Curriculum Overview: Maths

Our ambition is driven by the belief that all our students can become life-long learners of Maths, and in the belief in the importance of Maths to society. We want our students to become flexible problem-solvers and to recognise that it is ok to make mistakes and that this is a critical source of learning. Working alongside the Glow Hub we are working towards achieving procedural fluency and conceptual understanding within all lessons. This will ensure that there is a consistent structure to assess retention through interleaving, a clear focus on engaging students and appropriate challenge for all to deepen understanding. Through support and scaffolding, all students will be able to acquire this knowledge and develop these skills, regardless of starting point or special educational needs or disabilities. Students become independent learners through Hegarty maths, supported by homework club.

Maths is taught in a Spiral curriculum. A spiral curriculum is one in which there is an iterative revisiting of topics, subjects or themes throughout the course. A spiral curriculum is not simply the repetition of a topic taught. It requires also the deepening of it, with each successive encounter building on the previous one.

Pre-GCSE Maths

What we study in Year 7 and why we study it	Concepts	Competencies including literacy

Generally the sequencing of maths is based on the principle of interleaving so that prior knowledge is revisited at regular intervals.		
<u>Binary</u> This unit is something very different to stimulate curiosity and engagement at the start of secondary school. It introduces the foundational skills of pattern spotting and sequencing. It also supports coding in computer science.	Using a different way of representing numbers.	Write numbers up to 64 in binary.
<u>Number</u> This is foundational to all subsequent topics – without these skills other topics will be inaccessible. This unit is used to identify areas of strength and weakness as students make the transition from primary school.	Using 4 rules of number correctly.	Ordering numbers: positive and negative Integers & Decimals. Using inequalities Use four operations in integers, decimals and fractions Types of number: Factors, multiples, primes
<u>Expressions</u> This is unit is an introduction to algebra, which some students will not have learnt about at all before. It brings in the concept of 'unknowns', which can be a stumbling block later if not introduced early on.	Representing a number with a letter or a picture.	Order of operations, use correct algebraic notation
<u>Probability</u> Another new topic, introducing the concept of chance. It is reliant upon the number skills of being able to express probabilities as fractions – a skill developed in the 'number' unit.	Expressing a probability as a fraction.	Understand concepts of randomness and fairness. Use probability scale. Appropriate language.
<u>Equations</u> Interleaving: this unit builds on the expression unit where they learnt they could work with an unknown by teaching them to learn the structure of equation. It develops the concept of substitution.	Constructing a basic equation. Solve a basic equation	Understand notation. Substitute numbers into expressions, equations, formulae. Use vocabulary – term, expression, equation

<u>Ratio and proportion</u> Interleaving: builds on work on fractions begun in 'number' and 'probability'. This is a topic with many practical applications, with which students struggle to grasp; it also makes up a significant proportion of the GCSE curriculum; therefore, more time allocated.	Express parts of a whole as proportions (fractions) and comparing quantities using ratio.	Convert between standard units. Express one quantity as a fraction of another. Use ratio notation and simplify a ratio. Interpret fractions and decimals as operators.
<u>2D shapes</u> Introduction to geometry; subsequent units build directly upon this. Introduces the language of shape e.g. parallel, perpendicular which to be used in all their study of shape. Moving students on from Primary angle knowledge.	Recall properties of triangles and quadrilaterals. Use correct markings on shapes.	Use conventional notation and language (vertices not corners…). Define properties of special quadrilaterals.
<u>Area and perimeter</u> Builds on the language of 2D shapes with a focus on properties and relationship between area and perimeter.	Find area and perimeter of 2D shapes	Use conventional notation and language (vertices not corners…). Use standard units of measure and related concepts. Know and use formulae for triangle, rectangle, parallelogram.
<u>3D shapes</u> Extends the language of shape with 3D terminology e.g. face, vertical edges. Use of nets forms a link between 2D and 3D shapes.	Describe properties of common 3D shapes.	Identify and name common solids. Sketch 3D solids. Know terms face, vertex, edge.
<u>Building a sequence</u> Introduces the skills of describing patterns and how to continue patterns. Utilises the basic skills established in the initial binary unit.	Describe how a sequence grows using 'term-to-term' pattern spotting	Recognise and name common sequences. Know the word term and term-to-term rule. Generate sequences from diagrams and term-to-term rules.
<u>Sequences and graphs</u>		

Representing sequences in graphical form, taking the previous unit a stage further. This unit introduces functions.	Plot a sequence on a graph.	Use co-ordinates in all 4 quadrants. Plot graphs from a table of values.
<u>Transformations</u> Introduces the language of transformations. Strengthens students spatial awareness. Uses the understanding developed in the study of ratio and proportion and 2D shapes.	Congruent and similar shapes. Transforming shapes.	Rotate, translate, reflect ad enlarge 2D shapes.
<u>FDP</u> Building on primary introduction to FDP. Ensuring depth in understanding of equivalence between Fractions, Decimals and Percentages. Introduce 4 rules (add, subtract, multiply and divide) with fractions. Adding and subtracting decimals.	Equivalence between fractions, decimals and percentages	Use diagrams to find equivalent fractions or compare fractions. Describe shaded parts of fractions.
<u>Statistics</u> Introducing the idea of 'census'. Collecting data and then using a range of methods to represent their data. Building on the work in FDP and using FDP language to talk meaningfully about data.	Introducing ways to organise data, average data.	Understand and use census, tally, frequency tables, pictograms, pie charts, bar charts, line and bar graphs. Introduce the mode as a way to average data.
<u>Visualising and Construction</u> Building on previous learning of angles and ratio. Ensuring accuracy in measurement and use of an appropriate scale.	Spatial awareness in terms of direction scale.	Use and interpret maps. Use scale in drawings. Estimate lengths using scale diagrams. Draw diagrams from written instructions.

What we study in Year 8 and why we study it	**Concepts**	**Competencies including literacy**

Generally the sequencing of maths is based on the principle of interleaving so that prior knowledge is revisited at regular intervals.		
<u>Number</u> Building on and extending understanding of working with decimals.	Using 4 rules of number correctly.	Multiplying and dividing decimals using place value. Apply four operations to mixed numbers.
<u>Expressions</u> Extending and deepening the introduction to this topic in year 7. Introducing more complex forms of expression	Representing a number with a letter or a picture.	Cancelling to simplify calculations and expressions. Use conventional notation for order of operations.
<u>Probability</u> Builds on the concepts introduced in year 7. Students apply more	Expressing a probability as a fraction.	Apply systematic listing strategies, record and analyse results of probability experiments.
<u>Equations</u> Interleaving: this unit builds on the expression unit where they learnt they could work with an unknown by teaching them to learn the structure of equation. It develops the concept of substitution.	Constructing a basic equation. Solve a basic equation	Substitute numerical values into expressions, equations, scientific formulae Use conventional notation for priority of operations. Use and interpret algebraic notation. Understand and use the concepts and vocabulary of identities.
<u>Ratio and proportion</u> Interleaving: builds on work on fractions that was begun in 'number' and 'probability'. This is a topic with a lot of practical applications, but which students struggle to group; it also makes up a significant	Express parts of a whole as proportions (fractions) and	Identify and work with fractions in ratio problems. Convert between standard units in area, volume and mass.

proportion of the GCSE curriculum; therefore more time is allocated. <u>2D shapes</u> Building on geometrical concepts introduced in year 7. Introduces mathematical concepts in parallel lines and regular and irregular polygons. <u>Area and perimeter</u> Builds on the language of 2D shapes with a focus on properties and relationship between area and perimeter. <u>3D shapes</u> Use of nets forms a link between 2D and 3D shapes. Using nets to find surface areas. <u>Building a sequence</u> Introduces the concept of position-to-term in finding and using rules for linear sequences. <u>Sequences and graphs</u> Representing sequences in graphical form, taking the previous unit a stage further. This unit introduces functions.	comparing quantities using ratio. Recall properties of triangles and quadrilaterals. Use correct markings on shapes. Find area and perimeter of 2D shapes Describe properties of common 3D shapes. Describe how a sequence grows using 'term-to-term' pattern spotting Plot a sequence on a graph.	Understand and use alternate and corresponding angles on parallel lines. Deduce and use the angle sum in any polygon and derive the properties of regular polygons. Solve geometrical problems on a co-ordinate axis. Know and apply formulae related to parallelograms and trapeziums. Sketch the nets of cubes and cuboids and prisms. Recall and use the formulae for volume of cuboids, prisms. Find a specific term in the sequence using term-to-term and position-to-term rules. Use the nth term of an arithmetic sequence to decide if a given number is a term in the sequence or find the first term above or below a given number. Interpret simple expressions as functions with inputs and outputs. Generate a sequence from position to term rule. Interpret the reverse process as the inverse function. Use the form y=mx+c to identify parallel lines. Identify and interpret gradients and intercepts of linear functions graphically and

		algebraically. Interpret simple expressions as functions with outputs and inputs.
<u>Transformations</u> Formalising transformations of 2D shapes	Congruent and similar shapes. Transforming shapes.	Transform a 2D shape through rotation, translation, reflection and enlargement.
<u>FDP</u> Building on fluency developed in year 7, developing work with mixed numbers in the four rules.	Equivalence between fractions, decimals and percentages	Compare and order fractions, multiply and divide an integer by a fraction and vice versa. Convert fractions to decimals.
<u>Statistics</u> Developing and extending ideas of data collection and display from year 7.	Introducing ways to organise data, average data.	Use of the idea of population, cluster. Frequency tables, stem and leaf diagram, box plots, graphical misrepresentation, interpreting data. Median. Introducing quartiles and IQR.
<u>Visualising and Construction</u> Building on previous learning of angles and ratio. Ensuring accuracy in measurement and use of an appropriate scale.	Spatial awareness in terms of direction scale.	Understand, draw and measure bearings. Calculate and solve bearings problems including on scaled maps. Use standard ruler and compass constructions. Draw diagrams from written descriptions. Measure angles in geometric figures.

GCSE		

AQA 8300 Specification

What we study at GCSE	Concepts	Competencies including literacy and numeracy
Generally, the sequencing of maths is based on the principle of interleaving so that prior knowledge is revisited at regular intervals. <u>Number</u> This is foundational to all subsequent topics – without these skills other topics will be inaccessible. Reviews KS3 learning and extends.	Basic number	Order positive and negative integers Use the symbols =, ≠, <, >, ≤, ≥ Apply the four operations, including formal written methods, to integers – both positive and negative Understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals) Recognise and use relationships between operations including inverse operations (e.g. cancellation to simplify calculations and expressions) Estimate answers. Check calculations using approximation and estimation, including answers obtained using technology
	Factors and multiples	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 and **the use of the product rule for counting**
	Rounding	

<u>Expressions</u> This unit is starting point in GCSE algebra, which will review and extend KS3 learning.	Basic algebra	Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures) Use inequality notation to specify simple error intervals due to truncation or rounding Apply and interpret limits of accuracy **including upper and lower bounds** Use and interpret algebraic notation, including: • ab in place of $a \times b$ • $3y$ in place of $y + y + y$ and $3 \times y$ • a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ • $\frac{a}{b}$ in place of $a \div b$ Coefficients written as fractions rather than decimals brackets Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals Understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors Simplify and manipulate algebraic expressions by: • collecting like terms • multiplying a single term over a bracket • taking out common factors

<u>Probability</u> Building on and extending learning in KS3	Basic Probability	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 1 Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities
<u>Equations</u> Interleaving: this unit builds on the expression unit where students learnt they could work with an unknown by teaching them to learn the structure of equation. It develops the concept of substitution.	Equations.	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
<u>Ratio and proportion</u> Interleaving: builds on work on fractions begun in 'number' and 'probability'. This is a topic with many practical applications and which students often struggle to grasp; it also makes up a significant proportion of the GCSE curriculum; therefore, more time is allocated.	Ratio and proportion.	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 Understand and use proportion as equality of ratios Relate ratios to fractions and to linear functions

<u>Area and perimeter</u> Builds on the language of 2D shapes with a focus on properties and relationship between area and perimeter.	Perimeter and area.	Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres Calculate the perimeter of a 2D shapes and composite shapes Find the surface area of pyramids composite shapes Know and apply formulae to calculate area of: triangles, parallelograms, trapezia
	Circumference and area.	Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment Know and use the formulae: Circumference of a circle `= 2 pi r = pi d` Area of a circle `= pi r^2` 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
<u>2D shapes</u> Introduction to geometry; subsequent units build directly upon this. Introduces the language of shape e.g. parallel, perpendicular which to be used in all their study of shape. Moving students on from Primary angle knowledge.	2D representation of 3D shapes.	Construct and interpret plans and elevations of 3D shapes.
<u>3D shapes</u> Extends the language of shape with 3D terminology e.g. face, vertical edges. Use of nets forms a link between 2D and 3D shapes.	Pythagoras' Theorem.	Know the formula for Pythagoras' Theorem `a^2 + b^2 = c^2` Apply it to find length in right angled triangles in two dimensional figures

<u>Building a sequence</u> Introduces the skills of describing patterns and how to continue patterns. Utilises the basic skills established in the initial binary unit.	Sequences.	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 (`r^n` where `n` is an integer and `r`is a rational number > 0) and other sequences. Deduce expressions to calculate the nth term of linear and quadratic sequences
<u>Sequences and graphs</u> Representing sequences in graphical form, taking the previous unit a stage further. This unit introduces functions.	Coordinates and linear graphs.	Work with co-ordinates in all four quadrants Solve geometrical problems on co-ordinate axes Plot graphs of equations that correspond to straight line graphs in the co-ordinate plane Use the form y=mx+c to identify parallel lines and perpendicular lines Find the equation of the line through two given points, or through one point with a given gradient Identify and interpret gradients and intercepts of linear functions graphically and algebraically
<u>Transformations</u> Introduces the language of transformations. Strengthens students spatial awareness. Uses the understanding developed in the study of ratio and proportion and 2D shapes.	Transformations.	Identify, describe and construct congruent and similar shapes, including on co-ordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors) Describe translations as 2D vectors Describe the changes and invariance achieved by combinations of rotations, reflections and translations

<u>FDP</u> Building on primary introduction to FDP. Ensuring depth in understanding of equivalence between Fractions, Decimals and Percentages. Introduce 4 rules (add, subtract, multiply and divide) with fractions. Adding and subtracting decimals.	Basic Fractions	Order positive and negative fractions Apply the four operations, including formal written methods, to simple fractions (proper and improper) and mixed numbers - both positive and negative Calculate exactly with fractions
	Basic Decimals	Order positive and negative decimals Apply the four operations, including formal written methods, to decimals – both positive and negative Understand and use place value (e.g. when calculating with decimals) Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and `7/2` or 0.375 and `3/8`) including ordering **Change recurring decimals into their corresponding fractions and vice versa**
	Basic percentages.	Define percentage as 'number of parts per hundred' Interpret percentages and percentage changes as a fraction or 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
<u>Statistics</u> Introducing the idea of 'census'. Collecting data and then using a range of methods to represent their data. Building on the work in FDP and using FDP language to talk meaningfully about data.	Collecting and representing data.	Interpret and construct tables, charts and diagrams including, for categorical data:frequency tables, bar charts, pie charts, pictograms, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data, know their appropriate use. Interpret, analyse and compare distributions of data sets from univariate empirical distributions through appropriate

<u>Visualising and Construction</u> Building on previous learning of angles and ratio. Ensuring accuracy in measurement and use of an appropriate scale.	Scatter graphs. Angles. Scale diagrams and bearings.	graphical representation involving discrete, continuous and grouped data, **including boxplots** **Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use** Use and interpret scatter graphs of bivariate data Recognise correlation and know that it does not indicate causation Draw estimated lines of best fit Make predictions Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so 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

Year 10 Number Developing concepts from Year 9	Year10 Indices. Standard form. Measures.	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** Understand and use place value (e.g. when working with very large or very small numbers) Calculate with and interpret standard form $A \times 10^n$ where $1 \leqslant A < 10$ and `n` is an integer 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 (e.g. time, length, area, volume / capacity, mass) and compound units (e.g. 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
Expressions Developing concepts from Year 9	Algebra recap and extension.	Simplify and manipulate algebraic expressions by:expanding products of two binomials, factorising quadratic expressions of the form `x^2 + bx + c` including the difference of two

		squares, simplifying expressions involving sums, products and powers, including the laws of indices. Understand and use standard mathematical formulae Rearrange formulae to change the subject
<u>Probability</u> Developing concepts from Year 9	Probability.	Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions **Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams**
<u>Equations</u> Developing concepts from Year 9	Simultaneous equations.	Solve two simultaneous equations in two variables (linear / linear or **linear/quadratic**) algebraically Find approximate solutions using a graph Translate simple situations or procedures into algebraic expressions or formulae Derive two simultaneous equations Solve the equations and interpret the solution
<u>Ratio and proportion</u> Developing concepts from Year 9	Ratio and proportion.	Identify and work with fractions in ratio problems

<u>Area and perimeter</u> Developing concepts from Year 9	Perimeter and area. Circumference and area.	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 Understand and use proportion as equality of ratios Relate ratios to fractions and to linear functions Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres Calculate the perimeter of a 2D shapes and composite shapes Find the surface area of pyramids composite shapes Know and apply formulae to calculate area of: triangles, parallelograms, trapezia Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment Know and use the formulae: Circumference of a circle `= 2 pi r = pi d` Area of a circle `= pi r^2` 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

<u>Building a sequence</u> Developing concepts from Year 9	Introduction to trigonometry.	Know the exact values of $\sin\theta$ and $\cos\theta =$ 0°, 30° 45°, 60° and 90° Know the exact value of $\tan\theta$ for $\theta =$ 0°, 30°, 45° and 60° 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 Compare lengths using ratio notation; make links to trigonometric ratios
<u>Sequences and graphs</u> Developing concepts from Year 9	Graph recap and extension.	Solve geometrical problems on co-ordinate axes Use the form $y = mx+c$ to identify parallel lines Find the equation of the line through two given points, or through one point with a given gradient Identify and interpret gradients and intercepts of linear functions graphically and algebraically
	Real life graphs.	Plot and interpret graphs (including reciprocal graphs and **exponetial** 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 Interpret the gradient of a straight-line graph as a rate of change

<u>Transformations</u> Developing concepts from Year 9	Transformations.	Identify, describe and construct congruent and similar shapes, including on co-ordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and **negative** scale factors) Describe translations as 2D vectors **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**
	Congruence and similarity.	Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS) Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs Apply and use the concepts of congruence and similarity, including the relationships between lengths, **areas and volumes** in similar figures
<u>FDP</u> Developing concepts from Year 9	Calculating with percentages.	Solve problems involving percentage change, including: • percentage increase / decrease problems • original value problems • simple interest, including in financial mathematics
<u>Statistics</u> Developing concepts from Year 9	Statistical measures.	Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate measures of central tendency (median, mean, mode and

<u>Visualising and Construction</u> Developing concepts from Year 9	Properties of polygons. Constructions and loci.	modal class), spread (range, including consideration of outliers, **quartiles and inter-quartile range**) Apply statistics to describe a population Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling Derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons) 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 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 • Know that the perpendicular distance from a point to a line is the shortest distance to the line • Use these to construct given figures and solve loci problems

Year 11 Number Enhancing concepts from Year 10 Building a sequence Enhancing concepts from Year 10	Year 11 Algebra: quadratics, rearranging formulae and identities. Trigonometry.	Simplify and manipulate algebraic expressions by:expanding products of two binomials, factorising quadratic expressions of the form `x^2 + bx + c` including the difference of two squares, simplifying expressions involving sums, products and powers, including the laws of indices Understand and use standard mathematical formulae Rearrange formulae to change the subject Know the formula for Pythagoras' Theorem `a^2+b^2=c^2` Apply it to find length in right angled triangles and, where possible, general triangles in two and **three** dimensional figures Know and use the trigonometric ratios $\sin\theta = \frac{opposite}{hypotenuse}$, $\cos\theta = \frac{adjacent}{hypotenuse}$ and $tan\,\theta = \frac{opposite}{adjacent}$ Apply them to find angles and lengths in right-angled triangles and, where possible, general triangles in two and **three** dimensional figures Know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta =$ 0°, 30° 45°, 60° and 90° Know the exact value of $\tan\theta$ for $\theta =$ 0°, 30°, 45° and 60°

		Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including Pythagoras' Theorem, use known results to obtain simple proofs Compare lengths using ratio notation; Make links to trigonometric ratios
<u>Volume</u> Enhancing concepts from Year 10	Volume.	Compare lengths, areas and volumes using ratio notation Scale factors Make links to similarity Know and apply the formulae to calculate the volume of cuboids and other right prisms (including cylinders) Calculate the volume of spheres, pyramids, cones and composite solids Calculate exactly with multiples of `pi`
<u>Expressions</u> Enhancing concepts from Year 10	Inequalities.	Solve linear inequalities in one **or two** variables **and quadratic inequalities in one variable** Represent the solution set on a number line, **using set notation and on a graph**
<u>Equations</u> Enhancing concepts from Year 10	Algebra and graphs	Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation Find approximate solutions using a graph Solve quadratic equations (**including those that require rearrangement)** algebraically by factorising, **by completing the square and by using the quadratic formula** Find approximate solutions using a graph Recognise, sketch and interpret graphs of linear and quadratic functions Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically and **turning points by completing the square**

<u>Sequences and graphs</u> Enhancing concepts from Year 10	Solving quadratic equations. Quadratic graphs.	Translate simple situations or procedures into algebraic expressions or formulae derive an equation, solve the equation and interpret the solution Simplify and manipulate algebraic expressions (including those involving surds) by:expanding products of two or **more** binomials, factorising quadratic expressions of the form $x^2 + bx + c$ including the difference of two squares, **factorising quadratic expressions of the form** $x^2 + bx + c$ simplifying expressions involving sums, products and powers, including the laws of indices Understand and use standard mathematical formulae Rearrange formulae to change the subject Know the difference between an equation and an identity Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and **proofs** Where appropriate, interpret simple expressions as functions with inputs and outputs **Interpret the reverse process as the 'inverse function'** **Interpret the succession of two functions as a 'composite function'** Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, **exponential functions** $y = kx$ **for positive values of** k **, and the trigonometric functions (with arguments in degrees)** $y = \sin x, y = \cos x$ **and** $y = \tan x$ **for angles of any size**

<u>Ratio and proportion</u> Enhancing concepts from Year 10 <u>Visualising and Construction</u> Enhancing concepts from Year 10	Growth and decay. Vectors.	Set up, solve and interpret the answers in growth and decay problems, including compound interest **and work with general iterative processes** Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors **Use vectors to construct geometric arguments and proofs**