

# Implementation: Curriculum Narrative



**Subject: Mathematics**

**Year: 9**

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## Key Knowledge

*Pupils will know*

### Key Threshold Concepts:

the terms used in household finance, for example profit, loss, cost price, selling price, debit, credit, balance, income tax, VAT and interest rate.

not to round values during intermediate steps of a calculation.

the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors to include identities

to work with coordinates in all four quadrants

to identify and interpret gradients and intercepts of linear functions graphically and algebraically

to identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement

how to identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference

how to identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres

interpret plans and elevations of 3D shapes, construct and interpret plans and elevations of 3D shapes

the powers of 2, 3, 4, 5.

To recognise and use sequences of triangular, square and cube numbers and simple arithmetic progressions including Fibonacci-type sequences, quadratic sequences, and simple geometric progressions ( $rn$  where  $n$  is an integer and  $r$  is a rational number  $> 0$ )

know and apply formulae to calculate: area of triangles, parallelograms, trapezia;  
volume of cuboids and other right prisms (including cylinders)

know the formulae: circumference of a circle =  $2\pi r = \pi d$ , area of a circle =  $\pi r^2$ , calculate perimeters of 2D shapes, including circles, surface area and volume of spheres, pyramids, cones and composite solids, areas of circles and composite shapes

## Key Skills

*Pupils will be able to*

### Subject Skills:

order positive and negative integers, decimals and fractions

recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)

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

round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures). Use inequality notation to specify simple error intervals due to truncation or rounding.

substitute numerical values into formulae and expressions, including scientific formulae

simplify and manipulate algebraic expressions by: collecting like terms, multiplying a single term over a bracket, taking out common factors, simplifying expressions involving sums, products and powers, including the laws of indices, expanding products of two binomials, factorising quadratic expressions of the form  $x^2+bx+c$ , including the difference of two squares, expanding products of two or more binomials, factorising quadratic expressions of the form  $ax^2+bx+c$

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, draw diagrams from written description

use proportion as equality of ratios  
relate ratios to fractions and to linear functions

record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees

construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities

use the concepts and vocabulary of prime numbers, factors



**to 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, work with percentages greater than 100%, solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics**

**the property that the probabilities of an exhaustive set of mutually exclusive events sum to 1**

**to solve linear equations in one unknown algebraically, find approximate solutions using a graph, including those with the unknown on both sides of the equation generate terms of a sequence from either a term-to-term or a position-to-term rule**

**to deduce expressions to calculate the  $n$ th term of linear sequences, including quadratic sequences**

**to express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1**

**compare lengths, areas and volumes using ratio notation, scale factors, make links to similarity (including trigonometric ratios)**

**use conventional notation for priority of operations, including brackets, powers, roots and reciprocals**

**to interpret the gradient of a straight-line graph as a rate of change, recognise and interpret graphs that illustrate direct and inverse proportion**

(divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem

Estimate powers and roots of any given positive number. Students should know that  $1000=10^3$  and 1 million =  $10^6$  calculate with roots, and with integer indices, calculate with fractional indices

calculate exactly with fractions, calculate exactly with multiples of  $\pi$ , calculate exactly with surds, simplify surd expressions involving squares (

work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and interpret fractions and percentages as operators

estimate answers, check calculations using approximation and estimation, including answers obtained using technology

plot graphs of equations that correspond to straight-line graphs in the coordinate plane, 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, use the form  $y=mx+c$  to identify perpendicular lines

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)

calculate arc lengths, angles and areas of sectors of circles describe translations as 2D vectors

use scale factors, scale diagrams and maps

use and interpret scatter graphs of bivariate data, recognise correlation, know that it does not indicate causation, draw estimated lines of best fit, make predictions, interpolate and extrapolate apparent trends whilst knowing the dangers of so doing

use ratio notation, including reduction to simplest form 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, concentration)



## Subject Specific Knowledge and Sequencing:

### *Subject specific knowledge and sequencing*

The KLA mathematics timeline and subject sequence of learning contains a number maths topic headings. Key concepts and skills are embedded within each of these topics

**The skills and knowledge have been identified and highlighted where knowledge spirals within the subject.**

**An example of one topic and the spiral nature is below...**

Algebra Topics		
Year 7	Term 1	Sequences
Year 7	Term 1	Algebraic Notation
Year 7	Term 1	Equality and Equivalence
Year 8	Term 2	Brackets, Equations and Inequality
Year 8	Term 2	Sequences
Year 9	Term 1	Straight Line Graphs
Year 9	Term 1	Forming and Solving Equations
Year 9	Term 1	Testing Conjectures
Year 10 (Foundation)	Term 2	Algebra Quadratics, Rearranging Formulae and Identities
Year 10 (Foundation)	Term 2	Inequalities
Year 10 (Foundation)	Term 2	Simultaneous Equations
Year 10 (Foundation)	Term 2	Algebra and Graphs
Year 10 (Foundation)	Term 3	Solving Quadratic Equations
Year 10 (Higher)	Term 1	Algebra Quadratic, Rearranging Formula and Identities
Year 10 (Higher)	Term 2	Further Equations and Graphs
Year 10 (Higher)	Term 2	Simultaneous Equations
Year 10 (Higher)	Term 3	Inequalities
Year 11 (Foundation)	Term 1	Algebra Quadratics, Rearranging Formulae and Identities
Year 11 (Foundation)	Term 1	Algebra and Graphs
Year 11 (Foundation)	Term 1	Solving Quadratic Equations
Year 11 (Foundation)	Term 1	Quadratic Graphs
Year 11 (Higher)	Term 1	Further Equations and Graphs
Year 11 (Higher)	Term 1	Simultaneous Equations
Year 11 (Higher)	Term 1	Algebraic Fractions

## Prerequisites and Spiral Teaching:

- Key concepts and skills linked to and expanded from the Year 8 Overview.
- Leads into the Year 9 Overview, with many concepts revisited and investigated to a further degree.
- The designed Timeline of topics follows a similar format to those covered in Year 7 & 8, topics are adapted and extended from the following year. The mathematics involved is revisited in each topic spiralling from Year 7 & 8 and also within the same year.
- We move through number, algebra, geometry, probability, ratio and statistics throughout the course. The sequence is repeated throughout the year and throughout the student's time in KLA.
- Lesson starters are used to recap prior knowledge throughout the course from lesson to lesson.
- Teachers use lesson starter to constantly revisit previous knowledge throughout the course to enable students to become more familiar at recalling essential techniques and threshold concepts.
- Topic tests are used by teachers throughout the course to assess a student's ability at application and recall of key threshold concepts and techniques. A weekly 'torture time' is used by teachers to address the well documented issue surrounding the ability of students to quickly recall and use timestable information.

## Cross-Curricular Knowledge Links:

### *Cross-curricular knowledge*

- Area calculations in technology
- Calorie calculation in PE/Food tech
- % increase and decrease in business
- Time calculations in history
- Quantity and units in Science

## Reading Lists / Sources / Reading around the subject recommendations:

Reading lists / sources / reading around the subject recommendations

The KLA Maths department have a number of suggested further activities as a possible source of exploring around the topics covered in our Year 9 maths curriculum. We actively encourage the use of Sparx maths, and the PiXL App as methods of further a student's mathematical base and further problem solving. NRICH activities are explored in classes to aid development of student's problem solving and team work skills.



	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
<b>Autumn</b>	<b>Reasoning with Algebra</b>						<b>Constructing in 2 and 3 Dimensions</b>					
	Straight line graphs		Forming and solving equations		Testing conjectures		Three-dimensional shapes			Constructions and congruency		
<b>Spring</b>	<b>Reasoning with Number</b>						<b>Reasoning with Geometry</b>					
	Numbers		Using percentages		Maths and money		Deduction		Rotation and translation		Pythagoras' Theorem	
<b>Summer</b>	<b>Reasoning with Proportion</b>						<b>Representations and Revision</b>					
	Enlargement and similarity		Solving ratio & proportion problems		Rates		Probability		Algebraic representation		Revision	