Maths Department - Year 10 Higher

Shirley High Curriculum Map

The Year 10 curriculum builds on the knowledge and skills students have acquired in Key Stage 3. Examination technique is introduced, and students now focus on using their ability to communicate and reason Mathematically, developed at Key Stage 3, to problem solve using a wide array of techniques learnt from the six key concepts of Mathematics at Key Stage 4: Algebra, Geometry and Measures, Number, Ratio, Proportion and Rates of Change, Probability and Statistics.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:
	(1) Number (2) Algebra (3) Interpreting and representing data	(4) Fractions, ratios and percentages. (5) Angles and trigonometry	(6) Graphs (7) Area and volume	(8) Transformations and construction (9) Equations and inequalities (10) Probability	(11) Multiplicative reasoning (12) Similarity and congruence (13) More trigonometry	(14) Further statistics (15) Equations and graphs (R) Revision (EoY) End of Year Assessment
Why Now?	(1) Pupils consolidate learning from KS3 on some fundamental topics within Number. Some of the key skills in this unit will be used in all units. (2) Pupils consolidate learning from KS3 on some fundamental topics within Algebra. Some of the key skills in this unit will be used in all units. (3) Pupils consolidate learning from KS3 whilst being introduced to exam technique.	(4) This unit builds on learning from unit 1. Problem solving questions can also be accessed using skills from unit 2. (5) Pupils consolidate learning from KS3 whilst being introduced to exam technique. Problem solving questions can also be accessed using skills from unit 2.	(6) Pupils see the graphical representation of concepts seen in unit 2. (7) Pupils consolidate learning from KS3 whilst being introduced to exam technique. Problem solving questions can also be accessed using skills from unit 2.	(8) Pupils consolidate learning from KS3 focusing on exam technique and problem solving. (9) This unit builds on learning from units 1, 2 and 9. Problem solving questions can now be accessed using understanding from units such as unit 5 and 7. (10) Pupils cover the GCSE content for probability in this unit. Skills from unit 1 will enable pupils to execute calculations.	(11) This unit builds upon unit 4. Problem solving questions may involve content from units such as units 5 and 9. (12) This unit builds upon unit 11. Problem solving questions may involve content from units such as units 7, 8 and 9. (13) Pupils build on their understanding from units 5 and 6.	(14) Pupils cover the Higher tier specific Statistics content which will require the use of prior knowledge from earlier units. (15) Pupils build on their understanding from units 6 and 9.
Fundamental Concepts	Number Algebra Statistics	Number Ratio, proportion and rates of change Geometry and measures	Algebra Geometry and measures	Algebra Geometry and measures Probability	Ratio, proportion and rates of change Geometry and measures	Number Algebra Ratio, proportion and rates of change Geometry and measures Probability Statistics
Students will learn about …	(1) **Using** pictures or lists to help solve problems. **Working** out the total number of ways of performing a series of tasks. **Estimating** an answer. **Using** pace value to answer questions. **Writing** a number as a product of its prime factors. **Finding** the HCF and LCM of two numbers. **Using** powers and roots in calculations. **Using** index laws to multiply and divide. **Using** negative indices. **Using** fractional indices. **Writing** a number in standard form. **Calculating** with numbers in standard form. **Understanding** the difference between rational and irrational numbers. **Simplifying** surds. **Rationalising** a denominator. (2) **Using** the index laws to simplify algebraic terms. **Dividing** with indices. **Simplifying** expressions with powers of indices. **Expanding** brackets and simplifying expressions. **Factorising** expressions. **Solving** equations with numerical fractions. **Solving** problems using algebra. **Solving** equations with fractions by expanding brackets. **Substituting** integers and decimals into expressions. **Changing** the subject of a formula with a square root. **Substituting** values into a formula. **Using** integers and decimals in algebraic formulae. **Generating** sequences. **Writing** an expression for the nth term of a sequence. **Solving** problems using geometric sequences. **Working** out terms in Fibonacci sequences. **Finding** the nth term of a quadratic sequence. **Expanding** double brackets. **Using** the difference of squares. **Factorising** quadratic expressions. (3) **Constructing** and using back-to-back stem and leaf diagrams.	(4) **Adding**, subtracting, multiplying and dividing fractions and mixed numbers. **Finding** the reciprocal of an integer, decimal or fraction. **Writing** ratios in the form *1 : n* or *n : 1*. **Comparing** ratios. **Finding** quantities using ratios. **Sharing** quantities in a ratio, including three-part ratios. **Solving** problems involving ratios and proportions. **Using** bar models to help solve problems. **Working** out percentage increase or decrease. **Calculating** reverse percentages. **Calculating** the percentage of a quantity. **Calculating** using fractions, decimals and percentages. **Converting** a recurring decimal to a fraction. (5) **Deriving** and using the sum of angles in a triangle and a quadrilateral. **Deriving** and using the fact that the exterior angle of a triangle is equal to the sum of the two opposite interior angles. **Calculating** the sum of interior angles of a polygon. **Using** the interior angles of polygons to solve problems. **Knowing** the sum of exterior angles of a polygon. **Using** the exterior angles of polygons to solve problems. **Using** Pythagoras' theorem to calculate the hypotenuse. **Using** Pythagoras' theorem to calculate a shorter side. **Using** Pythagoras' theorem to solve problems. **Using** trigonometric ratios to find lengths in right-angled triangles. **Using** trigonometric ratios to solve problems. **Finding** angles of elevation and angles of depression. **Using** trigonometric ratios to calculate angles in right-angled triangles. **Knowing** the exact values of sine, cosine and tangent of some angles.	(6) **Drawing** and interpreting real-life linear graphs. **Recognising** direct proportion. **Drawing** and using a line of best fit. **Finding** the coordinates of the midpoint of a line segment. **Finding** the gradient and length of a line segment. **Finding** the equations of lines parallel or perpendicular to a given line. **Drawing** quadratic graphs. **Solving** quadratic equations using graphs. **Identifying** the line of symmetry using quadratic graphs. **Interpreting** quadratic graphs relating to real-life situations. **Drawing** graphs of cubic functions. **Solving** cubic equations using graphs. **Drawing** graphs of reciprocal functions. **Recognising** a graph from its shape. **Interpreting** linear and non-linear real-life graphs. **Drawing** the graph of a circle. (7) **Finding** the area and perimeter of compound shapes. **Recalling** and using the formula for the area of a trapezium. **Converting** between metric units of area. **Writing** error intervals for rounded values. **Calculating** upper and lower bounds. **Calculating** the volume of a prism. **Using** the volume of a prism to find a length. **Using** the volume of a cuboid to find a length. **Converting** between metric units of volume. **Calculating** the surface area of a prism. **Calculating** the circumference of a circle. **Working** out the area of a circle using the radius and diameter. **Solving** problems by working out the area of a circle. **Working** out the diameter and radius of a circle using circumference. **Calculating** the perimeter and area of semicircles and quarter circles. **Calculating** arc lengths and angles & areas of sectors.	(8) **Drawing** plans and elevations of 3D solids. **Reflecting** a 2D shape in a mirror line. **Rotating** a 2D shape about a centre of rotation. **Describing** reflections and rotations. **Carrying** out and describing combinations of reflections. **Describing** enlargements. **Translating** a shape using a vector. **Carrying** out and describing combinations of different transformations. **Drawing** and using scales on maps and scale drawings. **Solving** problems involving bearings. **Constructing** triangles using a ruler and compasses. **Constructing** the perpendicular bisector of a line. **Constructing** the shortest distance from a point to a line using a ruler and compasses. **Bisecting** an angle using a ruler and compasses. **Constructing** angles using a ruler and compasses. **Constructing** shapes made from triangles using a ruler and compasses. **Drawing** a locus. **Drawing** a locus of points given a distance from a point. **Drawing** a locus of points given a distance from a line segment. **Drawing** a locus of points equidistant from two points. **Finding** the region that is a given distance from two points. **Finding** the region that is a given distance from a point and a line. **Using** loci to solve problems. (9) **Solving** inequalities and showing the solution on a number line. **Using** set notation. **Rearranging** and solving quadratic equations. **Finding** the roots of quadratic equations. **Solving** more complex quadratic equations. **Using** the quadratic formula to solve a quadratic equation. **Completing** the square for a quadratic expression. **Solving** a quadratic equation by completing the square. **Solving** simultaneous equations.	(11) **Finding** an amount after repeated percentage changes. **Solving** growth and decay problems. **Solving** problems using an iterative process. **Converting** between metric speed measures. **Using** a formula to calculate speed and acceleration. **Solving** problems involving compound measures. **Using** relationships involving ratio. **Using** direct and inverse proportion. (12) **Showing** that two triangles are congruent. **Knowing** the conditions of congruence. **Proving** shapes are congruent. **Solving** problems involving congruence. **Using** geometric sketching to help solve congruence problems. **Using** the ratio of corresponding sides to work out scale factors. **Finding** the missing length on similar shapes. **Using** geometric sketching to help solve similarity problems. **Using** similar triangles to work lengths in real life. **Using** the link between linear scale factors and area scale factors to solve problems. **Using** the link between scale factors for length, area and volume to solve problems. (13) **Understanding** and using upper and lower bounds in calculations, especially involving trigonometry. **Understanding** how to find the sine of any angle. **Knowing** the graph of the sine function and use it to solve equations. **Understanding** how to find the cosine of any angle. **Knowing** the graph of the cosine function and use it to solve equations. **Understanding** how to find the tangent of any angle. **Knowing** the graph of the tangent function and use it to solve equations. **Finding** the area of a triangle and the segment of a circle. **Using** the sine rule to solve 2D problems. **Using** the cosine rule to solve 2D problems. **Solving** bearing problems using trigonometry.	(14) **Using** random numbers to select a random sample. **Understanding** the assumption made when using a sample to predict results for a population. **Using** the Petersen capture-recapture method. **Drawing** and interpreting cumulative frequency tables and graphs. **Working** out the median, quartiles and interquartile range from a cumulative frequency graph. **Finding** the quartiles and interquartile range from stem and leaf diagrams. **Drawing** and interpreting box plots. **Understanding** frequency density. **Drawing** histograms. **Interpreting** histograms. **Solving problems** by comparing distributions. (15) **Solving** simultaneous equations graphically. **Representing** inequalities on graphs. **Interpreting** graphs of inequalities. **Finding** the roots of equations. **Sketching** quadratic graphs. **Finding** the roots of quadratic equations. **Solving** quadratic inequalities. **Expanding** triple brackets. **Finding** the roots of cubic equations. **Sketching** the graphs of cubic equations. **Solving** quadratic and cubic equations using an iterative process.

	Constructing and using frequency polygons and pie charts. **Plotting** and interpreting time series graphs. **Using** trends to make predictions. **Plotting** and interpreting scatter graphs. **Determining** whether there is a linear relationship between two variables. **Drawing** a line of best fit on a scatter graph. **Using** the line of best fit to determine values. **Deciding** which average is best for a set of data. **Estimating** the mean and range from a grouped frequency table. **Finding** the modal class and the class containing the median. **Constructing** and using two-way tables. **Choosing** an appropriate diagram to display data. **Recognising** misleading graphs. **Drawing** and using scatter graphs. **Identifying** correlation.		**Calculating** the volume and surface area of a cylinder and a sphere. **Solving** problems involving volumes and surface areas of spheres and cylinders. **Calculating** the volume and surface area of pyramids and a cone. **Using** a flow diagram to help solve problems.	**Solving** simultaneous equations for real-life situations. **Using** simultaneous equations to find the equation of a straight line. **Solving** linear simultaneous equations where both equations are multiplied. **Writing** equations involving two unknowns to describe real-life situations before solving them. **Solving** simultaneous equations with one quadratic equation. (10) **Using** the product rule for finding the number of outcomes for two or more events. **Using** two-way tables and sample space diagrams to solve probability problems. **Identify** mutually exclusive outcomes and events. **Finding** the probabilities of mutually exclusive outcomes and events. **Solving** probability problems. **Estimating** the expected results for experimental and theoretical probabilities. **Comparing** real results with theoretical expected values to decide if a game is fair. **Drawing** and using frequency trees. **Calculating** probabilities of independent events. **Using** probability tree diagrams to solve problems. **Deciding** if two events are independent. **Drawing** and using tree diagrams to solve conditional probability problems. **Using** two-way tables to calculate conditional probability. **Using** set notation. **Using** Venn diagrams to solve conditional probability problems.	**Using** Pythagoras' theorem in 3D. **Using** trigonometry in 3D. **Recognising** how changes in a function affect trigonometric graphs.	
Language for Life (Key terms/Vocabulary)	(1) Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd, surd, rational, irrational, standard form, simplify. (2) Expression, identity, equation, formula, substitute, term, 'like' terms, index, power, negative and fractional indices, collect, substitute, expand, bracket, factor, factorise, quadratic, linear, simplify, approximate, arithmetic, geometric, function, sequence, nth term, derive. (3) Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data, scatter graph, line of best fit, correlation, positive, negative, sample, population, stem and leaf, frequency, table, sort, pie chart, estimate.	(4) Addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, reciprocal, integer, decimal, termination, percentage, VAT, increase, decrease, multiplier, profit, loss, ratio, proportion, share, parts. (5) Quadrilateral, angle, polygon, interior, exterior, proof, tessellation, symmetry, parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, segment, length.	(6) Coordinate, axes, 3D, Pythagoras, graph, speed, distance, time, velocity, quadratic, solution, root, function, linear, circle, cubic, approximate, gradient, perpendicular, parallel, equation. (7) Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, nets, isometric, symmetry, vertices, edge, face, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, composite, sphere, cone, capacity, hemisphere, segment, frustum, bounds, accuracy, surface area.	(8) Rotation, reflection, translation, transformation, enlargement, scale factor, vector, centre, angle, direction, mirror line, centre of enlargement, describe, distance, congruence, similar, combinations, single, corresponding, constructions, compasses, protractor, bisector, bisect, line segment, perpendicular, loci, bearing (9) Quadratic, solution, root, linear, solve, simultaneous, inequality, completing the square, factorise, rearrange, surd, function, solve, circle, sets, union, intersection. (10) Probability, mutually exclusive, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, Venn diagram, fairness, experimental.	(11) Ratio, proportion, best value, unitary, proportional change, compound measure, density, mass, volume, speed, distance, time, density, mass, volume, pressure, acceleration, velocity, inverse, direct, constant of proportionality. (12) Congruence, side, angle, compass, construction, shape, volume, length, area, volume, scale factor, enlargement, similar, perimeter, frustum. (13) Axes, coordinates, sine, cosine, tan, angle, graph, transformations, side, angle, inverse, square root, 2D, 3D, diagonal, plane, cuboid.	(14) Sample, population, fraction, decimal, percentage, bias, stratified sample, random, cumulative frequency, box plot, histogram, frequency density, frequency, mean, median, mode, range, lower quartile, upper quartile, interquartile range, spread, comparison, outlier. (15) Sketch, estimate, quadratic, cubic, function, factorising, simultaneous equation, graphical, algebraic.
Extended writing Opportunities						After the end of year assessment pupils write a reflection based on the end of year assessment.
Maths Across the Curriculum	(1) **Standard form** is used to represent very small or large numbers in physics. (2) **Index notation** is used in subjects such as chemistry, physics and computer science. (3) **Pupils** learn statistical techniques that are used in many other subjects such as science, geography and psychology.	(4) **Ratios** and proportionality arise in subjects such as food technology, design and technology, science and geography. (5) **Trigonometry** is used in physics to calculate components of forces.	(6) **Graphing rates of change** is used in subjects such as physics and geography. (7) **Calculating areas, surface areas and volumes** are needed in subjects such as science, geography and design and technology. (8) **Transformations** are used in art and design and technology, particularly in graphical design.	(9) **Simultaneous equations** can be used to solve chemical equations. (10) **Venn diagrams** can be used to compare and contrast any two topics, themes or objects.	(11) **Compound measures** are used in physics. **Iterative** processes are used in computer science. (12) **Similarity** can be used in design and technology when altering designs or creating models of a design. (13) **Trigonometry** is used in physics to calculate components of forces.	(14) **Pupils** learn statistical techniques that are used in many other subjects such as science, geography and psychology. (15) **Pupils** develop graphical fluency which can be used when modelling relationships in subjects such as biology, chemistry, physics, computer science and geography. **Quadratic graphs** can also be used to model projectiles such as shooting a basketball in physical education.
Links to careers/ aspirations	(1) **Standard form** is used in many industries such as astronomy. (2) **Solving equations** is a skill used by business managers, financial analysts and computer programmers.	(4) **Percentage change** and reverse percentages is used by business owners to calculate mark up prices or calculate profit margins. (5) **Trigonometry** is widely used in engineering.	(6) **Linear and quadratic graphs** are used by air traffic controllers to understand distances between flight paths of planes. (7) **Similarity** is paramount in the career of a model maker when	(8) **Loci** can help architects and interior designers to account for any logistical discrepancies in their designs, whilst it can be used by software developers and game programmers in the development of video games.	(11) **Iteration** is used in careers involving product design, computer programming, cooking and software development. (12)	(14) **Sampling** populations is a key statistical skill used across many fields of work such as pharmaceuticals, community management and manufacturing. (15)

	(3) **Scatter graphs** will often be used in careers that involve research to identify correlation.		making models of one product such as a car or modelling a design for an entire town or village.	(9) **Quadratic equations** are used by actuaries, statisticians, economists, physicists and astronomers. (10) **Probability** is used in careers that involve forecasting for things such as weather or sales.	**Similarity** is used in many fields of design such as fashion design and interior design. (13) **Trigonometry** is used in oceanography in calculating the height of tides in oceans. The sine and cosine functions are fundamental to the theory of periodic functions, those that describe the sound and light waves.	**Quadratic equations** are used in careers involving agriculture for tasks such as optimising the size of field and pen boundaries.
Cultural Capital	(1) **Pupils** can appreciate how far the distance between planets in the solar system are by understanding numbers in standard form. (2) **Pupils** are exposed to a method of solving linear equations known as balancing. This idea can be used as a template for pupils to understand social distress with regards to issues involving equality. By understanding that with equations, like forces in physics, one action must have an equal and opposite action to maintain balance. (3) **Pupils** learn that statistics can be misleading which will better prepare them to think independently when exposed to advertising and marketing campaigns across social media clubs.	(4) **Proportionality** is used to convert between currencies which can be used when travelling or when buying items online from another country. (5) **Pupils** learn about the presence of Mathematics throughout history as Pythagoras' theorem dates back to the 6th century BC.	(6) **Understanding graphs** can aid pupils in understanding information relayed to them from retailers or price comparison sites. Allowing them to make better informed decisions. (7) **Understanding bounds** will allow pupils to better understand how their income is taxed or how costs can be minimised and profits maximised. **Error intervals** help to reinforce that perfection is not achievable and there are outcomes that can be considered good enough.	(8) **Pupils** can learn to appreciate forms of art that specifically specialise in the use of transformations. (9) **Through** learning the process of solving simultaneous equations, pupils are exposed to taking a methodical approach to solving a problem that may seem initially overwhelming. (10) **Venn diagrams** are often used in decision making where there is a need to see a visual comparison of the advantages, or disadvantages or multiple options.	(11) **Pupils** will be able to calculate the potential interest they could make over a specific number of years. They will also appreciate the difference between offers of simple and compound interest from savings accounts. (12) **Proving** that two triangles are congruent allows pupils to understand the difference between knowing a point or hypothesis themselves and providing a logical and reasoned explanation to allow others to understand too. This skill translates across all stages of life from essay writing to collaboration with colleagues in the workplace. (13) **Pythagoras and trigonometry in 3D** encourages pupils to explore and experiment with the application of their understanding. To apply skills predominantly used with two dimensional shapes in a problem involving a three-dimensional shape, challenges pupils to redefine their understanding. This skill of abstracting prior knowledge to tackle a new problem is vital to the success of entrepreneurs and start-up companies. It can also be used to increase one's ability to empathise.	(14) **Pupils** can evaluate the reliability of research reported by the media by considering the size and method of sampling. (15) **Iterative processes** can be used to promote the growth mindset. Rather than seeing a first effort as a failure, it can be seen as the first iteration in a process that continuously improves until a criterion for success is achieved.
Practical Application of Skills	(1) **Pupils** can understand the answer provided by a calculator when a number is presented in standard form. (2) **Pupils** can use their understanding of equations and formulae to better understand how they are billed for electricity, gas, water, a meal at a restaurant or an Uber journey. (3) **Pupils** can decipher whether a given statistic witnessed in advertising is misleading.	(4) **Pupils** can use their understanding of multiplicative reasoning for tasks such as exchanging between currencies and adapting recipes. (5) **Pupils** can use Pythagoras' theorem to calculate or verify the size of a television as it is always the diagonal length that is advertised.	(6) **Pupils** can use their understanding of pattern recognition and graphs to improve their ability to plan journeys. By noticing the patterns – or turning points in graphical representations - of what times areas tend to have more traffic or public transport is most busy. (7) **Pupils** can use their understanding of bounds to purchase enough product for an area when provided with approximate dimensions, without being wasteful.	(8) **Loci** teaches pupils to problem solve by satisfying an array of requirements. This methodology can be translated to everyday problem solving such as positioning of furniture in a room or garden. (9) **Pupils** can form and solve simultaneous equations to find unknown values such as the fixed price or standing charge of an energy bill. (10) **Experimental probability** will provide pupils with a better understanding of why when they roll a dice 6 times they don't always get at least one 5, despite the probability of rolling a 5 being 1 out of 6.	(11) **Pupils** will be able to calculate the potential interest they could make over a specific number of years. They will also appreciate the difference between offers of simple and compound interest from savings accounts. (12) **Pupils** can use volume similarity to inform purchases of storage containers. For example, if two containers were available for purchase whereby the larger container was bigger by a scale factor of 3, a pupil could compare the price of the larger container to the price of 3 of the smaller containers knowing that their capacity would be equal. (13) **Pupils** can calculate the area of any triangular shape, such as a garden or section of a wall, which can allow for better planning when buying products such as paint or fertiliser.	(14) **Pupils** can use their understanding of comparing distributions to compare fluctuating prices of different energy providers over a period of time. This will better inform the choice of which energy provider would be best to choose. (15) **Pupils** can use their understanding of turning points to identify time frames of when the price of stocks have been increasing or decreasing.