Mathematics

Content follows the White Rose Maths secondary progression

L.E.A.D. Academy Trust
Lead • Empower • Achieve • Drive

Theme/ Concept	KS2	Year 7	Year 8	Year 9	Year 10	Year 11	Post-16
Number ***Understand & represent***	***Number and Place Value*** *Determine the value of each digit of numbers up to 10,000,000, order and compare them.* *Round whole numbers.* *Use negative numbers in context.* ***Addition, Subtraction, Multiplication and Division*** *Decide which operations and methods to use when solving problems.* *Use mental calculations for mixed operations and with large numbers.* *Use estimation to check answers.* *Use the formal written method of long division.*	Understand and use place value Compare and order numbers Round to powers of 10 and 1sf [Write 1sf number sin standard form] Use factors & multiples Order directed number Prime factorisation HCF and LCM	Revisit Y7 comparing and ordering Write numbers of any size in standard form [Use negative and fractional indices] Revisit rounding Round to given numbers of dp and sf	Types of number Standard form HCF and LCM Rational and real numbers Standard form Prime factorisation	Rounding and limits of accuracy [Upper and lower bounds] [Converting recurring decimals] Factors, multiples and primes Standard form	(Revision)	***AS Level Mathematics content*** ***Pure Mathematics*** • *Proof* • *Algebra and functions* • *Coordinate geometry* • *Trigonometry* • *Sequences* • *Exponentials and logarithms* • *Calculus* • *Vectors*
Number ***Calculations***		Use the four operations with positive integers and decimals Use a calculator Multiply and divide by positive powers of 10 Order of operations Multiply by 0.1 & 0.01 Use the four operations with directed number Add and subtract fractions including mixed numbers Use known facts	Multiply and divide fractions Multiply and divide mixed numbers Convert between units of time Order of operations Calculate with money Use estimation Convert metric units of length and area Use error interval notation	Fraction arithmetic Calculation int he context of financial mathematics	Work with exact answers Calculate with surds Work with powers and roots Calculate with standard form Calculate with surds	(Revision)	

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Number ***Understand fractions & decimals***	***Fractions*** *Simplify fractions.* *Divide proper fractions by whole numbers* *Use equivalent fractions to add and subtract fractions.*	Interchange between fractions and decimals below 1 Explore fractions above 1 Find fractions of an amount (up to 1) Solve problems with fractions greater than 1	Express on number as a fraction of another Explore calculator and non-calculator methods	(Extension)	Working with ratios and fractions Conversions Converting fractions and decimals	Multiplicative change including fractions and decimals Proving equivalence	***Statistics and mechanics*** • *Statistical sampling* • *Data presentation & interpretation* • *Probability* • *Statistical distributions* • *Statistical hypothesis testing* • *Quantities and units in mechanics* • *Kinematics* • *Forces and Newton's laws*
Number ***Percentages***		Interchange between fractions, decimals and percentages up to 100% Explore over 100% Find percentage of amount using mental and calculator methods (up to 100%) Explore over 100%)	Percentage increase and decrease Using multipliers Express on quantity as a percentage of another, compare two quantities using percentages Work with percentages greater than 100% Finding the original after percentage change	Reverse percentages Financial maths Repeated percentage change	Simple and compound interest Finding original values Repeated percentage change Revisit conversions and non-calculator methods	Show that' problems with percentages	

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Algebra ***Understand notation and substitute***	*Express missing number problems algebraically.* *Describe linear number sequences and know how to generate them.* *Use simple formulae.*	Function machines Algebraic notation Substitute into expressions Revisit notation and substitution in the context of directed number Simple algebraic fractions Explore related algebraic expressions	More complex expressions Work with indices Explore powers of powers	Revise algebraic representation	Work with powers and roots	Substitute in kinematics formulae Functions Composite and inverse functions	***A Level*** ***Pure Mathematics*** • *Proof* • *Algebra and functions* • *Coordinate geometry* • *Trigonometry* • *Sequences* • *Exponentials and logarithms* • *Calculus* • *Vectors* ***Pure Mathematic*** • *Proof* • *Algebra and functions* • *Coordinate geometry in (x,y) plane* • *Sequences* • *Trigonometry* • *Exponentials and logarithms* • *Calculus* • *Vectors*
Algebra ***Equivalence & proof***		Understand the difference between equality and equivalence Collecting like terms Revisit collecting like terms in the context of directed number Simple algebraic fractions Explore related algebraic expressions	Expand over a single bracket Simplify expressions involving brackets Identify and use formulae, expressions, identities & equations Expand a pair of binomials	Rearranging the form y = mx + c Change the subject of a formula Testing algebraic conjectures Expand a pair of binomials Change the subject of a more complex formula Revise algebraic representation	Factorising quadratics of the form x2 + bx + c Maintain equivalence using the rules of indices	Factorising quadratics of the form x2 + bx + c Completing the square Change the subject of a formula Change the subject of a formula where the subject appears more than once Algebraic proof	
Algebra ***Solve equations & inequalities***		Form and solve one-step equations Form and solve two-step equations	Solve inequalities Form and solve equations with brackets Identify and use formulae, expressions, identities and equations Form and solve equations & inequalities with unknowns on both sides	Form and solve equations and inequalities with unknowns on both sides Representing inequalities	Represent solutions to inequalities on number lines Form and solve linear simultaneous equations Solve quadratic equations & inequalities by factorising Solve simultaneous equations, one linear and one quadratic	Form and solve quadratic equations by factorising Solve quadratic equations using the formula and completing the square	

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Algebra ***Linear graphs***		Represent functions graphically	Conversion graphs Direct proportion graphs Using coordinates Plotting graphs y = k, x = k, y = kx, y = x + a, y = mx + c Exploring gradient Exploring non-linear graphs	Simplify, use and interpret y = mx + c Parallel lines Solve simultaneous equations graphically Explore perpendicular lines Interpret graphs in various forms including piece-wise linear	Solve linear simultaneous equations graphically	Perpendicular lines Equation of the tangent to a circle	***Statistics and mechanics*** • *Statistical sampling* • *Data presentation & interpretation* • *Probability* • *Statistical distributions* • *Statistical hypothesis testing* • *Quantities and units in mechanics* • *Kinematics* • *Forces and Newton's laws* • *Moments*
Algebra ***Non-linear graphs***		Represent functions graphically	Using coordinates Exploring gradient Exploring non-linear graphs	Interpret graphs in various forms (including quadratic, piece-wise, exponential, speed/ distance/time(	Solve linear quadratic simultaneous equations graphically	Roots, quadratic, cubic and reciprocal graphs Equations of circles Real-life graphs including speed/ distance/time Trig graphs Transforming graphs	
Algebra ***Sequences***		Recognise linear and non-linear sequences Generate sequences from an algebraic rule	More complex rules Find the rule for the nth term of a linear sequence	Testing conjectures about sequences Representing more complex sequences Finding the rule for the nth term of a more complex linear sequence	Names and types of sequences Find the rule for the nth term of a quadratic sequence Sequences with surds	(Revision)	

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Ratio, proportion & rates of change ***Multiplicative relationships***	*Use knowledge of fractions and multiples to solve problems.* *Solve problems, which include the calculation of percentages.* *Know how to find a solution to problems, which include relative sizes of two quantities.*	Convert metric units Use multiplicative relationships between known facts	Understand and use scale factors Salce diagrams and maps Currency conversions Conversion graphs Similar shapes Direct proportion graphs Metric units Convert area and volume measures	Scale drawings Conversion graphs Solve direct proportion problems Inverse proportion Inverse proportion graphs	Similar shapes Enlargement Area and volume similarity Revisit area and volume similarly with cones etc. Unit pricing ('best buys') Currency conversions Revisit area and volume similarity	Direct and inverse proportion numerically and graphically Pressure and density Variation with powers and roots	
Ratio, proportion & rates of change ***Ratio and rates***		(Multiplicative relationships)	Understand and use ratio notation Divide in ratio Work out parts and wholes π as a ratio Use of the form 1:π Link gradient and ratio	Repeated percentage change Speed, distance and time Density Compound units Converting compound measures Unit pricing problems	Ratios and fractions Ratios in the context of area and volume Repeated percentage change including compound interest Growth and decay problems Iterative processes	Gradients of curves Estimate the area under a curve Pressure and density	

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Geometry & measures ***Perimeter, Area and Volume***	***Measurement*** *Convert between standard units.* *Convert between kilometres and miles.* *Calculate the area of triangles and parallelograms.*	Solve perimeter problems Areas of rectangles, parallelograms and triangles Area of a trapezium	Circumference of a circle Area of trapezium Area of a circle Area of compound shapes	Surface area of cuboids and cylinders Volume of cuboids, cylinders and other prisms Explore volume of cones, spheres and compound shapes Surface area of prisms	Area & circumference of a circle Arc length Area of a sector Surface areas and volume of cylinders, cones and spheres Non-calculator methods	Perimeter, area and volume formulae as a context for rearrangement Volume of a pyramid	
Geometry & measures ***Construct and transform geometric figures***	***Properties of Shape*** *Use given angles and dimensions to draw 2D shapes.* *Build and describe simple 3D shapes, including making nets.*	Geometric notation Draw lines, angles and simple shapes Parallel and perpendicular lines Name and construct polygons	Work with scale factors Further geometric notation Recognise line symmetry Reflect shapes in a given line Standard ruler and compass constructions	Stand ruler and compass constructions Loci Recognise rotational symmetry Rotate points about a given point Translate shapes and describe translations Perform a series of transformations	Similarity and enlargement Negative scale factors of enlargement Parts of a circle	Loci Plans and elevations	
Geometry & measures ***Shape Properties***	*Know the names of different parts of circles.*	Properties of triangles and quadrilaterals	Explore diagonals of quadrilaterals	Testing conjectures about shapes Properties of 3-D shapes 2-D shapes in 3-D shapes	Shape names and properties in the context of enlargement Parts of a circle	Shape properties in the context of reasoning	

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Geometry & measures ***Angles***	***Position and Direction*** *Use the full coordinate grid to describe positions.* *Draw simple shapes on the coordinate plane.*	Angles at a point Adjacent angles on a straight line Vertically opposite angles Angles in triangles and quadrilaterals Angles in parallel lines Simple angle proofs	Angles in parallel lines Interior and exterior angles of polygons Angles formed by diagonals of quadrilaterals	Chains of reasoning to find angles	Interpret and use bearings	(Revision)	
Geometry & measures ***Pythagoras & Trigonometry***		(Geometric figures) (Shape properties) (Angles)	(Geometric figures) (Shape properties) (Angles)	Understand and use Pythagoras Theorem Show that a triangle is right-angled Use Pythagoras' theorem in 3-D shapes Explore ratios in right-angled triangles	Use trigonometry to find missing sides and angles in right-angled triangles Exact trig values Using the sine and cosine rules Area of a general triangle Pythagoras and trigonometry in the context of bearings	Trigonometry in the context of functions Exploring trigonometric graphs and transformations of these	
Geometry & measures ***Geometric Proof***		Simple angle proofs	Find and prove simple geometric facts	Explore congruency Developing chains of reasoning Develop more complex geometrical proofs Prove a triangle is/isn't right angled Explore proofs of Pythagoras' theorem	Proof with angle rules Prove shapes are similar Congruent triangles Proving triangles are congruent Prove and use the first four circle theorems Understand and use vectors Geometric proof with vectors	Proof Prove and use the remaining circle theorems Using correct language in 'show that'/proof questions Congruent triangle proofs	

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Probability	*Construct pie charts and line graphs and be able to interpret them.* *Calculate the mean as an average.*	Use the language of probability Calculate simple probabilities Use the probability scale Sample spaces Understand and use set notation, including Venn diagrams Know the sum of probabilities is 1 Complement of a set	Construct sample spaces for more than on event Use sample spaces to find probabilities Use tables and Venn diagrams to find probabilities Use the product rule for finding total number of outcomes	Compare experimental and theoretical probability Use frequency trees to find probabilities Simple tree diagrams	Effect of sample size on estimated probabilities Use tree diagrams Mutually exclusive and independent events Conditional probabilities	Sample spaces and probability rules	
Statistics ***Represent & Interpret Data***		Solve problems with line charts and bar charts Construct and interpret pie charts	Recognise different types of data Construct and interpret frequency tables, grouped and ungrouped, and two-way tables Collecting data Multiple bar charts Line graphs Misleading graphs	(Graphs)	Comparing distributions using diagrams Frequency polygons Time series Cumulative frequency diagrams Box plots Histograms	Comparing distributions using diagrams Describing a population	

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Statistics ***Statistical Measures***		Find the median and the range Find the mean	Find the mode Identify outliers Compare distributions using statistical measures Find the mean from a grouped or ungrouped frequency table	(Number)	Find the modal class Comparing distributions Finding the median and quartiles from cumulative frequency diagrams	Comparing distributions using data Describing a population	
Statistics ***Bivariate Data***		(Number)	Scatter graphs Correlation Lines of best fit	(Number)	Understand the risks of extrapolation	(Revision)	