

Key Stage 4 Foundation Tier Skills Map

Module 1: Number

Unit	Key Learning	
1: Factors, multiples and primes	<ul style="list-style-type: none"> Find the factors and multiples of a number Find prime numbers Find the prime factors of a number 	<ul style="list-style-type: none"> Determine highest common factor (HCF) by prime factorisation Determine the lowest common multiple (LCM) by prime factorisation
2: Powers and roots	<ul style="list-style-type: none"> Recognise and calculate with square numbers and cube numbers, knowing square and cube roots as appropriate Understand the meaning of higher powers and know how to find these 	<ul style="list-style-type: none"> Understand the meaning of roots and how to find these, including through approximation Efficient use of a calculator, when appropriate
3: Indices	<ul style="list-style-type: none"> Understand the meaning of higher powers and know how to find these (recap) 	<ul style="list-style-type: none"> Understand, derive and use the rules of indices with integer values
4: Standard Form	<ul style="list-style-type: none"> Multiply and divide numbers by any power of 10 Convert numbers to and from standard form 	<ul style="list-style-type: none"> Perform calculations involving standard form Efficient use of a calculator, when appropriate
5: Sequences	<ul style="list-style-type: none"> Recognise and describe arithmetic and geometric sequences 	<ul style="list-style-type: none"> Find a formula for the n^{th} term of a linear and geometric sequence

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Module 2: Applications of algebra

Unit	Key Learning	
6: Algebra review	<ul style="list-style-type: none"> Simplify expressions Substitute into formulae Form simple expressions Form and solve linear equations in one variable Use algebraic notation, understanding input and output 	<ul style="list-style-type: none"> Simplify more complex algebraic expressions, including using powers multiplied over a single bracket Use reasoning to show whether two expressions are equivalent, so developing their understanding of an identity Rearrange formulae where the subject appears twice
7: Quadratics	<ul style="list-style-type: none"> Expand products of two binomials Factorise quadratic expressions of the form $x^2 + bx + c$ 	<ul style="list-style-type: none"> Difference of two squares Solve quadratic equations of the form $x^2 + bx + c$ by factorising
8: Quadratic graphs	<ul style="list-style-type: none"> Draw and recognise quadratic graphs Use quadratic graphs to find the approximate solution to quadratic equations 	<ul style="list-style-type: none"> Identify intercepts, and using symmetry, the turning points of graphs of quadratic functions
9: Simultaneous equations	<ul style="list-style-type: none"> Solving simultaneous equations graphically Solving simultaneous equations algebraically 	<ul style="list-style-type: none"> Writing and solving simultaneous equations to solve problems

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Module 3: Percentages and Probability

Unit	Key Learning	
10: Fractions, percentages and decimals	<ul style="list-style-type: none"> Understand fraction notation, recognising when fractions are equivalent Convert between improper fractions and mixed numbers Apply the four rules of number to fractions 	<ul style="list-style-type: none"> Find fractions of a quantity Appreciate the equivalence of fractions, decimals and percentage and convert between them
11: Percentages	<ul style="list-style-type: none"> Increase and decrease by a given percentage Express one number as a percentage of another, including percentage changes Know the difference between simple and compound interest 	<ul style="list-style-type: none"> Solve problems involving compound interest Solve other problems involving repeated change, such as depreciation Solve problems involving growth and decay
12: Probability	<ul style="list-style-type: none"> Use the language associated with probability Find the probability of a single event when there are equally likely events Convert between different forms of probability - fractions, decimals and percentages Know that $P(\text{Not } A) = 1 - P(A)$ Solve equations from probability problems Understand what is meant by relative frequency Understand why relative frequency is sometimes used as an estimate for probability Compare theoretical probability with result obtained by experiments 	<ul style="list-style-type: none"> Use Venn diagrams and two-way tables to solve probability problems Construct Venn diagrams and two-way tables to solve probability problems Use the addition law for probability, understanding when events are mutually exclusive Systematically list sample spaces Understand the multiplication rule for independent and dependent events Use tree diagrams to solve probability problems Construct tree diagrams to solve probability problems

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Module 4: Geometry

Unit	Key Learning	
13: Transformations	<ul style="list-style-type: none"> Reflect a shape in a given line, including on a coordinate grid using e.g. $x = \pm a$ Rotate a shape by a 90°, 180° and 270° about a given centre Translate a shape by a given vector Understand that these transformations do not affect the area of the shape and that the distance between pairs of points is the same in the image as in the original shape 	<ul style="list-style-type: none"> Describe a single transformation using correct mathematical language Enlarge shapes, with or without a coordinate grid, from a given centre, using positive integer and fractional scale factors Find the centre of enlargement given a shape and its image
14: 2D shape and circle geometry	<ul style="list-style-type: none"> Round numbers to a given number of decimal places Calculate the area of triangles, parallelograms, trapezia, circles and composite 2D shapes Find the circumference of a circle Find the perimeter of composite 2D shapes 	<ul style="list-style-type: none"> Identify and use the terms centre, radius, chord, diameter, circumference, tangent, arc, sector and segment Calculate the length of an arc of a circle Calculate the area of a sector of a circle
15: 3D shapes	<ul style="list-style-type: none"> Recognise the vocabulary associated with 3D solids Interpret plans and elevations of 3D solids 	<ul style="list-style-type: none"> Construct plans and elevations of 3D solids
16: Volume and surface area	<ul style="list-style-type: none"> Calculate the surface area and volume of: cuboids, spheres, cones, pyramids, simple composite solids Compare the surface area and volume of solid shapes, using ratios where appropriate Form and solve equations related to 3D shapes 	<ul style="list-style-type: none"> Give answers in terms of pi if appropriate Understand the limits of accuracy, using inequality notation to show error intervals Convert between area and volume units

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Module 5: Similarity

Unit	Key Learning	
17: Ratio	<ul style="list-style-type: none"> Recognise and use ratio notation, simplify ratios, compare ratios to fractions, decimals and percentages 	<ul style="list-style-type: none"> Share a quantity in a given ratio Solve simple ratio and proportion problems
18: Direct and inverse proportion	<ul style="list-style-type: none"> Use and apply compound units such as density and pressure Know and apply $\text{Density} = \text{Mass} \div \text{Volume}$ Use and apply compound units in algebraic contexts Solve problems using unitary method Recognise the link between gradient and proportion 	<ul style="list-style-type: none"> Solve problems involving direct proportion in numerical and algebraic contexts Solve formal problems involving direct proportion where $y \propto x$ Solve problems involving inverse proportion in contexts such as speed, distance and time Solve formal problems involving inverse proportion where $y \propto \frac{1}{x}$
19: Pythagoras' theorem	<ul style="list-style-type: none"> Find missing sides in right-angled triangles given the other two sides Model practical situations with right-angled triangles and so find missing lengths 	<ul style="list-style-type: none"> Identify whether a triangle is right-angled by considering the lengths of its sides
20: Similarity and trigonometry	<ul style="list-style-type: none"> Understand the meaning of similarity Find missing sides in pairs of similar shapes, including similar triangles Understand and use the relationship between lengths, areas and volumes of similar shapes 	<ul style="list-style-type: none"> Understand and use the trigonometric ratios $\sin \theta$, $\cos \theta$ and $\tan \theta$ Understand the link between similar triangles and trigonometry Derive and use the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90°; know the exact value of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60°

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Module 6: Data handling

Unit	Key Learning	
21: Average and range review	<ul style="list-style-type: none"> • Calculate the mean, median and mode and range of ungrouped data • Find the modal class of grouped data • Find estimates of the mean, median and range of grouped data 	<ul style="list-style-type: none"> • Make comparisons between sets of data using summary statistics • Design tables to classify data
22: Data collection and sampling	<ul style="list-style-type: none"> • Appreciate the difference between quantitative, qualitative, discrete and continuous data • Explore methods of data collection including surveys, questionnaires and the use of secondary data 	<ul style="list-style-type: none"> • Classify and tabulate data • Know the difference between a sample and a population • Understand different types of sampling and discuss the reliability of different types of sample
23: Presenting data including scatter diagrams	<ul style="list-style-type: none"> • Interpret and construct: bar charts (including comparative and stacked), pie charts and line graphs for time series data • Identify trends within time series • Recognise when graphs and charts can be misleading • Identify outliers 	<ul style="list-style-type: none"> • Scatter graphs <ul style="list-style-type: none"> ○ Plot to identify correlation ○ Understand that correlation does not imply causality ○ Draw (by eye) lines of best fit ○ Interpret the graphs to make estimates, knowing the limitations of this ○ Spot outliers on a scatter graph

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Module 7: Reasoning and proof

Unit	Key Learning	
24: Vectors	<ul style="list-style-type: none"> Represent a two dimensional vector as a column vector Add and subtract vectors 	<ul style="list-style-type: none"> Multiply a vector by a scalar
25: Geometric reasoning	<ul style="list-style-type: none"> Know the names of different types of angle Derive and use the sum of interior angles of a triangle Find the sum of the interior angles of a polygon Find the interior angle of a regular polygon Derive and use the sum of the exterior angles of a polygon Identify and know the properties of special quadrilaterals 	<ul style="list-style-type: none"> Know and use: the sum of angles at a point and angles on a straight line, vertically opposite angles are equal, alternate angles are equal and corresponding angles are equal Use angle facts to justify results in simple proofs Use the known properties of triangles and quadrilaterals to follow and to derive simple proofs in rectilinear figures, including key angle and area facts
26: Bearings	<ul style="list-style-type: none"> Understand and use bearings 	
27: Congruence and proof	<ul style="list-style-type: none"> Construct triangles and quadrilaterals from given information Recognise congruent triangles 	<ul style="list-style-type: none"> Be aware of the conditions for congruency Prove pairs of triangles are congruent using SSS, ASA, AAS and RHS
28: Construction and loci	<ul style="list-style-type: none"> Use rulers, protractors and pairs of compasses accurately Use the standard ruler and compass constructions for: perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point and bisecting a given angle Understand and use the perpendicular distance from a point to a line as the shortest distance to the line 	<ul style="list-style-type: none"> Construct triangles and quadrilaterals from given information Apply ruler and compass constructions to construct figures Understand the term equidistant Identify the loci of points and use these to solve real world problems

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Module 8: Inequalities and graphs

Unit	Key Learning	
29: Inequalities	<ul style="list-style-type: none"> Form and solve linear equations in one variable (review) 	Form and solve inequalities in one variable, including representing solutions on a number line
30: Linear graphs	<ul style="list-style-type: none"> Solve problems involving coordinates and midpoints of line segments Plot straight line graphs Understand input and output Understand the equation of a straight line, interpreting the gradient and intercept 	<ul style="list-style-type: none"> Rearrange formulae where the subject appears only once Find the equation of a straight line given sufficient information Prove whether two straight lines are parallel by considering their equations, rearranging where necessary
31: Non-linear graphs	<ul style="list-style-type: none"> Construct and interpret graphs of real-life contexts such as: Currency conversion, Temperature conversion, Distance time graphs Use tables of values to plot polynomial graphs 	<ul style="list-style-type: none"> Use tables of values to plot reciprocal graphs Recognise and sketch graphs of cubic and reciprocal functions

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