Mathematics Curriculum Map

Year 11

Carnforth High School

Rationale and Links to The National Curriculum	
Mathematics is a creative and highly inter-connected 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. • To be **fluent** in the fundamentals of mathematics so that pupils have a deep conceptual understanding and are able to recall and apply mathematics skills quickly. • To **reason mathematically** by following lines of enquiry, developing arguments, drawing conclusions and generalisations from their findings. • To **solve problems** by applying their mathematical understanding to a variety of contextual and abstract problems. • To **communicate mathematically** using correct mathematical terminology and notation. • To recognise and appreciate the interlinking nature of mathematics and **make connections** through the different areas of maths. The expectation is that the majority of students will progress through the scheme of learning at broadly the same pace. However, decisions about when to progress will always be based on the security of students' understanding and their readiness to progress. Students who grasp concepts rapidly will be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material will spend time consolidating their understanding, including through additional practice, before moving on. Year 11 students are separated into Foundation and Higher Tier pathways from year 10. Cross-over topics are taught to both pathways and final decisions are made as late as possible to help secure best outcomes for individual students.	Throughout the five years, students will cover a range of topics within the following areas of mathematics: • Number • Algebra • Ratio, Proportion and Rates of Change • Geometry & Measures • Probability • Statistics The exact content within each area will differ depending on the students' recall of previous learning.

Year 11	Half Term 1	Half Term 2	Half Term 3
Key Topics	Unit 1 Gradient & Lines Unit 2 Non-Linear Graphs Unit 3 Using Graphs	Unit 4 Expanding & Factorising Unit 5 Changing the Subject Unit 6 Functions	Unit 7 Multiplicative Reasoning Unit 8 Geometric Reasoning
Substantive Knowledge **(Bold is higher tier only)**	• Work with coordinates and equations to plot linear and quadratic graphs • Identify gradients, including those of parallel and **perpendicular lines** • Solve linear equations to find intercepts with the axis or with other graphs (simultaneous equations) • Factorise and solve a quadratic equation • Sketch quadratic graphs through factorising • **Identify and interpret other non-linear graphs, including finding rates of change**	• Solve linear equations and inequalities, including those requiring rearrangement and with unknowns on both sides • Change the subject of formulae including those with perimeter, area and volume formula • Substitute values into expressions and formulae of 3D shapes, including spheres, cylinders, cones and pyramids • Multiply out and factorise into a single bracket • Expand the products of two binomials • Factorise and solve quadratic expressions and equations using formal methods **(including DOTS, completing the square and those with a>1)** • **Solve equations with iteration** • Understand and use formal function notation with function machines, including reverse operations • **Work with inverse and composite function problems** • Interpret results from real-life expressions and formulae	• Construct and interpret speed, distance, time graphs, memorise and use the equations to link SDT, DMV and PFA. • Simplify ratio, share values in a given ratio and compare ratios given separately • Use and determine ratios and scale factors in similar shapes • Use ratio and scale factors in conversion problems • Link ratio to algebra • Link the gradient of a line to proportion • Find and use scale factors and ratios with area and volume questions • Identify all basic angles facts, such as around a point, on a line, within parallel lines and polygons. • **Construct and work with complex direct and indirect proportion equations, and those including 'k'** • Understand and use vector notation **(including complex shapes)** • **Identify all circle theorems** • Use trigonometry and Pythagoras to solve problems**, including the cosine, sine and area sine rules and in 3D shapes**
Disciplinary Knowledge **(Bold is higher tier only)**	Select and apply the most appropriate mathematical method to solve problems, including those , by working with: • Linear, quadratic and other non-linear graphs in an algebraic or graph form • Key elements of graphs, including intercepts with the axis or other graphs, turning points, gradients, roots, rates of change and area under curves. • Graphs in real-life context to interpret roots, gradients, areas and intercepts	Select and apply the most appropriate mathematical method to solve problems, including those , by working with: • Linear equations and inequalities (including real-life context) and interpret results • Rearranging formulae including those with perimeter, area and volume to work with 3D shapes, including spheres, cylinders, cones and pyramids to answer questions • Interpreting the results from real-life expressions • Expanding and factorising methods • Factorising and solving quadratics to find turning points, roots and axes intercepts. • **The results of iterative methods in real-life context.** • Function methods to interpret results in real-life context	Select and apply the most appropriate mathematical method to solve problems, including those , by working with: • SDT, DMV and PFA formulae • Ratio and scale factors to answer questions , including similar shapes, area and volume problems. • Direct and indirect proportion methods • Angle properties **(or circle theorems)** to answer angle questions and those including proof. • Trigonometry and Pythagoras, **including those in 3D shapes.**

<table>
<tr><td>Assessment</td><td colspan="2">• Check In Tasks are completed the week prior to teaching each unit to assess retained knowledge and starting point.
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The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof.
Students are assisted in making their thinking clear to themselves as well as others and explicit modelling is a key priority for classroom teaching. Teachers ensure that pupils build secure foundations by using discussion and whiteboard assessment to probe and remedy any misconceptions.</td></tr>
<tr><td>graph
gradient
intercept
midpoint
segment
linear
parallel
perpendicular
non-linear
quadratic</td><td>root
turning point/vertex
completing the square
cubic
reciprocal
exponential
tangent
area
velocity</td><td>equation
term
expression
balance
inverse operation
brackets
inequality
expand
factorise
simplify
solve
rearrange
linear
quadratic
completing the square
iteration
iterative formula
binomial</td><td>function machine
input
output
change the subject
perimeter
area
surface area
volume
prism
cylinder
cone
sphere
pyramid
kinematics
function notation
composite
inverse
substitute</td><td>ratio
proportion/proportional
direct
inverse
scale factor
compound measures
speed
distance
time
density
mass
volume
pressure
force
area
gradient</td><td>instantaneous
rate of change
Pythagoras
hypotenuse
trigonometry
adjacent
opposite
sine
cosine
tangent
circle theorem
segment
radius
alternate
cyclic quadrilateral</td></tr>
<tr><td>Numeracy</td><td colspan="6">As defined</td></tr>
<tr><td>Personal Development</td><td colspan="2">•</td><td colspan="2">•</td><td colspan="2">•</td></tr>
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Year 11

	Half Term 4
Key Topics	Unit 9 Algebraic Reasoning Unit 10 Transforming & Constructing Unit 11 Listing & Describing Unit 12 Show That
Substantive Knowledge **(Bold is higher tier only)**	• Simplify expressions, including those that include brackets • Find and use rules for sequences; triangular, square, cube, arithmetic, Fibonacci-style, geometric **(including surds) and quadratics.** • Solve linear simultaneous equations algebraically and using a graph (**including one graph being a quadratic or a circle)** • **Form and work with algebraic proof** • Perform and describe line symmetry & reflection, rotations & rotational symmetry, translations of shapes, enlargements **(including negative enlargements and invariant points)** • Use a set of compasses to solve loci problems • Calculate bearings with known angle rules • **Recognise, sketch and interpret trigonometric graphs for angles of any size** • **Sketch and identify translations and reflections of any given function (H)** • Compile and work with organised lists • Construct and interpret sample spaces, Venn and tree diagrams, including those working with probability • Construct and interpret plans and elevations • Construct and use work with scattergraphs • **Use the product rule for counting** • **Construct and interpret histograms, cumulative frequency diagrams, box plots and other charts representing data** • **Start and work with proof methods for** congruent triangles and **vectors**
Disciplinary Knowledge **(Bold is higher tier only)**	Select and apply the most appropriate mathematical method to solve problems, including those , by working with: • Algebraic methods to simplify expressions, including those that include brackets, • Sequence rules; triangular, square, cube, arithmetic, Fibonacci-style, geometric **(including surds) and quadratics.** • Solving linear simultaneous equations algebraically and using a graph (**including one graph being a quadratic or a circle)** • **Algebraic proof** • Symmetry & reflection, rotations & rotational symmetry, translations of shapes, enlargements **(including negative enlargements and invariant points) problems.** • Loci and bearing problems , including those requiring angle rules • **Trigonometric graphs for angles of any size** • **Translations and reflections of any given function in graph or algebraic form** • Organised lists to solve problems • Sample spaces, Venn and tree diagrams, including those working with probability • Plans and elevations • Scattergraphs • **The product rule for counting** • **Histograms, cumulative frequency diagrams, box plots and other charts representing data to solve problems** • **Proof methods for** congruent triangles and **vectors**
Assessment	• Check In Tasks are completed the week prior to teaching each unit to assess retained knowledge and starting points for new learning • Check Out Tasks are completed the week following teaching with a teacher-led feedback and improvement lesson following marking.
	The national curriculum for mathematics reflects the importance of spoken language in students' development across the whole curriculum – cognitively, socially and linguistically.

<table>
<tr><td>Reading, Writing and Vocabulary</td><td colspan="4">The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof. Students are assisted in making their thinking clear to themselves as well as others and explicit modelling is a key priority for classroom teaching. Teachers ensure that pupils build secure foundations by using discussion and whiteboard assessment to probe and remedy any misconceptions.</td></tr>
<tr><td></td><td>index/indices
laws of indices
base
power
identity
recurring
histogram
class interval
cumulative frequency
box plot</td><td>systematic
listing
sample space
Venn diagram
two-way table
tree diagram
scale diagrams
bearings
plan
elevation</td><td>independent
dependent
conditional
grouped frequency
counting
product rule
construct
bisector
perpendicular
locus/loci
invariant</td><td>transformations
object
image
reflection
rotation
translation
vector
enlargement
scale factor</td></tr>
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