventional notation for priority of operations, including brackets, powers, roots and reciprocals
- substitute numerical values into scientific formulae
- rearrange formulae to change the subject
- use and interpret algebraic notation, including: a^2b in place of $a \times a \times b$, coefficients written as fractions rather than as decimals

Unit 4: Generalising Arithmetic

- simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices
- understand and use the concepts and vocabulary of inequalities and factors
- use and interpret algebraic notation, including: a^2b in place of $a \times a \times b$, coefficients written as fractions rather than as decimals

Unit 5: Exploring Shape

- understand and use alternate and corresponding angles on parallel lines
- derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)

Term 2

Unit 6: Reasoning with Measures

- calculate perimeters of 2D shapes, including circles
- calculate areas of circles and composite shapes

- know and apply formulae to calculate volume of right prisms (including cylinders)

Unit 7: Discovering Equivalence

- work with percentages greater than 100%
- solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 or $\frac{3}{8}$)

Unit 8: Reasoning with Fractions

- apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative
- calculate exactly with fractions
- apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams
- construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities

Unit 9: Solving Problems with Number

- solve linear equations with the unknown on both sides of the equation

Unit 10: Investigating Statistics

- use and interpret scatter graphs of bivariate data
- recognise correlation
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)
- apply statistics to describe a population

Term 3
Unit 11: Visualising Shape

- measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings
- use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle)
- use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line

Unit 12: Exploring Change

- plot graphs of equations that correspond to straight-line graphs in the coordinate plane
- find approximate solutions to linear equations using a graph
- identify and interpret gradients and intercepts of linear functions graphically and algebraically
- recognise, sketch and interpret graphs of linear functions and quadratic functions

Unit 13: Proportional Reasoning

- express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
- express a multiplicative relationship between two quantities as a ratio or a fraction
- understand and use proportion as equality of ratios
- relate ratios to fractions and to linear functions
- compare lengths, areas and volumes using ratio notation
- use scale factors, scale diagrams and maps
- identify and work with fractions in ratio problems

Unit 14: Describing Position

- identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement

Unit 15: Measuring and Estimating

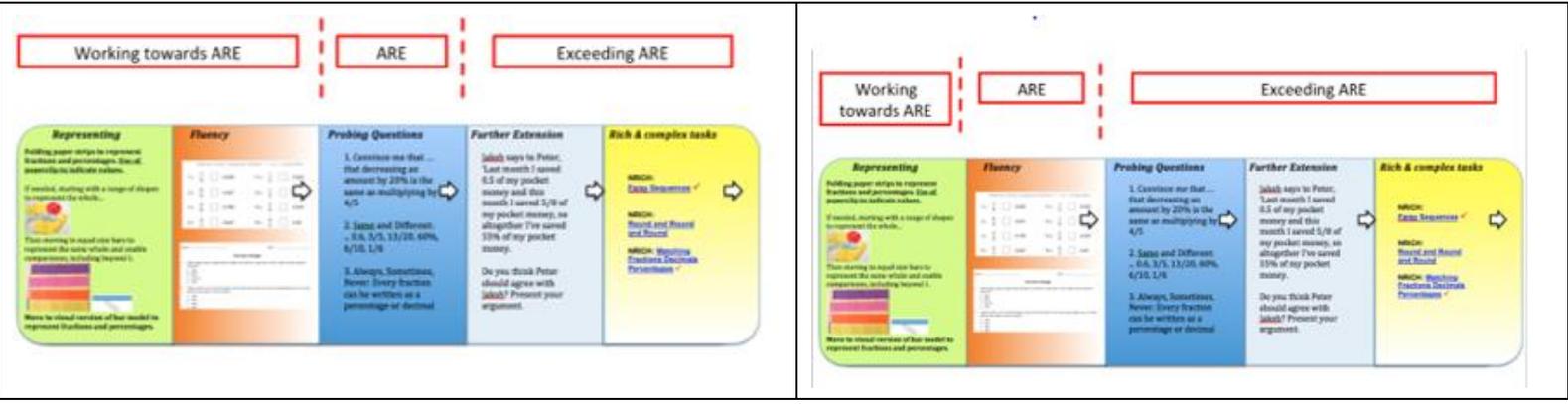
- use compound units such as speed, rates of pay, unit pricing
- change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts
- plot and interpret graphs and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration

YEAR 9

3 Pathways	Who is it suitable for?	What does it cover?	Where does it lead to at the end of Year 9?
Core Curriculum	Students targeting Grades 3-6	Foundation Content	Intermediate GCSE Curriculum (Overlapping content) → 3, 4, 5 and option to stretch to Grade 6 OR Foundation GCSE Curriculum OR Higher GCSE Curriculum
Advanced Curriculum	Students targeting Grades 6-9	Overlapping Foundation and Higher Tier content	Higher GCSE Curriculum (mostly Higher-only content) → 6, 7, 8, 9
Support Curriculum	Students targeting Grades 1 - 3	Consolidation of Foundation Fundamentals	Foundation Curriculum (mostly Foundation-only content) → 1, 2, 3

Year 9 Students following the Support SOL	Year 9 Students following the Core SOL	Year 9 Students following the Higher SOL
The Support SOL will not equip students to achieve age related expectations. The SOL is	Pupils following the core curriculum will be considered to be achieving ARE is reasoning through the use of probing questions (consistent with Y7-9)	Pupils following the higher curriculum will be considered to be achieving ARE is fluent in higher topics; since this is typically requires greater understanding of core topics.

designed for students who are targeted a grade 3 or below and therefore will be judged to be working towards age related expectations.



Year 9 Core Overview

Core	Autumn Term	Number: Calculation Place Value Rounding (powers of 10, dp, sf) Ordering integers, decimals Four operations – whole numbers and decimals Order of operations Primes, factors, multiples, HCF, LCM, product of primes Calculating with powers & roots	Geometry: Shape Properties of shapes (2D and 3D) Basic angle rules Angles on parallel lines Angles in polygons	Algebra: Simplifying Collecting like terms Expanding single brackets, Factorising Using index laws Writing and representing simple inequalities	Number: FDP Fractions; Equivalent Fractions Fraction Arithmetic Converting between FDP Ordering fractions, decimals and percentages Express amounts as fractions/% Terminating decimals Percentages of amounts Percentage change problems
		19	14	11	16
	Spring Term	Number and Algebra: Sequences Generating sequences Nth terms of linear sequences	Algebra: Solving Solving linear equations Formulae – substitution, rearranging, writing	Geometry: Measuring Perimeter including circumference Area – rectangles, parallelograms, trapezia, circles Volume of cuboids, right prisms and cylinders	R&P: Scaling Ratio – simplifying, dividing in a given ratio, solving problems Scale factors Direct and inverse proportion problems Standard Units Converting between units

		10	9	11	11
	Summer Term	Algebra: Graphing Coordinates Plotting linear graphs Horizontal and vertical graphs Straight line graphs Simple gradient and intercept	Geometry: Visualising Bearings Reflection, Rotation, Translation, Enlargement Congruence	Statistics: Probability Calculating simple probabilities	Statistics: Data Construct and interpret charts, tables and diagrams (discrete data) Scatter graphs Central tendency and spread
		10	13	8	10

Year 9 Age Related Expectations - Students following the Core SOL

Term 1

Unit 1: Number Calculation

- understand and use place value
- order positive and negative integers and decimals; use the symbols \neq , $<$, $>$, \leq , \geq
- round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)
- apply the four operations, including formal written methods, to integers, decimals - both positive and negative
- use conventional notation for priority of operations, including brackets, powers, roots and reciprocals
- use positive integer powers and associated real roots; recognise powers of 2, 3, 4 and 5
- calculate with roots and positive whole number indices
- use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem

Unit 2: Geometry Shape

- identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres
- use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles
- derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language

- apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles; understand and use alternate and corresponding angles on parallel lines; derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)

Unit 3: Algebra Simplifying

- Use and interpret algebraic notation, including: ab in place of $a \times b$; $3y$ in place of $y + y + y$ and $3 \times y$; a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, $a2b$ in place of $a \times a \times b$; a/b in place of $a \div b$; coefficients written as fractions rather than decimals; brackets
- Understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors
- Simplify and manipulate algebraic expressions by: collecting like terms; multiplying a single term over a bracket; taking out common factors; and simplifying expressions involving sums, products and powers, including the laws of indices

Unit 4: Ratio and Proportion – Fractions, Decimals, Percentages

- order integers, decimals and fractions
- apply the four operations, including formal written methods, to simple fractions (proper and improper), and mixed numbers
- express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1
- define percentage as ‘number of parts per hundred’; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; solve problems involving percentage change, including percentage increase/decrease
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $7/2$ or 0.375 or $3/8$)
- interpret fractions and percentages as operators

Term 2

Unit 5: Number and Algebra - Sequences

- generate terms of a sequence either from a term-to-term rule or a position-to-term rule
- recognise and use sequences of triangular, square and cube numbers as well as simple arithmetic progressions
- deduce expressions to calculate the n th term of linear sequences

Unit 6: Algebra Solving

- substitute numerical values into formulae and expressions, including scientific formulae
- solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)
- translate simple situations or procedures into algebraic expressions or formulae; derive an equation, solve the equation and interpret the solution
- understand and use standard mathematical formulae, rearrange formulae to change the subject

Unit 7: Geometry - Measuring

- know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)
- know the formulae $C = 2\pi r = \pi d$, area of a circle $A = \pi r^2$; calculate: perimeters of 2D shapes including circles, areas of circles and composite shapes

Unit 8: Ratio and Proportion - Scaling

- divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
- express a multiplicative relationship between two quantities as a ratio or a fraction
- understand and use proportion as equality of ratios
- relate ratios to fractions and to linear functions
- use scale factors, scale diagrams and maps
- compare lengths, areas and volumes using ratio notation; make links to similarity and scale factors
- identify and work with fractions in ratio problems
- solve problems involving direct and inverse proportion, including graphical and algebraic representations
- change freely between related standard units in numerical contexts

Term 3**Unit 9: Algebra Graphing**

- work with coordinates in all four quadrants
- solve geometrical problems on coordinate axes
- plot graphs of equations that correspond to straight-line graphs in the coordinate plane
- identify and interpret gradients and intercepts of linear functions graphically and algebraically
- recognise, sketch and interpret graphs of linear functions

Unit 10: Geometry Visualising

- measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings
- identify, describe and construct congruent shapes, including on coordinate axes, by considering rotation, reflection and translation and enlargement; describe translations as 2D vectors

Unit 11: Statistics Probability

- record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees
- apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments
- relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale
- construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities
- apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams
- construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities

Unit 12: Statistics



- interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range)
- use and interpret scatter graphs of bivariate data; recognise correlation and know correlation does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

Year 9 Higher Overview

Higher Curriculum Year 9	Autumn Term	Number: Calculation Rounding and truncation Limits of accuracy Calculating with roots and integer indices Standard Form Calculating with π Terminating decimals ¹⁴	Geometry: Visualising Circle Properties Constructions Loci Plans and Elevations	Algebra: Simplifying Expanding and factorising double brackets Proving equivalence Identities Writing expressions and formulae	R&P: Scaling Percentage Change Original amounts Direct and inverse proportion problems Compound Measures/Units Applied similarity/congruence
		14	7	12	15
	Spring Term	Number and Algebra: Sequences Recognise and use Fibonacci sequences, Quadratic sequences and Geometric Sequences	Algebra: Solving 1 Linear Inequalities Formulae – substitution, rearranging	Geometry: Measuring Pythagoras Sectors/Arcs Volume and SA of prisms and cylinders linked to this.	Geometry: Proving Congruence Angle Proofs
		6	6	15	6
	Summer Term	Algebra: Graphing $y=mx+c$ Parallel lines Equation from 2 points Quadratic graphs and roots Sketch other functions (cubic, reciprocal) Graphs of non-standard functions Kinematics	Algebra Solving 2 Simultaneous Equations Graphical solutions for equations Linear Inequalities (2 variables)	Statistics: Probability Tree Diagrams Combined Events Experimental vs theoretical probability	Statistics: Data Recap central tendency and spread Construct and interpret charts Lines of best fit Correlations
		12	10	7	10

Year 9 Age Related Expectations – Students following the Higher SOL

Term 1

Unit 1: Number Calculation

- use inequality notation to specify simple error intervals due to truncation or rounding
- apply and interpret limits of accuracy
- calculate with roots, and with integer indices
- calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
- calculate exactly with multiples of π
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 or $\frac{3}{8}$)

Unit 2: Geometry Shape

- identify and apply circle definitions and properties, including: centre, radius, diameter, chord, circumference, tangent, arc, sector and segment
- use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line
- construct and interpret plans and elevations of 3D shapes

Unit 3: Algebra Simplifying

- simplify and manipulate algebraic expressions by expanding products of two binomials and factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares
- know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments
- understand and use the concepts and vocabulary of identities
- translate simple situations or procedures into algebraic expressions or formulae

Unit 4: Ratio and Proportion – Fractions, Decimals, Percentages

- solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics
- solve problems involving direct and inverse proportion, including graphical and algebraic representations
- apply the concepts of congruence and similarity, including the relationships between lengths in similar figures
- use compound units such as density and pressure;
- change freely between compound units (e.g. density, pressure) in numerical and algebraic contexts

Term 2

Unit 5: Number and Algebra - Sequences

- recognise and use Fibonacci type sequences, quadratic sequences and simple geometric progressions (r^n where n is an integer, and r is a rational number > 0)

Unit 6: Algebra Solving

- translate simple situations or procedures into algebraic expressions or formulae; derive an equation, solve the equation and interpret the solution
- understand and use standard mathematical formulae, rearrange formulae to change the subject
- solve linear inequalities in one variable
- represent the solution set to an inequality on a number line and using set notation

Unit 7: Geometry - Measuring

- know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and apply it to find lengths in right-angled triangles in two dimensional figures
- apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs
- calculate arc lengths, angles and areas of sectors of circles

Unit 8: Ratio and Proportion - Scaling

- apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs
- use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)

Term 3

Unit 9: Algebra Graphing

- use the form $y = mx + c$ to identify parallel lines
- find the equation of the line through two given points, or through one point with a given gradient
- identify and interpret roots, intercepts, turning points of quadratic functions graphically
- deduce roots of quadratic functions algebraically
- recognise, sketch and interpret graphs of simple cubic functions and the reciprocal function $y = 1/x$ with $x \neq 0$
- plot and interpret graphs (and those of non-standard functions) in real contexts to find approximate solutions to problems such as simple kinematic problems

Unit 10 : Geometry Visualising

- find approximate solutions to linear equations using a graph
- solve two linear simultaneous equations in two variables algebraically
- derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution
- find approximate solutions to simultaneous equations using a graph

- solve linear inequalities in two variables; represent the solution using set notation and on a graph

Unit 11: Statistics Probability

- construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities
- apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one
- enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams
- construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities
- calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions
- understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size

Unit 12: Statistics

- interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use
- interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range)
- use and interpret scatter graphs of bivariate
- data; recognise correlation and know correlation does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

Year 9 Support Overview

Support	Autumn Term	Number: Calculation Place Value Rounding (powers of 10, dp) Ordering integers, decimals Negative Numbers Four operations – whole numbers and decimals	Geometry: Shape Angles at a point, on a line, in triangles and quadrilaterals Properties of shapes (2D and 3D)	Number: Calculation 2 Primes, factors, multiples Simple powers and roots	Algebra: Simplifying Collecting like terms, expanding single brackets, factorising into single brackets, simplifying		
		17	13	11	10		
	Spring Term	Number: FDP Fractions; Equivalent Fractions Proper Fraction Arithmetic Converting between FDP Ordering fractions, decimals and percentages Terminating decimals Percentages of amounts	Number and Algebra: Pattern Sniffing Continuing sequences Generating sequences Nth terms of linear sequences	Algebra: Solving Solving linear equations	Geometry: Measuring Perimeter Area – rectangles, parallelograms, trapezia Volume/SA of cuboids	R&P: Scaling Ratio – simplifying, dividing in a given ratio Proportion – writing as fractions///Scale factors Similar Shapes (2D) Standard Units Converting between units	
		16	8	10	10	7	
	Summer Term	Algebra: Graphing Coordinates Horizontal and vertical graphs Graph Plotting (Linear)	Geometry: Visualising Measuring and Drawing Lines and Angles Bearings Reflection, Rotation, Translation, Enlargement	Statistics: Probability Simple probability	Statistics: Data Construct and interpret charts, tables and diagrams Averages from lists and tables.		
		8	11	6	10		

Year 9 Age Related Expectations – Students following the Support SOL

The Support SOL will not equip students to achieve age related expectations. The SOL is designed for students who are targeted a grade 3 or below and therefore will be judged to be working towards age related expectations.