



## Mathematics Curriculum Overview Plan

### Whole school curriculum intent

Develop a broad and balanced curriculum that enables students to learn, recall and apply knowledge and skills across different contexts, supported by a robust and consistent approach to assessment. This will lead to successful and resilient lifelong learners who can cope in a range of changing contexts.

### Key stage 3/4 subject curriculum intent

We aim to inspire our pupils to appreciate the beauty of Mathematics and use its logic skilfully across all areas of the school curriculum and life.



## Mathematics Curriculum Overview Plan

Year Group		Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 7	<b>Topic</b>	Algebraic Thinking	Place Value and Proportion	Applications of Number	Directed Number and Fractional thinking	Lines and Angles	Reasoning with Number
	<b>Core knowledge from this topic</b>	Sequences Understand and use algebraic notation Equality and Equivalence	Place Value and ordering integers and decimals Fraction, decimal and percentage equivalence	Solving problems with addition, subtraction, multiplication, and division Fractions and percentages of amounts	Operations and equations with directed number Addition and subtraction of fractions	Constructing, measuring and using geometric notation Developing geometric reasoning	Developing Number Sense Sets and Probability Prime Numbers and proof
	<b>Links to the national curriculum</b>	A1, A2, A3, A4, A5, A7, A8, A9, A10, A11, A12, A13, A14, A17, A22, A23, A24	N1, N4, N9, N15, N16, N10, N11, N12, S4	N1, N4, N9, N15, N16, N2, N3, N6, N13, N10, N11, N12, R1, R2, R6, R10, G4, G17, S1, S2, S4	N1, N4, N9, N15, N2, N3, N6, N13, N16, A1, A2, A3, A4, A5, A7, A17	N2, N3, N6, N13, N16, A1, A2, A3, A4, A5, R1, R2, R6, R10, S1, S2, G1, G3, G4, G9, G11, G12 G16 G17	P1, P2, P3, P4, P5, P6
	<b>Previous content that this topic builds upon</b>	Use of calculators estimation	Solve equations with fractions including fractional coefficients Consider sequences with fractions	Perimeter problems Equations and simplifying Rounding Distance charts/timetables Mental, written and calculator methods Order of operations	Number lines Inequality number lines Fractions of amounts	Simplifying expressions Perimeter Form and solve equations Mental and formal methods of addition and subtraction, including decimals	Revisit FDP equivalence FDP addition and subtraction Revisit factors and multiples (numerically and algebraically)
	<b>Key vocabulary</b>	Sequence, Term, Position, Rule, Term-to-term, linear, non-linear, difference, ascending, descending, Fibonacci, estimate, operation, square, inverse, variable, coefficient, expression, Evaluate, substitute, order, bracket, scale, equation, equality, equals, solve, solution, unknown, like, unlike, index, equivalent, simplify, collect	Place value, digit, integer, equal division, interval, approximate, round, order, ascending, descending, leading digit, range, difference, median, middle, order, average, decimal, significant figure, power, index, standard form, percentage, fraction, denominator, Numerator, part, whole, improper, mixed number, rational, recurring	Total, sum, difference, number line, associate, inverse, bridging, difference, column method, place value, exchange, placeholder, equivalence, estimating, subtraction, polygon, profit, loss, balance, credit, debit, statement, change, bill, scale, multiple, standard form, power, exponent, significant figure	Product, multiply, divide, inverse, factor, Venn diagram, integer, multiple, common, lowest common multiple, place value, product, efficient, estimate, base, parallel, parallelogram, perpendicular height, trapezium, mean, average, median, range, expression, term, simplify, fraction, equivalent, numerator, denominator, percent, reflection, ascending, descending, add, minus, subtract, substitute, expression, order of operations, equation, function machine, solution, indices, square, square root, denominator, numerator, lowest common multiple, common denominator, improper fraction, sequence, substitute, solve, equation, linear, geometric, inverse, expression, simplify, like terms, collect	Line, line segment, notation, polygon, segment, rotation, angle, acute, obtuse, right-angle, reflex, interior, exterior, protractor, degrees, construct, parallel, perpendicular, intersect, equilateral, isosceles, scalene, square, rectangle, kite, rhombus, parallelogram, polygon, edges, vertices, equal, triangle, point, isosceles, equilateral, scalene, right-angled, regular, rhombus, diagonals, compound, proportion, sector, protractor, adjacent, vertically opposite, intersect, conjecture, transversal, co-interior, corresponding, alternate, demonstration,	Compensation, factors, numerator, denominator, factor, equivalent, multiple, rounding, significant figures, overestimate, underestimate, equivalent, product, equation, expression, equality, estimate, interpret, universal set, inclusive, element, member, set, Venn diagrams, intersection, mutually exclusive, union, element, And, complement, Or, Both, impossible, likely, even, unlikely, certain, random, bias, event, sample space, possibilities, outcomes, event, integer, factorise, Prime number, triangular number, relationship, square number, expression, common factor, highest common lowest common multiple, prime factor, express,
	<b>Development of cultural capital</b>	Sequences link to real-life situations including production lines, architecture and quantity surveying as well as traffic flow modelling.	Pupils develop the skills and understanding to calculate with proportionality. Real life applications include recipes.	Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and “real-life” mathematical problems.	Ensure pupils develop an understanding of FDP to apply to everyday and real-life problems. For example, decimals can be used with money problems so that pupils can apply this to real-life context to deepen understanding.	This is used in construction and architecture when pupils have to accurately draw plans to implement them. They are also regularly used with Flying and the Military, GPS, CCF cadets, Duke of Edinburgh and orienteering.	Ensure that pupils are numerate and confident with calculations
	<b>Development of reading</b>	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Place value - calculations	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading –Alan Turing	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Katherine Johnson	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Construction	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Prime Numbers and encryption



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		Guided reading – Into to magic squares					
	<b>Concepts –what will students be able to do at the end of the topic</b>	<p>Sequences</p> <ul style="list-style-type: none"> <li>Describe and continue sequences in diagram and number forms, both linear and non-linear</li> <li>Compare numerical and graphical forms</li> </ul> <p>Algebraic Notation</p> <ul style="list-style-type: none"> <li>Use single function machines and series of two function machines with numbers, bar models and letters</li> <li>Use and interpret algebraic notation</li> <li>Understand and use inverse operations</li> <li>Form and substitute into expression, including to generate sequences</li> <li>Represent functions graphically</li> </ul> <p>Equality and Equivalence</p> <ul style="list-style-type: none"> <li>Understand equality</li> <li>Use fact families</li> <li>Form and solve one-step equations</li> <li>Understand equivalence of algebraic expressions</li> <li>Collect like terms</li> </ul>	<p>Place Value and Ordering</p> <ul style="list-style-type: none"> <li>Recognise and use integer place value up to one billion</li> <li>Recognise and use decimal place value to at least hundredths</li> <li>Work out intervals and use number lines</li> <li>Compare and order numbers</li> <li>Use ordered lists to find the range and the median of a set of numbers</li> <li>Round numbers to positive powers of ten</li> <li>Round numbers to one significant figure</li> </ul> <p>Fraction, decimal and percentage equivalence</p> <ul style="list-style-type: none"> <li>Represent tenths and hundredths on diagrams and number lines</li> <li>Interchange between fractions, decimals and percentages for multiples of one tenths and one quarter</li> <li>Interpret pie charts</li> <li>Equivalent fractions</li> <li>Convert between other fractions, decimals and percentages</li> </ul>	<p>Addition and Subtraction</p> <ul style="list-style-type: none"> <li>Use mental and formal written methods of addition with integers and decimals, including choosing the most appropriate method</li> <li>Solve problems in the context of perimeter, money and frequency trees and tables</li> <li>Solve problems in the context of bar charts and line charts</li> </ul> <p>Multiplication and division</p> <ul style="list-style-type: none"> <li>Multiply by 10, 100, 100, 0.1 and 0.01 and convert metric units</li> <li>Use mental and formal written methods of multiplication and division</li> <li>Find the HCF and LCM of small numbers</li> <li>Evaluate areas of triangles, rectangles, and parallelograms</li> <li>Find the mean of a set of numbers</li> <li>Find simple fractions and percentages of amounts</li> <li>Begin to use the order of operations</li> </ul> <p>Fractions and percentages of amounts</p> <ul style="list-style-type: none"> <li>Work out simple fractions and percentages of amounts with and without a calculator</li> </ul>	<p>Directed Number</p> <ul style="list-style-type: none"> <li>Order directed numbers, both in contextualised and abstract situations</li> <li>Revisit four operation to include directed number</li> <li>Use a calculator with directed number</li> <li>Solve two-step equations (with and without a calculator)</li> <li>Use the order of operations</li> </ul> <p>Adding and Subtracting fractions</p> <ul style="list-style-type: none"> <li>Represent tenths and hundredths on diagrams and number lines</li> <li>Convert mixed numbers and improper fractions</li> <li>Add and subtracting fractions with the same denominator, one denominator a multiple of the other and different denominators</li> <li>Add and subtract fractions and decimals</li> </ul>	<p>Constructing and Measuring</p> <ul style="list-style-type: none"> <li>Understand and use letting and labelling notation for lines and angles</li> <li>Draw and measure lines and angles accurately</li> <li>Classify angles</li> <li>Identify and draw parallel and perpendicular lines</li> <li>Recognise types of triangle, quadrilateral and other polygons</li> <li>Construct triangles given SSS, SAS, ASA</li> <li>Draw and interpret pie charts</li> </ul> <p>Geometric Reasoning</p> <ul style="list-style-type: none"> <li>Calculate and use angles at a point, angles on a straight line and vertically opposite angles</li> <li>Calculate missing angles in triangles and quadrilaterals</li> <li>Understand and use parallel lines rules</li> <li>Understand and use the sum of angles in any polygon</li> </ul>	<p>Developing Number sense</p> <ul style="list-style-type: none"> <li>Mental arithmetic strategies</li> <li>Use known facts to derive other facts</li> <li>Evaluate an algebraic expression given a related fact</li> <li>Use estimation</li> </ul> <p>Sets and Probability</p> <ul style="list-style-type: none"> <li>Understand and use set notation</li> <li>Draw and interpret Venn diagrams</li> <li>Understand and use the language of probability</li> <li>Calculate the probability of a single event</li> <li>Use the sum of probabilities of an event is 1</li> </ul> <p>Prime Numbers and proof</p> <ul style="list-style-type: none"> <li>Recognise prime, square and triangle numbers</li> <li>Express a number as a product of prime factors</li> <li>Powers and roots</li> <li>Make and test conjectures</li> <li>Understand and use counterexamples</li> </ul>
	<b>Additional Higher Content</b>		Explore and use standard index form Explore fractions above one Convert multiple of one eight to decimals and percentages	Explore addition of numbers given in standard form Evaluate area of a trapezium Find the HCF and LCM of algebraic expressions Use fractions greater than 1	Negative square roots Mixed numbers	Understand and use parallel lines rules Understand and use the sum of angles in any regular polygon Derive simple proofs using angles rules	Understand and use the complement of a set Use prime factors to find HCF and LCMs
	<b>Knowledge organisers</b>	<a href="#">Sequences</a> <a href="#">Understand and use algebraic notation</a> <a href="#">Equality and Equivalence</a>	<a href="#">Place Value and ordering integers and decimals</a> <a href="#">Fraction, decimal and percentage equivalence</a>	<a href="#">Solving problems with addition, subtraction, multiplication, and division</a> <a href="#">Fractions and percentages of amounts</a>	<a href="#">Operations and equations with directed number</a> <a href="#">Addition and subtraction of fractions</a>	<a href="#">Constructing, measuring and using geometric notation</a> <a href="#">Developing geometric reasoning</a>	<a href="#">Developing Number Sense</a> <a href="#">Sets and Probability</a> <a href="#">Prime Numbers and proof</a>
<b>Year Group</b>		<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
<b>Year 8</b>	<b>Topic</b>	Proportional Reasoning	Representations	Algebraic Techniques	Developing Number	Developing Geometry	Reasoning with Data



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	<b>Core knowledge from this topic</b>	Ratio and Scale Multiplicative Change Multiplying and Dividing Fractions	Working in the Cartesian Plane Representing data Tables and probability	Brackets, equation and inequalities Sequences Indices	Fractions and percentages Standard Index Form Number Sense	Angles in parallel lines and polygons Area of trapezia and circles Line symmetry and reflection	The data handling cycle Measures of location
	<b>Links to the national curriculum</b>	N2, N3, N6, N13, N16, A8, A9, A10, A11, A12, A13, A14, A17, R1, R2, R6, R10, R4, R5, R8, R11, G4, G17	A8, A9, A10, A11, A12, A13, A14, A17, S1, S2, S6, P1, P2, P3, P4, P5, P6	A1, A2, A3, A4, A5, A7, A17 A22, A23, A24	N1, N4, N9, N15, N2, N3, N6, N7, N13, N16, N10, N11, N12	G1, G3, G4, G9, G11, G12 G16 G17	R1, R2, R6, R10, S1, S2, S4
	<b>Previous content that this topic builds upon</b>	Interleaving links Revisit area Revisit equation Revisit converting improper fractions and mixed numbers Fractions of an amount	Interleaving links Revisit calculation with directed number Link to solving one and two-step linear equations Revisiting Venn diagrams and set notation Representing data and using graphs	Interleaving links Directed number Solve equations with shapes, angles, probability, ratio	Interleaving links Fraction, decimal and percentage equivalence Evaluate percentage increase and decrease	Forming and Solving equations Properties of shapes Equation of straight lines	Finding the range Use algebraic substitution to form lists for averages and the range Data collection and representations
	<b>Key vocabulary</b>	Ratio, equal parts, proportion, relationship, order, multiplier, placeholder, share, label, factors, equivalent, divide, simplify, common factors, scale, compare, perimeter, circumference, constant, pi, regular, diameter, gradient, slope, steep, linear, variable, axes, labelling, conversion, approximation, exchange rate, currency, estimate, sterling, rate, directly proportional, origin, relationship, similar, corresponding, scale factor, enlargement, plan, image, distance, metric, numerator, denominator, product, reciprocal, convert, simplify, factors, denominators, term, expression, simplest form	Quadrant, coordinates, horizontal, vertical, axis, origin, parallel, vertical, horizontal, equation, scale, graph, multiple, steep, linear, axes, proportion, direct, difference, gradient, equation, intercept, incline, sequence, descending, ascending, non-linear, symmetrical, midpoint, equidistant, segment, mean, variable, corelation, outlier, discrete, continuous, qualitative, quantitative, frequency, ungrouped, range, set, probability, systemic, chance, event, equally likely, unbiased, P(event), sample, set, intersection, And/Or, union, region, possibilities, outcomes, product	Expression, simplify, term, substitute, coefficient, equivalent, directed, solve, expand, identity, factor, factorise, HCF, expression, like terms, unlike terms, equivalent, solution, equation, inequality, satisfy, formula, subject, sequence, position, term, linear, Fibonacci, difference, constant, term-to-term, integer, Index, indices, power, product, base,	Equivalent, denominator, numerator, estimate, multiplier, growth, express, profit, loss, interest, change, reverse, index, indices, power, standard from, negative, place value, reciprocal, root, significant, integer, number line, decimal place, discrete, continuous, bound, operation, order, priority, change, deposit, interest, debit, credit, balance, metric, metre, prefix, kilo, milli, centi, area, perpendicular, square units, dimensions, cubic units, 12-hour clock, 24-hour, clock, week, month, year, leap year	Adjacent, angles at a point, vertically opposite, straight, acute, obtuse, reflex, right angle, parallel, transversal, alternate, corresponding, co-interior, isosceles, equilateral, scalene, rhombus, parallelogram, square, trapezium rectangle, kite, perpendicular, bisect, delta, exterior, interior, regular, polygon, sum, total, pentagon, hexagon, bisect, bisector, acute, obtuse, compasses, sector, estimate, infinity, radius, pi, approximately, radius, diameter, line symmetry, polygon, reflect, congruent, object, image, vertical, horizontal, vertex, perpendicular distance,	Hypothesis, investigation, enquiry, primary data, secondary data, sample, pictogram, bar chart, line chart, tally, frequency, pie chart, fraction, full tern, proportion, axes, scale, change, read off, read from, comparison, scatter graph, bivariate, grouped data, frequency diagram, discrete, continuous, intervals, range, spread, consistent, average, compare, distribution, broken axis, difference, average, mean, median, mode, modal value, estimate, midpoint, modal class,
	<b>Development of cultural capital</b>	Pupils develop the skills and understanding to calculate with proportionality. Real life applications include recipes.	Understanding and interpreting statistical data in the media to develop and support their own opinions.	Sequences link to real-life situations including production lines, architecture, and quantity surveying as well as traffic flow modelling.	Percentages are used as “everyday maths” when calculating interest rates, offers and sales with “percentage off”. The intention will allow pupils to develop confidence to calculate with percentages	Links to projections for profit and loss as well as manufacturing processes for large scale productions.	Understanding and interpreting statistical data in the media to develop and support their own opinions
	<b>Development of reading</b>	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Scale drawings	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – collecting data	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Alan Turing or Fibonacci sequences	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Percentages	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading –Angles	The ‘Fraye model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice Guided reading – Representing data
	<b>Concepts –what will students be able to do at the end of the topic</b>	Ratio and Scale <ul style="list-style-type: none"> <li>Understand ratio and its link to multiplication</li> <li>Use ratio notation</li> <li>Reduce ratios to simplest form</li> <li>Solve ratio problems</li> </ul>	Working in the Cartesian Plane <ul style="list-style-type: none"> <li>Plot and interpret straight line graphs</li> <li>Understand and use the equations of a straight line, including lines parallel to the axes</li> </ul>	Brackets, equation and inequations <ul style="list-style-type: none"> <li>Expand and factorise into single brackets</li> <li>Form and use expressions, formulae and identities</li> <li>Form and use expressions, formulae and identities</li> </ul>	Fractions and percentages <ul style="list-style-type: none"> <li>Develop understanding of fractions ,decimals and percentages</li> <li>Evaluate percentage increases and decrease</li> <li>Use multipliers to solve percentage problems</li> </ul>	Angles in parallel lines and polygons <ul style="list-style-type: none"> <li>Revisit angle rules</li> <li>Understand and use parallel lines and angles</li> <li>Revisit geometric notation</li> <li>Work out angles in special quadrilaterals</li> </ul>	The data handling cycle <ul style="list-style-type: none"> <li>Understand and use primary and secondary sources of data</li> <li>Collect data, including using questionnaires</li> <li>Interpret and construct statistical diagrams,</li> </ul>



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		<ul style="list-style-type: none"> <li>Calculate the circumference of a circle</li> </ul> <p>Multiplicative Change</p> <ul style="list-style-type: none"> <li>Use scale factors, linking to ratio to solve simple direct proportion problems</li> <li>Convert between currencies, including using graphs</li> </ul> <p>Draw and interpret scale diagrams and maps</p> <p>Multiplying and Dividing Fractions</p> <ul style="list-style-type: none"> <li>Multiply and divide a fraction by an integer</li> <li>Multiply and divide a fraction by a fraction</li> <li>Understand and use the reciprocal</li> </ul>	<ul style="list-style-type: none"> <li>Make links between direct proportion and straight lines of the form <math>y=kx</math></li> <li>Model situation by translating them into expression, formulae and graphs</li> </ul> <p>Representing data</p> <ul style="list-style-type: none"> <li>Draw and interpret scatter graphs</li> <li>Understand correlation</li> <li>Draw and use lines of best fit</li> <li>Understand grouped and ungrouped, discrete and continuous data</li> <li>Design and use one and two-way tables</li> </ul> <p>Tables and probability</p> <ul style="list-style-type: none"> <li>List outcomes using sample space diagrams for one and two events</li> <li>Find probabilities using tables and Venn diagrams</li> </ul>	<ul style="list-style-type: none"> <li>Form and solve equations and inequalities with and without brackets</li> <li>Distinguish between equation expression formulae and identities</li> </ul> <p>Sequences</p> <ul style="list-style-type: none"> <li>Generate sequences using more complex rules, eg; with brackets and squared terms, both in words and algebraically</li> </ul> <p>Indices</p> <ul style="list-style-type: none"> <li>Form expressions using indices</li> <li>Understand and use the addition and subtraction rules</li> </ul>	<ul style="list-style-type: none"> <li>Express one number as a percentage of another</li> </ul> <p>Standard Index Form</p> <ul style="list-style-type: none"> <li>Convert between numbers in ordinary form and standard form</li> <li>Compare numbers given in standard form</li> <li>Calculate with numbers given in standard form, with and without a calculator</li> </ul> <p>Number Sense</p> <ul style="list-style-type: none"> <li>Develop mental strategies</li> <li>Convert between metric measures and units</li> <li>Decimal places</li> <li>Use the order of operations</li> </ul>	<ul style="list-style-type: none"> <li>Find and use the sum of interior and exterior angles of a polygon</li> <li>Prove simple geometric facts</li> </ul> <p>Area of trapezia and circles</p> <ul style="list-style-type: none"> <li>Review area of shapes covered in year 7</li> <li>Calculate the area of a trapezium</li> <li>Calculate the area of a circle and the area of parts of a circle</li> <li>Use significant figures</li> <li>Calculate the area of compound shapes</li> </ul> <p>Line symmetry and reflection</p> <ul style="list-style-type: none"> <li>Recognise line symmetry in polygons and other shapes</li> <li>Reflect shapes in horizontal, vertical and diagonal lines</li> </ul>	<ul style="list-style-type: none"> <li>including multiple bar charts</li> <li>Construct and interpret pie charts</li> <li>Compare distributions using charts</li> <li>Identify misleading graphs</li> </ul> <p>Measures of location</p> <ul style="list-style-type: none"> <li>Revisit the median and mean, including finding the total given for the mean</li> <li>Find the mean of grouped data</li> <li>Work out the mode and modal class</li> <li>Choose the appropriate average</li> <li>Comparing distributions using measure</li> </ul>
	<b>Additional Higher Content</b>	Express any ratio in the form 1:n Explore direct proportion graphs Multiply and divide mixed numbers Multiply and divide simple algebraic fractions	Find the mid-point of a line segment Explore gradient Explore non-linear graphs Use the product rule for counting	Expand a pair of binomials Solve equation and inequalities with unknown on both sides Find the rule for nth term of a linear sequence Explore powers of powers	Finding the original given any percentage Understand and use surd notation Understand and use negative and simple fractional indices Convert between units of area and volume Use error interval notation	Perform standard constructions including perpendiculars Understand and use the properties of diagonals of quadrilaterals	Find unknown data values given the mean or changes in the mean Explore histograms for unequal groups Find the median from a table of values
	<b>Knowledge organisers</b>	<a href="#">Ratio and Scale</a> <a href="#">Multiplicative Change</a> <a href="#">Multiplying and Dividing Fractions</a>	<a href="#">Working in the Cartesian Plane</a> <a href="#">Representing data</a> <a href="#">Tables and probability</a>	<a href="#">Brackets, equation and inequalities</a> <a href="#">Sequences</a> <a href="#">Indices</a>	<a href="#">Fractions and percentages</a> <a href="#">Standard Index Form</a> <a href="#">Number Sense</a>	<a href="#">Angles in parallel lines and polygons</a> <a href="#">Area of trapezia and circles</a> <a href="#">Line symmetry and reflection</a>	<a href="#">The data handling cycle</a> <a href="#">Measures of location</a>
<b>Year Group</b>		<b>Autumn Term 1</b>	<b>Autumn Term 2</b>	<b>Spring Term 1</b>	<b>Spring Term 2</b>	<b>Summer Term 1</b>	<b>Summer Term 2</b>
<b>Year 9</b>	<b>Topic</b>	<b>Reasoning with Algebra</b>	<b>Constructing in 2 and 3 Dimensions</b>	<b>Reasoning with Number</b>	<b>Reasoning with Geometry</b>	<b>Reasoning with proportion</b>	<b>Representations and revision</b>
	<b>Core knowledge from this topic</b>	Straight line graphs Forming and solving equations Testing conjectures	Three-dimensional shapes Constructions and congruency	Numbers Using percentages Maths and money	Deduction Rotation and translation Pythagoras' Theorem	Enlargement and similarity Solving ratio and proportion problems Rates	Probability Algebraic representations Revision
	<b>Links to the national curriculum</b>	A1, A2, A3, A4, A5, A7, A8, A9, A10, A11, A12, A13, A14, A17, A22, A23, A24, R1, R2, R6, R10	G9, G11, G12, G16, G17	N1, N4, N9, N15, N2, N3, N6, N13, N16, N10, N11, N12, R4, R5, R8, R11	G1, G3, G4, G9, G11, G12, G13, G16, G17	R1, R2, R6, R10, R4, R5, R8, R11	P1, P2, P3, P4, P5, P6 N1, N4, N9, N15, N16, A1, A2, A3, A4, A5, A7, A8, A9, A10, A11, A12, A13, A14, A17, A22, A23, A24, SS4, S1, S1, S6
	<b>Previous content that this topic builds upon</b>	Link equations of graphs to solving equations. Make sure that you revisit key topics	Revisit estimations, rounding to the nearest integer, decimals places and significant figures.	Add and subtract fraction (lowest common denominator), working out fractions of	Revisit fractions and directed number in the context of rotation. Compare and contrast	Link to ration notation, revisit circumference, $y=mx+c$ and unit pricing.	Revisit frequency trees, tables and Venn diagrams, and inequalities



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		through equations, brackets and geometric properties and rules	Also revisit unit conversions including area and volume units	amounts, FDP equivalence and ratio.	rotational symmetry with line symmetry. Identify 2D and 3D shapes, link constructions and geometric reasoning		
	<b>Key vocabulary</b>	Parallel, horizontal, vertical, straight line, axis, equation, graph, intercept, linear, equation, table of values, function, gradient, slope steep, coordinate, y-intercept, linear, rearrange, perpendicular, product, reciprocal, negative, reciprocal, solution, unknown, inverse, solve, inverse, expand, satisfy, reverse, coefficient, variable, subject, make the subject of, inverse operation, square/root, factor, multiple, prime, common, odd, even, express, conjecture, verify, demonstrate, expand, factorise, binomial, term, quadratic,	Dimensions, cube, cuboid, cylinder, cone, sphere, pyramid, tetrahedron, face, edge, vertex, polygon, prism, cross-section, net, plan, front elevation, side elevation, area, perpendicular, height, compound, acute, obtuse, reflex, right-angle, estimate, protractor, scale, ratio, multiplier, locus, path, equidistant, construction lines, point, arc, bisector, line segment, congruent	Integer, real, rational, irrational, root, surd, simplify, directed, inverse, square, cube, product, sum, difference, remainder, factor, multiple, prime, HCF, LCM, product of primes, fraction, numerator, denominator, mixed number, improper fraction, standard form, percentage, convert, equivalent, reduce, multiplier, profit, loss, original, change, increase, decrease, reverse, depreciate, power, index, total, debt, credit, balance, expense, annual, deposit, per annum, tax, value added, income, salary, exemption, wage, overtime, currency, convert, proportion, cost.	Product, multiply, divide, inverse, factor, Venn diagram, odd, even, integer, multiple, common, lowest common multiple, place value, product, efficient, estimate, order, operation, base, parallel, parallelogram, perpendicular height, trapezium, mean, average, median, range, expression, term, simplify, fraction, equivalent, numerator, denominator, whole, percent, symmetric, ascending, descending, Increase, decrease, add, minus, subtract, substitute, expression, order of operations, equation, solution, sequence, substitute, solve, equation, linear, inverse, expression, simplify, like terms, collect,	Ratio, equal parts, proportion, order, colon, divide, proportional, multiply, part, multiplier, placeholder, share, total, factors, equivalent, divide, simplify, common factors, scale, compare, perimeter, circumference, constant, pi, regular, diameter, gradient, slope, steep, linear, variable, axes, labelling, conversion, approximation, exchange rate, currency, estimate, sterling, rate, directly proportional, similar, corresponding, scale factor, not to scale, enlargement, plan, metric, product, reciprocal, convert, simplify, factors, term, expression, simplest form	Fraction, Percentage, outcomes, sample space, set, probability, systemic, chance, event, equally likely, unbiased, P(event), set, intersection, And/Or, union, region, total, possibilities, outcomes, product, sequence, Term, Position, Rule, Term-to-term, linear, non-linear, difference, constant difference, ascending, descending, arithmetic, Fibonacci, estimate, operation, inverse, variable, coefficient, expression, evaluate, substitute, order, bracket, constant, scale, curve, equation, equality, solve, solution, unknown, like, unlike, index, equivalent, simplify,
	<b>Development of cultural capital</b>	Exposing pupils to “real-life” maths so that they develop the confidence to apply their own skills and knowledge to functional style questions involving more than one skill (usually involving money).	This is used in construction and architecture when pupils have to accurately draw plans to implement them. They are also regularly used with Flying and the Military, GPS, CCF cadets, Duke of Edinburgh and orienteering.	Exploring everyday finances, budgeting, tax and salary	Pupils can apply these skills to real-life situation such as building and constructions.	Pupils develop the skills and understanding to calculate with proportionality. Real life applications include recipes.	Exposing pupils to “real-life” maths so that they develop the confidence to apply their own skills and knowledge to functional style questions involving more than one skill (usually involving money).
	<b>Development of reading</b>	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Straight line graphs	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – 3D shapes	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading –Percentages	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Angles	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading –ratio	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading –Probability
	<b>Concepts –what will students be able to do at the end of the topic</b>	<b>Straight line graphs</b> -lines parallel to the axes, $y=x$ and $y = -x$ - Using a table of values -compare gradients Compare intercepts Understand and use $y=mx+c$ Find an equation of a line from a graph Interpret gradient and intercepts of real-life  <b>Forming and solving Equations</b> -Solve one and two step equations and inequalities -solve one and two step equation and inequalities with brackets -Inequalities with negative numbers	<b>Three-dimensional shapes</b> -Know names of 2D and 3D shapes Recognise prisms -Accurate nets of cuboids and other 3D shapes -Sketch and recognise nets of cuboids and other 3D shapes -plans and elevations -find area of 2D shapes -surface area of cubes and cuboids -surface area of triangular prisms -Surface area of triangular prisms -surface area of a cylinder -volume of cubes and cuboids  <b>Constructions and congruency</b> -draw and measure angles -construct and interpret scale drawings -locus of distance from a point	Numbers -integers, real and rational numbers -work with directed number -solve problems with integers -solve problems with decimals -HCF and LCM -Adding and subtracting fractions -multiplying and dividing fractions -solving problems with fractions -numbers in standard form  Using percentages  -Use the equivalence of fractions, decimals and percentages -calculate percentage increase and decrease -Express a change as a percentage -solve reverse percentage problems	Deduction -angles in parallel lines -solving angles problems (using chains of reasoning) -Angles problems with algebra -Conjectures with angles -conjectures with shapes  Rotation and translation -Identify the order of rotational symmetry of a shape -compare and contrast rotational symmetry with line symmetry -rotate a shape about a point of a shape -rotate a shape about a point not on a shape -translate points and shapes by a given vector	Enlargement and similarity -Recognise enlargement and similarity -enlarge a shape by a positive integer scale factor -enlarge a shape by a positive integer scale factor from a point -enlarge a shape by a positive fractional scale factor -Work out missing sides and angles in a pair of given similar shapes  Solving ratio and proportion problems -Solve problems with direct proportion -direct proportion and conversion graphs	Probability -single event probability -relative frequency – include convergence -expected outcomes -independent events - use diagrams to work out probabilities Algebraic representations -Draw and interpret quadratic graphs -Interpret graphs including reciprocal and piece-wise -represent inequalities  Revision – Suggestions Number -standard form -product of primes



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		<ul style="list-style-type: none"> <li>- Solve equations with unknowns on both sides</li> <li>-Solve inequalities with unknowns on both sides</li> <li>-solving equations and inequalities in context</li> <li>-substituting into formulae and equations</li> <li>-rearrange formulae (one-step)</li> <li>-rearrange formulae (two-step)</li> </ul> <p><b>Testing conjectures</b></p> <ul style="list-style-type: none"> <li>-Factors, multiples and primes</li> <li>-Always, sometimes, Never true</li> <li>-Conjectures about number</li> <li>-Expand a pair of binomials</li> <li>- Conjectures with algebra</li> </ul> <p>Explore the 100 grid</p>	<ul style="list-style-type: none"> <li>-locus of distance from a straight line/shape</li> <li>-construct a perpendicular bisector</li> <li>-construct a perpendicular from a point</li> <li>-construct a perpendicular to a point</li> <li>-Locus of distance from two lines</li> <li>-construct an angle bisector</li> <li>-construct triangle from given information</li> <li>-identify congruent figures</li> <li>-explore congruent triangles</li> <li>-identify congruent triangles</li> </ul>	<ul style="list-style-type: none"> <li>-recognise and solve percentage problems (non-calculator)</li> <li>-recognise and solve percentage problems (calculator)</li> </ul> <p>Maths and money</p> <ul style="list-style-type: none"> <li>-solve problems with bills and bank statements</li> <li>-calculate simple interest</li> <li>-calculate compound interest</li> <li>-solve problems with Value Added Tax</li> <li>-Calculate wages and taxes</li> <li>-solve problems with exchange rates</li> <li>-solve unit pricing problems</li> </ul>	<ul style="list-style-type: none"> <li>-compare rotation and reflection of shapes</li> </ul> <p>Pythagoras' Theorem</p> <ul style="list-style-type: none"> <li>-Squares and square roots</li> <li>-Identify the hypotenuse of a right-angled triangle</li> <li>-Determine whether a triangle is a right-angle</li> <li>-calculate the hypotenuse of a right-angled triangle</li> <li>-calculate missing sides in right-angled triangles</li> <li>-use Pythagoras theorem on coordinate axes</li> <li>-explore proofs of Pythagoras' theorem</li> </ul>	<ul style="list-style-type: none"> <li>-solve problems with inverse proportion</li> <li>_solve ratio problems give the whole or a part</li> <li>-solve "best buy" problems</li> </ul> <p>Rates</p> <ul style="list-style-type: none"> <li>-Solve speed, distance and time problems without a calculator</li> <li>-Solve speed, distance and time problems with a calculator</li> <li>-Use distance/time graphs</li> <li>-solve problems with density, mass and volume</li> <li>-solve flow problems and their graphs</li> <li>-rates of change and their units</li> </ul>	<ul style="list-style-type: none"> <li>-error intervals</li> </ul> <p>Representing data</p> <ul style="list-style-type: none"> <li>-scatter graphs</li> <li>-statistical graphs</li> <li>-Measures</li> <li>-Tables and timetables</li> <li>-Data handling project</li> </ul> <p>Algebraic Representation</p> <ul style="list-style-type: none"> <li>-Find the rule for the nth term of a sequence</li> </ul> <p>Representing problems</p> <ul style="list-style-type: none"> <li>-using graphs, equations, tables</li> </ul>
	<b>Additional Higher Content</b>	<p>Write an equation in the form <math>y=mx+c</math></p> <p>Model real-life graphs involving inverse proportion</p> <p>Explore perpendicular lines</p> <p>Rearrange complex formulae including brackets and squares</p>	Explore volume of cones, pyramids and spheres	Understand and use surds Solve problems with repeated percentage change	Links construction and geometrical reasoning Find the result of a series of transformations Use Pythagoras' theorem in 3D shapes	<ul style="list-style-type: none"> <li>-Enlarge a shape by a negative scale factor</li> <li>-Solve problems with similar triangles</li> <li>-Explore ratios in right-angles triangles</li> <li>-Graphs of inverse relationships</li> <li>-solve problems ratio and algebra</li> <li>-convert compound units#</li> </ul>	<ul style="list-style-type: none"> <li>-use tree diagrams</li> <li>-use tree diagrams to solve without replacement problems</li> <li>-Investigate graphs of simultaneous equations</li> </ul>
	<b>Knowledge organisers</b>	<a href="#">Straight line graphs</a> <a href="#">Forming and solving equations</a> <a href="#">Testing conjectures</a>	<a href="#">Three-dimensional shapes</a> <a href="#">Constructions and congruency</a>	<a href="#">Numbers</a> <a href="#">Using percentages</a> <a href="#">Maths and money</a>	<a href="#">Deduction</a> <a href="#">Rotation and translation</a> Pythagoras' Theorem	Enlargement and similarity Solving ratio and proportion problems Rates	Probability Algebraic representations Revision
<b>Year Group</b>		<b>Autumn Term 1</b>	<b>Autumn Term 2</b>	<b>Spring Term 1</b>	<b>Spring Term 2</b>	<b>Summer Term 1</b>	<b>Summer Term 2</b>
<b>Year 10 Foundation</b>	<b>Topic</b>						
	<b>Core knowledge from this topic</b>	Angles, scale diagrams and bearings Basic Number, Factors and Multiples Basic Algebra Skills Fractions and Decimals Coordinates and Linear Graphs	Rounding Collecting and representing data Sequences Basic Percentages	Perimeter and Area Circumference and area Real-life graphs Ratio and proportion Properties of polygons	Equations Indices Basic Probability Standard form Measures	Transformations Congruence 2D representations of 3D shapes Calculating with percentages	Statistical measures Constructions and loci
	<b>Links to the national curriculum (if applicable)</b>	G1, G3, R2, G15, N1, N2, N3, N4, N5, A1, A2, A3, N8, N10, A8, A9, A10, G11	N15, N16, S2, S3, S4, A23, A24, A25, R9, N12,	G8, G12, G16, G17, G18, A14, R14, N11, R3, R4, R5, R6, R7, R8, G3, G4	A2, A17, N6, N17, P1, P4, P7, N8, A24, N2, N9, N16, G14, N13, R1, R11	G7, G24, G8, G5, G6, G19, G13, R9	S1, S4, S5, G2
	<b>Previous content that this topic builds upon</b>	Ordering numbers including fractions and decimals. Using the four operations with simple decimal problems up to 3 digits. Solving problems involving adding and subtraction of decimals. Understand place value and one decimal place.	Students will have an appreciation of place value and recognise even and odd numbers. Students will have knowledge of using the four operations with whole numbers. Students should have knowledge of integer complements to 10 and to 100. Students should have knowledge of strategies for multiplying	Students should be able to measure lines and recall the names of 2D shapes.  Students should be able to use strategies for multiplying and dividing by powers of 10.	Students should be able to interpret scales on a range of measuring instruments.	Draw line segments and angles using ruler and protractor. Properties of triangles and quadrilaterals. Standard conventions for labelling the sides and angles of triangle ABC..	Students should be able to read scales on graphs, draw circles, measure angles and plot coordinates in the first quadrant, and know that there are 360 degrees in a full turn and 180 degrees at a point on a straight line. Students should have experience of tally charts. Students will have used inequality



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		Working with pounds and pence which lends itself to working with decimals. Knowledge that numbers below zero can be non-integers and be written in a decimal format.	and dividing whole numbers by 2, 4, 5, and 10. Students should be able to read and write decimals in figures and words	Students should be able to find areas by counting squares and volumes by counting cubes.  Students should be able to interpret scales on a range of measuring instruments.	Students should be able to find a percentage of an amount and relate percentages to decimals.  Students should be able to rearrange equations and use these to solve problems.  Students should know $\text{speed} = \frac{\text{distance}}{\text{time}}$ , $\text{density} = \frac{\text{mass}}{\text{volume}}$ .	Understand and use the relationship between parallel lines and alternate and corresponding angles. Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures. Identify similar shapes by enlargement. Reducing a ratio to its simplest form. Use the four operations applied to decimals.	notation. Students must be able to find the midpoint of two numbers. Students should be able to use the correct notation for time using 12- and 24-hour clocks
	<b>Key vocabulary</b>	Expression, identity, equation, formula, substitute, term, like terms, index, power, collect, substitute, simplify, Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd, inverse, fractions, mixed, improper, recurring, integer, decimal, terminating, percentage	Place value, digit, placeholder, integer, scale, approximate, round, nearest, halfway, compare, not equal, greater than, less than, order, ascending, descending, range, difference, median, average, tenth, hundredth, significant figure, power, index, standard form, rational, recurring Sequence, Term, Position, Rule, Term-to-term, table, linear, non-linear, difference, ascending, descending, arithmetic, Fibonacci, discrete, continuous, qualitative, quantitative, frequency, ungrouped, range, class, class boundary, outcomes, set, probability, systemic, chance, event, equally likely, unbiased, P(event), sample, convert, equivalent, multiplier, change, increase, decrease,	Line, line segment, notation, polygon, angles, rotation, angle, acute, obtuse, right-angle, reflex, interior, exterior, sum, measure, construct, parallel, perpendicular, intersect, equilateral, isosceles, scalene, right-angled, square, rectangle, kite, rhombus, parallelogram, polygon, edges, vertices, equal, vertex, point, isosceles, equilateral, scalene, right-angled, regular, rhombus, diagonals, compound, Triangle, rectangle, parallelogram, trapezium, area, perimeter, prism, compound, measurement, polygon, cuboid, volume, vertices, edge, face, units, conversion, diameter, radius, chord, circumference, Ratio, proportion, simplify, common factors, scale, compare, circumference, constant, pi, regular, diameter, gradient, slope, steep, axes, labelling, conversion, approximation, exchange rate, currency, estimate, directly proportional	Ratio, proportion, best value, proportional change, compound measure, density, mass, volume, speed, distance, time, density, mass, volume, pressure, acceleration, velocity, inverse, direct, standard form, power, exponent, significant figure, outcomes, sample space, set, probability, systemic, chance, event, equally likely, unbiased, P(event), set, intersection, And/Or, union, region, product, unknown, inverse, solve, inverse, expand, reverse, coefficient, variable, subject, make the subject of, inverse operation, square/root	congruent, similar, ratio, scale factor, multiplier, reflection, rotation, translation, enlargement, line symmetry, polygon, reflect, congruent, object, image, vertical, horizontal, vertex, perpendicular distance, percentage, convert, equivalent, increase, decrease, reduce, multiplier, profit, loss, original, change, increase, decrease, reverse, related facts, depreciate, power, index,	Plan, front elevation, side elevation, perspective, isometric, solid, area, perpendicular, height, formulae, compound, commutative, acute, obtuse, reflex, right-angle, estimate, protractor, scale, ratio, multiplier, locus, path, equidistant, construction lines, point, arc, bisector, line segment, congruent,
	<b>Development of cultural capital</b>	Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and “real-life” mathematical problems.	Sequences link to real-life situations including production lines, architecture and quantity surveying as well as traffic flow modelling.	Pupils develop the skills and understanding to calculate with proportionality. Real life applications include recipes. Real-life graphs expose pupils to distance-time graphs that have real-world applications.	Scientists use standard form when working with the speed of light and distances between galaxies, which can be enormous. The size of bacteria may also be referred to in standard form as they are so tiny.	Plans and elevations are needed in constructions, building and quantity surveying. An elevation drawing is an orthographic projection drawing that shows one side of the house. The purpose of an elevation drawing is to show the finished appearance of a given side of a house and furnish vertical height dimensions.	Real-life links can be made to data analysts and market research.
	<b>Development of reading</b>	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading –Angles, scale drawings	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – collecting data, representing data	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – area and perimeter	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Equations, Formulas	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Transformations	The ‘Frayer model’ will be used to help students organise their understanding of a new academic term or complex vocabulary choice  Guided reading – Constructions, collecting data, representing data





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Concepts –what will students be able to do at the end of the topic	Angles, scale diagrams and bearings	Rounding	Perimeter and Area	Equations	Transformations	Statistical measures
<p><b>Concepts –what will students be able to do at the end of the topic</b></p>	<p><b>Angles, scale diagrams and bearings</b> 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</p> <p>Use the standard conventions for labelling and referring to the sides and angles of triangles</p> <p>Draw diagrams from written descriptions</p> <p>Apply the properties of: angles at a point, angles at a point on a straight line, vertically opposite angles</p> <p>Understand and use alternate and corresponding angles on parallel lines</p> <p>Use scale factors, scale diagrams and maps</p> <p>Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings</p> <p><b>Basic Number, Factors and Multiples</b> Order positive and negative integers</p> <p>Use the symbols =, ≠, &lt;, &gt;, ≤, ≥</p> <p>Apply the four operations, including formal written methods, to integers both positive and negative</p> <p>Understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals)</p> <p>Recognise and use relationships between operations including inverse operations (eg cancellation to simplify calculations and expressions)</p> <p>Estimate answers</p> <p>Check calculations using approximation and estimation, including answers obtained using technology</p> <p>Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem</p> <p>Apply systematic listing strategies including use of the product rule for counting</p> <p><b>Basic Algebra Skills</b> Use and interpret algebraic notation, including:</p> <ul style="list-style-type: none"> <li>– <math>ab</math> in place of <math>a \times b</math></li> <li>– <math>3y</math> in place of <math>y + y + y</math> and <math>3 \times y</math></li> <li>– <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>, <math>a^2b</math> in place of <math>a \times a \times b</math></li> <li>– <math>\frac{a}{b}</math> in place of <math>a \div b</math></li> <li>– coefficients written as fractions rather than as decimals</li> <li>– Brackets</li> <li>– Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals</li> <li>– Understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors</li> </ul>	<p><b>Rounding</b> Round numbers and measures to an appropriate degree of accuracy (eg to a specified number of decimal places or significant figures)</p> <p>Use inequality notation to specify simple error intervals due to truncation or rounding</p> <p>Apply and interpret limits of accuracy including upper and lower bounds</p> <p><b>Collecting and representing data</b> Interpret and construct tables, charts and diagrams, including:</p> <ul style="list-style-type: none"> <li>– frequency tables, bar charts, pie charts and pictograms for categorical data</li> <li>– vertical line charts for ungrouped discrete numerical data</li> <li>– tables and line graphs for time series data</li> </ul> <p>And know their appropriate use</p> <p>Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:</p> <ul style="list-style-type: none"> <li>– appropriate graphical representation involving discrete, continuous and grouped data</li> </ul> <p><b>Sequences</b> Generate terms of a sequence from either a term-to-term or a position-to-term rule</p> <p>Recognise and use:</p> <ul style="list-style-type: none"> <li>– sequences of triangular, square and cube numbers</li> <li>– simple arithmetic progression,</li> <li>– Fibonacci-type sequences,</li> </ul> <p><b>Basic Percentages</b> Define percentage as 'number of parts per hundred'</p> <p>Interpret percentages and percentage changes as a fraction or a decimal and interpret these multiplicatively</p> <p>Express one quantity as a percentage of another</p> <p>Compare two quantities using percentages</p> <p>Work with percentages greater than 100%</p> <p>Interpret fractions and percentages as operators</p>	<p><b>Perimeter and Area</b> Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres</p> <p>Calculate the perimeter of 2D shapes and composite shapes</p> <p>Find the surface area of pyramids and composite solids</p> <p>Know and apply formulae to calculate area of:</p> <ul style="list-style-type: none"> <li>– triangles</li> <li>– parallelograms</li> <li>– trapezia</li> </ul> <p><b>Circumference and area</b> Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment</p> <p>Know and use the formulae:</p> <p>Circumference = <math>2\pi r = \pi d</math></p> <p>Area of a circle = <math>\pi r^2</math></p> <p>Calculate the perimeters of 2D shapes including circles and composite shapes</p> <p><b>Real-life graphs</b> Plot and interpret graphs (including reciprocal graphs and exponential 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</p> <p>Interpret the gradient of a straight-line graph as a rate of change</p> <p><b>Ratio and proportion</b> Identify and work with fractions in ratio problems</p> <p>Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1</p> <p>Use ratio notation, including reduction to simplest form</p> <p>Divide a given quantity into two parts in a given part : part or part : whole ratio</p> <p>Express the division of a quantity into two parts as a ratio</p> <p>Apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing and concentrations)</p> <p>Express a multiplicative relationship between two quantities as a ratio or fraction</p> <p>Understand and use proportion as equality of ratios</p> <p>Relate ratios to fractions and to linear functions</p> <p><b>Properties of polygons</b> Derive and use the sum of angles in a triangle (eg to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)</p> <p>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</p>	<p><b>Equations</b> Substitute numerical values into formulae and expressions, including scientific formulae</p> <p>Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)</p> <p><b>Indices</b> Use positive integer powers and associated real roots (square, cube and higher)</p> <p>Recognise powers of 2, 3, 4, 5</p> <p>Estimate powers and roots of any given positive number</p> <p>Calculate with roots, and with integer and fractional indices</p> <p><b>Basic Probability</b> Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</p> <p>Apply the property that the probabilities of an exhaustive set of outcomes sum to 1</p> <p>Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p> <p>Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities</p> <p><b>Standard form</b> Understand and use place value (eg when working with very large or very small numbers)</p> <p>Calculate with and interpret standard form <math>A \times 10^n</math> where <math>1 \leq A &lt; 10</math> and <math>n</math> is an integer</p> <p><b>Measures</b> Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money etc.)</p> <p>Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate</p> <p>Change freely between related standard units (eg time, length, area, volume/capacity, mass) and compound units (eg speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts</p> <p>Use compound units such as speed, rates of pay, unit pricing, density and pressure</p>	<p><b>Transformations</b></p> <ul style="list-style-type: none"> <li>➤ Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement</li> <li>➤ Describe translations as 2D vectors</li> <li>➤ Describe the changes and invariance achieved by combinations of rotations, reflections and translations</li> </ul> <p><b>2D representations of 3D shapes</b></p> <ul style="list-style-type: none"> <li>➤ Construct and interpret plans and elevations of 3D shapes</li> </ul> <p><b>Calculating with percentages</b></p> <ul style="list-style-type: none"> <li>➤ Solve problems involving percentage change, including :             <ul style="list-style-type: none"> <li>– percentage increase/decrease problems</li> <li>– original value problems</li> <li>– simple interest, including in financial mathematics</li> </ul> </li> </ul>	<p><b>Statistical measures</b></p> <ul style="list-style-type: none"> <li>➤ Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through :             <ul style="list-style-type: none"> <li>– appropriate measures of central tendency (median, mean, mode and modal class)</li> <li>– spread (range, including consideration of outliers, quartiles and inter-quartile range)</li> </ul> </li> <li>➤ Apply statistics to describe a population</li> </ul> <p><b>Constructions and loci</b></p> <ul style="list-style-type: none"> <li>➤ 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</li> <li>➤ Use these to construct given figures and solve loci problems</li> <li>➤ Know that the perpendicular distance from a point to a line is the shortest distance to the line</li> </ul>



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		<p>Simplify and manipulate algebraic expressions by:</p> <ul style="list-style-type: none"> <li>- collecting like terms</li> <li>- multiplying a single term over a bracket</li> <li>- taking out common factors</li> </ul> <p><b>Fractions and Decimals</b> Order positive and negative decimals and fractions Apply the four operations, including formal written methods, to decimals and simple fractions (proper and improper), and mixed numbers - both positive and negative Understand and use place value (eg when calculating with decimals) Calculate exactly with fractions Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and <math>\frac{7}{2}</math> and 0.375 and <math>\frac{3}{8}</math>) Change recurring decimals into their corresponding fractions and vice versa</p> <p><b>Coordinates and Linear Graphs</b> 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</p>					
<b>Knowledge organisers</b>		<p>Angles, scale diagrams and bearings Basic Number, Factors and Multiples Basic Algebra Skills Fractions and Decimals Coordinates and Linear Graphs</p>	<p>Rounding Collecting and representing data Sequences Basic Percentages</p>	<p>Perimeter and Area Circumference and area Real-life graphs Ratio and proportion Properties of polygons</p>	<p>Equations Indices Basic Probability Standard form Measures</p>	<p>Transformations Congruence 2D representations of 3D shapes Calculating with percentages</p>	<p>Statistical measures Constructions and loci</p>
<b>Year Group</b>		<b>Autumn Term 1</b>	<b>Autumn Term 2</b>	<b>Spring Term 1</b>	<b>Spring Term 2</b>	<b>Summer Term 1</b>	<b>Summer Term 2</b>
<b>Year 10 Higher</b>	<b>Topic</b>						
	<b>Core knowledge from this topic</b>	<p>Angles, scale diagrams and bearings Basic Number, Factors and Multiples Basic Algebra Skills Fractions and Decimals Coordinates and Linear Graphs</p>	<p>Rounding Collecting and representing data Sequences Basic Percentages</p>	<p>Perimeter and Area Circumference and area Real-life graphs Ratio and proportion Properties of polygons</p>	<p>Equations Indices Surds Basic Probability Standard form Measures</p>	<p>Transformations Congruence 2D representations of 3D shapes Calculating with percentages</p>	<p>Statistical measures Constructions and loci</p>
	<b>Links to the national curriculum (if applicable)</b>	G1, G3, R2, G15, N1, N2, N3, N4, N5, A1, A2, A3, N8, N10, A8, A9, A10, G11	N15, N16, S2, S3, S4, A23, A24, A25, R9, N12,	G8, G12, G16, G17, G18, A14, R14, N11, R3, R4, R5, R6, R7, R8, G3, G4	A2, A17, N6, N17, P1, P4, P7, N8, A24, N2, N9, N16, G14, N13, R1, R11	G7, G24, G8, G5, G6, G19, G13, R9	S1, S4, S5, G2
	<b>Previous content that this topic builds upon</b>	Ordering numbers including fractions and decimals. Using the four operations with simple decimal problems up to 3 digits. Solving problems involving adding and subtraction of decimals.	Students will have an appreciation of place value and recognise even and odd numbers. Students will have knowledge of using the four operations with whole numbers. Students should have knowledge of integer complements to 10 and to 100. Students should have	Students should be able to measure lines and recall the names of 2D shapes.	Students should be able to interpret scales on a range of measuring instruments.	Draw line segments and angles using ruler and protractor. Properties of triangles and quadrilaterals. Standard conventions for labelling the sides and angles of triangle ABC..	Students should be able to read scales on graphs, draw circles, measure angles and plot coordinates in the first quadrant, and know that there are 360 degrees in a full turn and 180 degrees at a point on a straight line. Students



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		<p>Understand place value and one decimal place. Working with pounds and pence which lends itself to working with decimals. Knowledge that numbers below zero can be non-integers and be written in a decimal format.</p>	<p>knowledge of strategies for multiplying and dividing whole numbers by 2, 4, 5, and 10. Students should be able to read and write decimals in figures and words</p>	<p>Students should be able to use strategies for multiplying and dividing by powers of 10.</p> <p>Students should be able to find areas by counting squares and volumes by counting cubes.</p> <p>Students should be able to interpret scales on a range of measuring instruments.</p>	<p>Students should be able to find a percentage of an amount and relate percentages to decimals.</p> <p>Students should be able to rearrange equations and use these to solve problems.</p> <p>Students should know <math>\text{speed} = \frac{\text{distance}}{\text{time}}</math>, <math>\text{density} = \frac{\text{mass}}{\text{volume}}</math>.</p>	<p>Understand and use the relationship between parallel lines and alternate and corresponding angles. Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures. Identify similar shapes by enlargement. Reducing a ratio to its simplest form. Use the four operations applied to decimals.</p>	<p>should have experience of tally charts. Students will have used inequality notation. Students must be able to find the midpoint of two numbers. Students should be able to use the correct notation for time using 12- and 24-hour clocks</p>
	<b>Key vocabulary</b>	<p>Expression, identity, equation, formula, substitute, term, like terms, index, power, collect, substitute, simplify, Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd, inverse, fractions, mixed, improper, recurring, integer, decimal, terminating, percentage</p>	<p>Place value, digit, placeholder, integer, equal division, interval, scale, approximate, round, nearest, halfway, compare, order, ascending, descending, range, greatest, least, difference, median, middle, order, average, decimal, significant figure, power, index, standard form, percentage, fraction, denominator, Numerator, part, whole, improper, mixed number, rational, recurring Sequence, Term, Position, Rule, Term-to-term, table, linear, non-linear, Fibonacci, discrete, continuous, qualitative, quantitative, frequency, ungrouped, total, class, Fraction, Percentage, outcomes, set, probability, chance, event, equally likely, unbiased, P(event), convert, equivalent, increase, decrease, reduce, multiplier, profit, loss, original, change, increase, decrease, reverse, depreciate, power, index</p>	<p>Line, line segment, geometric figure, notation, polygon, segment, angles, rotation, angel, acute, obtuse, right-angle, reflex, interior, exterior, protractor, degrees right-angle, half-turn, sum, measure, construct, parallel, perpendicular, intersect, equilateral, isosceles, scalene, right-angled, length, angle, square, rectangle, kite, rhombus, parallelogram, polygon, edges, vertices, angles, equal, length, compasses, vertex, point, isosceles, equilateral, scalene, right-angled, regular, rhombus, diagonals, compound, Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, vertices, edge, face, units, conversion, diameter, radius, chord, circumference, Ratio, equal parts, proportion, relationship, divide, proportional, multiply, multiplier, share, factors, equivalent, divide, simplify, common factors, scale, compare, perimeter, circumference, constant, pi, regular, diameter, gradient, slope, steep, linear, variable, axes, conversion, approximation, exchange rate, currency, estimate, sterling, rate, directly proportional</p>	<p>Ratio, proportion, best value, proportional change, compound measure, density, mass, volume, speed, distance, time, density, mass, volume, pressure, acceleration, velocity, inverse, direct, standard form, power, exponent, significant figure, Fraction, Percentage, outcomes, set, probability, systemic, chance, event, equally likely, unbiased, P(event), set, intersection, And/Or, union, possibilities, outcomes, product, solution, unknown, inverse, solve, expand, reverse, coefficient, variable, subject, inverse operation, square/root</p>	<p>congruent, similar, ratio, scale factor, multiplier, reflection, rotation, translation, enlargement, line symmetry, polygon, reflect, congruent, vertical, horizontal, vertex, perpendicular distance, percentage, convert, equivalent, increase, decrease, reduce, multiplier, profit, loss, original, change, reverse, depreciate, power, index,</p>	<p>Plan, front elevation, side elevation, perspective, isometric, solid, area, perpendicular, height, formulae, compound, acute, obtuse, reflex, right-angle, estimate, protractor, scale, ratio, multiplier, locus, path, equidistant, construction lines, point, arc, bisector, line segment, congruent,</p>
	<b>Development of cultural capital</b>	<p>Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and “real-life” mathematical problems.</p>	<p>Sequences link to real-life situations including production lines, architecture and quantity surveying as well as traffic flow modelling.</p>	<p>Pupils develop the skills and understanding use to calculate with proportionality. Real life applications include recipes. Real-life graphs expose pupils to distance-time graphs that have real-world applications.</p>	<p>Scientists use standard form when working with the speed of light and distances between galaxies, which can be enormous. The size of bacteria may also be referred to in standard form as they are so tiny.</p>	<p>Plans and elevations are needed in constructions, building and quantity surveying. An elevation drawing is an orthographic projection drawing that shows one side of the house. The purpose of an elevation drawing is to show the finished appearance of a given side of a house and furnish vertical height dimensions.</p>	<p>Real-life links can be made to data analysts and market research.</p>



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	<p><b>Development of reading</b></p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Scale drawings, angles</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Collecting data</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – perimeter and area</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Equations, Formula, inequalities</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Transformations</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Representing data</p>
	<p><b>Concepts –what will students be able to do at the end of the topic</b></p>	<p><b>Angles, scale diagrams and bearings</b> 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 descriptions 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 Use scale factors, scale diagrams and maps Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings <b>Basic Number, Factors and Multiples</b> Order positive and negative integers Use the symbols =, ≠, &lt;, &gt;, ≤, ≥ Apply the four operations, including formal written methods, to integers both positive and negative Understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals) Recognise and use relationships between operations including inverse operations (eg cancellation to simplify calculations and expressions) Estimate answers Check calculations using approximation and estimation, including answers obtained using technology Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem Apply systematic listing strategies including use of the product rule for counting <b>Basic Algebra Skills</b> Use and interpret algebraic notation, including:  <ul style="list-style-type: none"> <li>– <math>ab</math> in place of <math>a \times b</math></li> <li>– <math>3y</math> in place of <math>y + y + y</math> and <math>3 \times y</math></li> <li>– <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>, <math>a^2b</math> in place of <math>a \times a \times b</math></li> <li>– <math>\frac{a}{b}</math> in place of <math>a \div b</math></li> <li>– coefficients written as fractions rather than as decimals</li> </ul> </p>	<p><b>Rounding</b> Round numbers and measures to an appropriate degree of accuracy (eg to a specified number of decimal places or significant figures) Use inequality notation to specify simple error intervals due to truncation or rounding Apply and interpret limits of accuracy including upper and lower bounds <b>Collecting and representing data</b> 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, tables and line graphs for time series data and know their appropriate use Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data including boxplots Construct and interpret diagrams for grouped discrete data and continuous data, ie histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use <b>Sequences</b> Generate terms of a sequence from either a term-to-term or a position-to-term rule Recognise and use: sequences of triangular, square and cube numbers simple arithmetic progression, Fibonacci-type sequences, quadratic sequences, simple geometric progressions (<math>r^n</math> where <math>n</math> is an integer and <math>r</math> is a rational number <math>&gt; 0</math>) other sequences Deduce expressions to calculate the <math>n</math>th term of linear and quadratic sequences <b>Basic Percentages</b> 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% Interpret fractions and percentages as operators</p>	<p><b>Perimeter and Area</b> Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres Calculate the perimeter of 2D shapes and composite shapes Find the surface area of pyramids and composite solids Know and apply formulae to calculate area of: triangles parallelograms trapezia <b>Circumference and area</b> Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment Know and use the formulae: Circumference = <math>2\pi r = \pi d</math> Area of a circle = <math>\pi r^2</math> Calculate the perimeters of 2D shapes including circles and composite shapes Calculate areas of circles and composite shapes Calculate surface area of spheres, cones and composite solids Calculate arc lengths, angles and areas of sectors of circles <b>Real-life graphs</b> Plot and interpret graphs (including reciprocal graphs and exponential 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 <b>Interpret the gradient of a straight-line graph as a rate of change</b> <b>Ratio and proportion</b> Identify and work with fractions in ratio problems Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1 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 and concentrations) Express a multiplicative relationship between two quantities as a ratio or fraction</p>	<p><b>Equations</b> 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) <b>Indices</b> Use positive integer powers and associated real roots (square, cube and higher) Recognise powers of 2, 3, 4, 5 Estimate powers and roots of any given positive number calculate with roots, and with integer and fractional indices <b>Surds</b> Calculate exactly with surds Simplify surd expressions involving squares (eg <math>\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}</math>) and rationalise denominators Recognise and use simple geometric progressions (<math>r^n</math> where <math>n</math> is an integer and <math>r</math> is a surd) <b>Basic Probability</b> Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees Apply the property that the probabilities of an exhaustive set of outcomes sum to 1 Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities <b>Standard form</b> Understand and use place value (eg when working with very large or very small numbers) Calculate with and interpret standard form <math>A \times 10^n</math> where <math>1 \leq A &lt; 10</math> and <math>n</math> is an integer <b>Measures</b> Apply and interpret limits of accuracy including upper and lower bounds Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money etc.) Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate Change freely between related standard units (eg time, length, area, volume/capacity, mass) and compound units (eg speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts Use compound units such as speed, rates of pay, unit pricing, density and pressure</p>	<p><b>Transformations</b>  <ul style="list-style-type: none"> <li>➤ Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement including fractional and negative scale factors</li> <li>➤ Describe translations as 2D vectors</li> <li>➤ Describe the changes and invariance achieved by combinations of rotations, reflections and translations</li> </ul> <b>Congruence and similarity</b>  <ul style="list-style-type: none"> <li>➤ Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)</li> <li>➤ Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs</li> <li>➤ Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures</li> </ul> <b>2D representations of 3D shapes</b>  <ul style="list-style-type: none"> <li>➤ Construct and interpret plans and elevations of 3D shapes</li> </ul> <b>Calculating with percentages</b>  <ul style="list-style-type: none"> <li>➤ Solve problems involving percentage change, including : <ul style="list-style-type: none"> <li>– percentage increase/decrease problems</li> <li>– original value problems</li> <li>– simple interest, including in financial mathematics</li> </ul> </li> </ul> </p>	<p><b>Statistical measures</b>  <ul style="list-style-type: none"> <li>➤ Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through : <ul style="list-style-type: none"> <li>– appropriate measures of central tendency (median, mean, mode and modal class)</li> <li>– spread (range, including consideration of outliers, quartiles and inter-quartile range)</li> </ul> </li> <li>➤ Apply statistics to describe a population</li> </ul> <b>Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling</b>  <b>Constructions and loci</b>  <ul style="list-style-type: none"> <li>➤ 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</li> <li>➤ Know that the perpendicular distance from a point to a line is the shortest distance to the line</li> </ul> </p>



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		<ul style="list-style-type: none"> <li>- Brackets</li> <li>- Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals</li> <li>- Understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors</li> </ul> <p>Simplify and manipulate algebraic expressions (including those involving surds) by:</p> <ul style="list-style-type: none"> <li>- collecting like terms</li> <li>- multiplying a single term over a bracket</li> <li>- taking out common factors</li> </ul> <p>Fractions and Decimals Order positive and negative decimals and fractions Apply the four operations, including formal written methods, to decimals and simple fractions (proper and improper), and mixed numbers - both positive and negative Understand and use place value (eg when calculating with decimals) Calculate exactly with fractions Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and <math>\frac{7}{2}</math> and 0.375 and <math>\frac{3}{8}</math>) Change recurring decimals into their corresponding fractions and vice versa</p> <p>Coordinates and Linear Graphs 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.</p> <p>Use the form <math>y = mx + c</math> to identify parallel and perpendicular lines</p> <p>Find the equation of the line through two given points, or through one point with a given gradient</p> <p>Identify and interpret gradients and intercepts of linear functions graphically and algebraically</p>		<p>Understand and use proportion as equality of ratios Relate ratios to fractions and to linear functions</p> <p>Properties of polygons Derive and use the sum of angles in a triangle (eg to deduce and use the angle sum in any polygon, and to derive properties of regular polygons) 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</p>			
<b>Knowledge organisers</b>		Angles, scale diagrams and bearings Basic Number, Factors and Multiples Basic Algebra Skills Fractions and Decimals Coordinates and Linear Graphs	Rounding Collecting and representing data Sequences Basic Percentages	Perimeter and Area Circumference and area Real-life graphs Ratio and proportion Properties of polygons	Equations Indices Surds Basic Probability Standard form Measures	Transformations Congruence 2D representations of 3D shapes Calculating with percentages	Statistical measures Constructions and loci
<b>Year Group</b>		<b>Autumn Term 1</b>	<b>Autumn Term 2</b>	<b>Spring Term 1</b>	<b>Spring Term 2</b>	<b>Summer Term 1</b>	<b>Summer Term 2</b>
<b>Year 11 Foundation</b>	<b>Topic</b>						
	<b>Core knowledge from this topic</b>	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs	Inequalities Pythagoras' Theorem Simultaneous equations Algebra and graphs	Sketching graphs Direct and inverse proportion Basic Trigonometry	Solving Quadratic Equations Quadratic Graphs Growth and decay Vectors		



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<b>Links to the national curriculum (if applicable)</b>	P2, P3, P5, P6, P8, P9, R12, G16, G17, N8, A4, A5, A6, A7, S6	A16, A17, A18, A12, A11, A19, A21, A12, R10, R13, R14	A22, G20, G21, G6, R12, R16, G25, A13	G22, G23, G10, R15, R14, A15			
<b>Previous content that this topic builds upon</b>	<p>Students need to be able to convert between fractions, decimals and percentages. It is likely that students will be familiar with basic probability ideas from Key Stage 3, but they can access the materials in this topic without any prior knowledge. How to multiply a single term over a bracket.</p> <p>How to factorise a linear expression.</p> <p>How to collect like terms.</p> <p>How to calculate area and perimeter of rectangles or compound shapes made up of rectangles.</p> <p>Students will hopefully have seen the skill of substitution before but might need a recap.</p> <p>How to and why you can simplify a fraction.</p>	<p>Students should be able to use inequality signs between numbers.</p> <p>Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations.</p> <p>Students should be able to deal with decimals and negatives on a calculator.</p> <p>Students should be able to use index laws numerically.</p> <p>Students should be able to draw a number line.</p>	<p>Students should be able to plot coordinates and read scales</p> <p>Students should be able to substitute into a formula.</p> <p>Students should be able to square negative numbers. Students should be able to substitute into formulae.</p> <p>Students should be able to plot points on a coordinate grid.</p> <p>Students should be able to expand single brackets and collect 'like' terms</p> <p>Students should be able to rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae.</p> <p>Students should recall basic angle facts. Students should understand when to leave an answer in surd form. Students can plot coordinates in all four quadrants and draw axes.</p>	<p>Students will have used column vectors when dealing with translations. Students can recall and apply Pythagoras' Theorem on a coordinate grid. Students should be able to find a percentage of an amount and relate percentages to decimals.</p>			
<b>Key vocabulary</b>	Probability, dependent, independent, conditional, outcomes, theoretical, relative frequency, fairness, experimental, Triangle, rectangle, parallelogram, trapezium, area, perimeter, prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion volume, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi,	solve, inequality, represent, substitute, linear, accuracy, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy, Rearrange, simultaneous, substitution, elimination, subject	Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy,	Compound interest, growth, decay, depreciation, multiplier, Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket, Reciprocal, linear, gradient, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination,			
<b>Development of cultural capital</b>	Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and "real-life" mathematical problems.	Many positions that fall under the umbrella term of management use Pythagoras' Theorem regularly. Computer and information systems managers, construction managers, engineering and natural sciences managers use this in their day-to-day business of their respective fields.	Astronomers use trigonometry to calculate how far stars and planets are from Earth, Even though we know the distances between planets and stars, this mathematical technique is also used by NASA scientist today when they design and launch space shuttles and rockets.	People who regularly include exponents (growth and decay) are economists, bankers, biologist, engineers, computer programmers and risk assessors. This topics has a vast number of real-life links to ensure that pupils can have real-life concepts to cement their understanding too.			
<b>Development of reading</b>	The 'Frayer model' will be used to help students organise their understanding of a new academic	The 'Frayer model' will be used to help students organise their	The 'Frayer model' will be used to help students organise their	The 'Frayer model' will be used to help students organise their			



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	term or complex vocabulary choice	understanding of a new academic term or complex vocabulary choice	understanding of a new academic term or complex vocabulary choice	understanding of a new academic term or complex vocabulary choice		
	Guided reading – Probability	Guided reading – Inequalities, Pythagoras	Guided reading – Trigonometry	Guided reading –Quadratics, Vectors		
<b>Concepts –what will students be able to do at the end of the topic</b>	<p>Probability</p> <ul style="list-style-type: none"> <li>➤ Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments</li> <li>➤ Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 to 1 probability scale</li> <li>➤ Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size</li> <li>➤ Enumerate sets and combinations of sets systematically using tables, grids, Venn diagrams and tree diagrams</li> <li>➤ Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</li> </ul> <p>Volume</p> <ul style="list-style-type: none"> <li>➤ Compare lengths, areas and volumes using ratio notation</li> <li>➤ Scale factors</li> <li>➤ Make links to similarity</li> <li>➤ Know and apply formulae to calculate the volume of cuboids and other right prisms (including cylinders)</li> <li>➤ Calculate the volume of spheres, pyramids, cones and composite solids</li> <li>➤ Calculate exactly with multiples of <math>\pi</math></li> </ul> <p>Algebra (quadratics, rearranging formulae and identities)</p> <ul style="list-style-type: none"> <li>➤ Simplify and manipulate algebraic expressions (including those involving surds) by:               <ul style="list-style-type: none"> <li>– simplifying expressions involving sums, products and powers, including the laws of indices</li> <li>– expanding products of two binomials</li> <li>– factorising quadratic expressions of the form <math>x^2 + bx + c</math> including</li> </ul> </li> </ul>	<p>Inequalities</p> <ul style="list-style-type: none"> <li>➤ Solve linear inequalities in one variable</li> <li>➤ Represent the solution set on a number line</li> </ul> <p>Pythagoras’ Theorem</p> <ul style="list-style-type: none"> <li>➤ Know the formula for Pythagoras’ Theorem <math>a^2 + b^2 = c^2</math></li> <li>➤ Apply it to find lengths in right angled triangles in two dimensional figures</li> </ul> <p>Simultaneous equations</p> <ul style="list-style-type: none"> <li>➤ Solve two simultaneous equations in two variables (linear/linear) algebraically</li> <li>➤ Find approximate solutions using a graph</li> <li>➤ Translate simple situations or procedures into algebraic expressions or formulae</li> <li>➤ Derive two simultaneous equations, solve the equations and interpret the solution</li> </ul> <p>Algebra and graphs</p> <ul style="list-style-type: none"> <li>➤ Solve linear equations in one unknown algebraically</li> <li>➤ Including those with the unknown on both sides of the equation</li> <li>➤ Find approximate solutions using a graph</li> <li>➤ Translate simple situations or procedures into algebraic expressions or formulae</li> <li>➤ Derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution</li> </ul>	<p>Sketching graphs</p> <ul style="list-style-type: none"> <li>➤ Recognise, sketch and interpret graphs of linear functions, quadratic functions</li> <li>➤ Simple cubic functions and the reciprocal function <math>y = \frac{1}{x}</math> with <math>x \neq 0</math></li> </ul> <p>Direct and inverse proportion</p> <ul style="list-style-type: none"> <li>➤ Solve problems involving direct and inverse proportion, including graphical and algebraic representations</li> <li>➤ Understand that <math>X</math> is inversely proportional to <math>Y</math> is equivalent to <math>X</math> is proportional to <math>\frac{1}{Y}</math></li> <li>➤ Interpret equations that describe direct and inverse proportion</li> <li>➤ Recognise and interpret graphs that illustrate direct and inverse proportion</li> </ul> <p>Basic Trigonometry</p> <ul style="list-style-type: none"> <li>➤ Know and use the trigonometric ratios</li> </ul> <p><math>\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}, \cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan \theta =</math></p> <ul style="list-style-type: none"> <li>➤ Apply them to find angles and lengths in right-angled triangles in two dimensional figures</li> <li>➤ Know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math></li> <li>➤ Know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> <li>➤ Compare lengths using ratio notation</li> <li>➤ Make links to trigonometric ratios</li> </ul>	<p>Solving Quadratic equations</p> <ul style="list-style-type: none"> <li>➤ <u>Solve quadratic equations algebraically by factorising</u></li> <li>➤ <u>Find approximate solutions using a graph</u></li> </ul> <p>Quadratic graphs</p> <ul style="list-style-type: none"> <li>➤ Recognise, sketch and interpret graphs of quadratic functions</li> <li>➤ <u>Identify and interpret roots, intercepts and turning points of quadratic functions graphically</u></li> <li>➤ <u>Deduce roots algebraically</u></li> </ul> <p>Growth and decay</p> <ul style="list-style-type: none"> <li>➤ <u>Set up, solve and interpret the answers in growth and decay problems, including compound interest</u></li> </ul> <p>Vectors</p> <ul style="list-style-type: none"> <li>➤ <u>Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors</u></li> </ul>		



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		<p>the difference of two squares</p> <ul style="list-style-type: none"> <li>➤ Understand and use standard mathematical formulae</li> <li>➤ Rearrange formulae to change the subject</li> <li>➤ Know the difference between an equation and an identity</li> <li>➤ Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments</li> <li>➤ Where appropriate, interpret simple expressions as functions with inputs and outputs</li> </ul> <p>Scatter graphs</p> <ul style="list-style-type: none"> <li>➤ Use and interpret scatter graphs of bivariate data</li> <li>➤ Recognise correlation and know that it does not indicate causation</li> <li>➤ Draw estimated lines of best fit</li> <li>➤ Make predictions</li> <li>➤ Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so</li> </ul>					
	<b>Knowledge organisers</b>	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs	Inequalities Pythagoras' Theorem Simultaneous equations Algebra and graphs	Sketching graphs Direct and inverse proportion Basic Trigonometry	Solving Quadratic Equations Quadratic Graphs Growth and decay Vectors		
<b>Year Group</b>		<b>Autumn Term 1</b>	<b>Autumn Term 2</b>	<b>Spring Term 1</b>	<b>Spring Term 2</b>	<b>Summer Term 1</b>	<b>Summer Term 2</b>
<b>Year 11 Higher</b>	<b>Topic</b>						
	<b>Core knowledge from this topic</b>	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs Numerical methods	Equations of circles Further equations and graphs Simultaneous equations Sketching graphs Diverse and inverse proportion	Inequalities Pythagoras' Theorem Basic Trigonometry Growth and decay Vectors Transforming functions	Sine and Cosine Circle Theorems Gradients and rate of change Pre-calculus and area under a curve Algebraic fractions		
	<b>Links to the national curriculum (if applicable)</b>	P2, P3, P5, P6, P8, P9, R12, G16, G17, N8, A4, A5, A6, A7, S6, N20	A16, A17, A18, A12, A11, A19, A21, A12, R10, R13, R14	A22, G20, G21, G6, R12, R16, G25, A13	G22, G23, G10, R15, R14, A15	NA	NA
	<b>Previous content that this topic builds upon</b>	Students need to be able to convert between fractions, decimals and percentages. It is likely that students will be familiar with basic probability ideas from	Students should be able to use inequality signs between numbers. Students should be able to use negative numbers with the four operations, recall and use the	Students should be able to plot coordinates and read scales. Students should be able to substitute into a formula.	Students will have used column vectors when dealing with translations. Students can recall and apply Pythagoras' Theorem on a coordinate grid. Students		





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		<p>Key Stage 3, but they can access the materials in this topic without any prior knowledge. How to multiply a single term over a bracket.</p> <p>How to factorise a linear expression.</p> <p>How to collect like terms.</p> <p>How to calculate area and perimeter of rectangles or compound shapes made up of rectangles.</p> <p>Students will hopefully have seen the skill of substitution before but might need a recap.</p> <p>How to and why you can simplify a fraction.</p>	<p>hierarchy of operations and understand inverse operations.</p> <p>Students should be able to deal with decimals and negatives on a calculator.</p> <p>Students should be able to use index laws numerically.</p> <p>Students should be able to draw a number line.</p>	<p>Students should be able to square negative numbers. Students should be able to substitute into formulae.</p> <p>Students should be able to plot points on a coordinate grid.</p> <p>Students should be able to expand single brackets and collect 'like' terms</p> <p>Students should be able to rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae.</p> <p>Students should recall basic angle facts. Students should understand when to leave an answer in surd form. Students can plot coordinates in all four quadrants and draw axes.</p>	<p>should be able to find a percentage of an amount and relate percentages to decimals.</p>		
	<b>Key vocabulary</b>	<p>Probability, dependent, independent, conditional, outcomes, theoretical, relative frequency, experimental, Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, , prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area</p>	<p>solve, inequality, represent, substitute, linear, accuracy, Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy, rearrange, simultaneous, substitution, elimination,</p>	<p>Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare, triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy,</p>	<p>Compound interest, growth, decay, depreciation, multiplier, Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket, Reciprocal, linear, gradient, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination,</p>		
	<b>Development of cultural capital</b>	<p>Ensure that all pupils can apply all four operations to any problem so that they can confidently apply all skills to functional and "real-life" mathematical problems.</p>	<p>Many positions that fall under the umbrella term of management use Pythagoras' Theorem regularly. Computer and information systems managers, construction managers, engineering and natural sciences managers use this in their day-to-day business of their respective fields.</p>	<p>Astronomers use trigonometry to calculate how far stars and planets are from Earth, Even though we know the distances between planets and stars, this mathematical technique is also used by NASA scientist today when they design and launch space shuttles and rockets.</p>	<p>People who regularly include exponents (growth and decay) are economists, bankers, biologist, engineers, computer programmers and risk assessors. This topics has a vast number of real-life links to ensure that pupils can have real-life concepts to cement their understanding too.</p>		
	<b>Development of reading</b>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Probability</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Inequalities, Pythagoras</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading – Trigonometry</p>	<p>The 'Frayer model' will be used to help students organise their understanding of a new academic term or complex vocabulary choice</p> <p>Guided reading –Quadratics, Vectors</p>		
	<b>Concepts –what will students be able to do at the end of the topic</b>	<p>Probability</p> <ul style="list-style-type: none"> <li>➤ Apply ideas of randomness, fairness and equally likely events to calculate expected</li> </ul>	<p>Equations of circles</p> <ul style="list-style-type: none"> <li>➤ Recognise and use the equation of a circle with centre at the origin</li> <li>➤ Find the equation of a tangent to a circle at a given point</li> </ul>	<p>Inequalities</p> <ul style="list-style-type: none"> <li>➤ Solve linear inequalities in one or two variable(s) and quadratic inequalities in one variable</li> </ul>	<p>Sine and Cosine</p> <ul style="list-style-type: none"> <li>➤ Know and apply the Sine rule <math>\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}</math> and cosine rule <math>a^2 = b^2 + c^2 - 2bc \cos A</math> to find unknown lengths and angles</li> </ul>		



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		<p>outcomes or multiple future experiments</p> <ul style="list-style-type: none"> <li>➤ Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale</li> <li>➤ Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</li> <li>➤ Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams</li> <li>➤ Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</li> <li>➤ Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams</li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>➤ Compare lengths, areas and volumes using ratio notation</li> <li>➤ Scale factors</li> <li>➤ Make links to similarity</li> <li>➤ Know and apply the formulae to calculate volume of cuboids and other right prisms (including cylinders)</li> <li>➤ Calculate the volume of spheres, pyramids, cones and composite solids</li> <li>➤ Calculate exactly with multiples of <math>\pi</math></li> </ul> <p><b>Algebra (quadratics, rearranging formulae and identities)</b></p> <ul style="list-style-type: none"> <li>➤ Simplify and manipulate algebraic expressions (including those involving surds) by:             <ul style="list-style-type: none"> <li>– expanding products of two or more binomials</li> <li>– factorising quadratic expressions of the form <math>x^2 + bx + c</math> including the difference of two squares</li> <li>– factorising quadratic expressions of the form <math>ax^2 + bx + c</math></li> <li>– simplifying expressions involving sums, products and powers, including the laws of indices</li> </ul> </li> <li>➤ Understand and use standard mathematical formulae</li> <li>➤ Rearrange formulae to change the subject</li> <li>➤ Know the difference between an equation and an identity</li> <li>➤ Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs</li> </ul>	<p><b>Further equations and graphs</b></p> <ul style="list-style-type: none"> <li>➤ Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)</li> <li>➤ Find approximate solutions using a graph</li> <li>➤ Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula</li> <li>➤ Find approximate solutions using a graph</li> <li>➤ Recognise, sketch and interpret graphs of linear and quadratic functions</li> <li>➤ Identify and interpret roots, intercepts and turning points of quadratic functions graphically</li> <li>➤ Deduce roots algebraically</li> <li>➤ Deduce turning points by completing the square</li> <li>➤ Translate simple situations or procedures into algebraic expressions or formulae</li> <li>➤ Derive an equation, solve the equation and interpret the solution</li> </ul> <p><b>Simultaneous equations</b></p> <ul style="list-style-type: none"> <li>➤ Solve two simultaneous equations in two variables (linear/linear or linear/ quadratic) algebraically</li> <li>➤ Find approximate solutions using a graph</li> <li>➤ Translate simple situations or procedures into algebraic expressions or formulae</li> <li>➤ Derive an equation (or two simultaneous equations), solve the equations and interpret the solution</li> </ul> <p><b>Sketching graphs</b></p> <ul style="list-style-type: none"> <li>➤ Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function <math>y = \frac{1}{x}</math> for <math>x \neq 0</math>, exponential functions <math>y = kx</math> for positive values of <math>k</math>, and the trigonometric functions (with arguments in degrees) <math>y = \sin x</math>, <math>y = \cos x</math> and <math>y = \tan x</math> for angles of any size</li> </ul> <p><b>Diverse and inverse proportion</b></p> <ul style="list-style-type: none"> <li>➤ Solve problems involving direct and inverse proportion, including graphical and algebraic representations</li> <li>➤ Understand that <math>X</math> is inversely proportional to <math>Y</math> is equivalent to <math>X</math> is proportional to <math>\frac{1}{Y}</math></li> <li>➤ Construct and interpret equations that describe direct and inverse proportion</li> <li>➤ Recognise and interpret graphs that illustrate direct and inverse proportion</li> </ul>	<ul style="list-style-type: none"> <li>➤ Represent the solution set on a number line, using set notation and on a graph</li> </ul> <p><b>Pythagoras' Theorem and Basic Trigonometry</b></p> <ul style="list-style-type: none"> <li>➤ Know the formula for Pythagoras' Theorem <math>a^2 + b^2 = c^2</math> and the trigonometric ratios</li> </ul> $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}, \cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan \theta = \frac{\text{opp}}{\text{adj}}$ <ul style="list-style-type: none"> <li>➤ Apply them to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures</li> <li>➤ Know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math></li> <li>➤ Know the exact value of <math>\tan \theta</math> for <math>0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> <li>➤ Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras Theorem, and use known results to obtain simple proofs</li> <li>➤ Compare lengths using ratio notation and make links to trigonometric ratios</li> </ul> <p><b>Growth and decay</b></p> <ul style="list-style-type: none"> <li>➤ Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes</li> </ul> <p><b>Vectors</b></p> <ul style="list-style-type: none"> <li>➤ Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors</li> <li>➤ Use vectors to construct geometric arguments and proofs</li> </ul> <p><b>Transforming functions</b></p> <ul style="list-style-type: none"> <li>➤ Sketch translations and reflections of a given function</li> </ul>	<p>Know and apply <math>\text{Area} = \frac{1}{2}ab\sin C</math> to calculate the area, sides or angles of any triangle</p> <p><b>Circle Theorems</b></p> <ul style="list-style-type: none"> <li>➤ Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results</li> </ul> <p><b>Gradients and rate of change</b></p> <ul style="list-style-type: none"> <li>➤ Interpret the gradient at a point on a curve as the instantaneous rate of change</li> <li>➤ Apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts</li> <li>➤ Interpret the gradient of a straight-line graph as a rate of change</li> </ul> <p><b>Pre-calculus and area under a curve</b></p> <ul style="list-style-type: none"> <li>➤ Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs)</li> <li>➤ Interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts</li> </ul> <p><b>Algebraic fractions</b></p> <ul style="list-style-type: none"> <li>➤ Simplify and manipulate algebraic expressions involving algebraic fractions</li> </ul>		
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		<ul style="list-style-type: none"> <li>➤ Where appropriate, interpret simple expressions as functions with inputs and outputs</li> <li>➤ Interpret the reverse process as the 'inverse function'</li> <li>➤ Interpret the succession of two functions as a 'composite function'</li> </ul> <p>Scatter graphs</p> <ul style="list-style-type: none"> <li>➤ Use and interpret scatter graphs of bivariate data</li> <li>➤ Recognise correlation and know that it does not indicate causation</li> <li>➤ Draw estimated lines of best fit</li> <li>➤ Make predictions</li> <li>➤ Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so</li> </ul> <p>Numerical methods</p> <ul style="list-style-type: none"> <li>➤ Find approximate solutions to equations numerically using iteration including the use of suffix notation</li> </ul>					
	<b>Knowledge organisers</b>	Probability Volume Algebra (quadratics, rearranging formulae and identities) Scatter graphs Numerical methods	Equations of circles Further equations and graphs Simultaneous equations Sketching graphs Diverse and inverse proportion	Inequalities Pythagoras' Theorem Basic Trigonometry Growth and decay Vectors Transforming functions	Sine and Cosine Circle Theorems Gradients and rate of change Pre-calculus and area under a curve Algebraic fractions		