Maths Department - Year 9

Shirley High Curriculum Map

The Year 9 curriculum builds upon the knowledge students have acquired in Year 8. The curriculum continues to cover the fundamental topics from the six key concepts of Mathematics at Key Stage 3: Algebra, Geometry and Measures, Number, Ratio, Proportion and Rates of Change, Probability and Statistics. Students continue to participate in a range of interactive activities that promote an enjoyment of Mathematics as well as the necessary practice to ensure content retention.

	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) Indices and standard form (2) Expression and formulae	(3) Dealing with data (4) Multiplicative reasoning	(5) Constructions (6) Sequences, inequalities, equations and proportion	(7) Circles, Pythagoras and prisms	(8) Graphs (9) Probability	(10) Comparing shapes (R) Revision (EoY) End of Year Assessment
Why Now?	(1) This unit revisits and builds upon content from unit 4 in year 8 and involves some key skills used in the next unit. (2) This unit revisits and builds upon content from unit 4 in year 8. Pupils learn how to change the subject of an equation or formula which is a valuable skill that will be require in units 4, 6, 7, 8, 9 and 10.	(3) This unit revisits and builds upon content from unit 3 in year 8 in terms of data analysis skills; however, pupils now learn how to assess and evaluate data collection in terms of the types of data collected and the presence of bias. (4) Pupils revisit content taught in unit 10 in year 7 in terms of enlargement but will now learn about the relation of enlargement with multiplicative reasoning and proportionality.	(5) Pupils learn how to bisect lines and angles and construct triangles. The use of scales for maps and diagrams links to the previous unit. (6) This unit builds on the concept of proportionality students came across in unit 4. Pupils will now learn how to formulate the proportionality of two variables. Pupils also learn about inequalities and how to solve them using skills acquired during unit 2.	(7) Pupils learn how to calculate the area and circumference of a circle and volumes of prisms having learnt how to areas and volumes in year 8. Pupils learn about finding missing lengths using Pythagoras' theorem now that they have a good grasp on changing the subject of equations.	(8) This unit revisits and builds upon content from unit 9 in year 8. Pupils will now be able to link straight line graphs to proportionality. (9) This unit revisits and builds upon content from unit 6 in year 7. Pupils will also learn about Venn diagrams and how to use them to calculate probability.	(10) Pupils learn how to use trigonometry. Pupils are familiar with finding missing lengths of a triangle from unit 7 as well as being able to change the subject of equations learnt in unit 2.
Fundamental Concepts	Number Algebra	Statistics Ratio, proportion and rates of change Geometry and measures	Ratio, proportion and rates of change Geometry and measures Algebra	Geometry and measures Number	Algebra	Number Algebra Ratio, proportion and rates of change Geometry and measures Probability Statistics
Students will learn about …	(1) **Calculating** combinations of indices and brackets, including nested brackets. **Using** index laws to simplify expressions. **Calculating** combinations of powers, roots, fractions and brackets. **Estimating** answers to calculations. **Understanding** numbers written in index form and negative and zero indices. (2) **Writing** and solving equations with fractions and unknown on both sides. **Using** the priority of operations when substituting into algebraic expressions. **Substituting** values into expressions involving powers and roots. **Writing** and using formulae. **Substituting** into formulae and then solving equations to find unknown values. **Changing** the subject of a formula. **Using** the rules of indices for multiplying and dividing. **Simplifying** and factorising expression involving brackets. **Multiplying** out double brackets and collecting like terms.	(3) **Identifying** sources of primary and secondary data. **Identifying** factors that may affect data collection and how to reduce bias. **Understanding** how to choose a suitable sample size and what data to collect. **Designing** a good questionnaire and using data collection sheets and tables. **Finding** the median from a frequency table. **Estimating** the mean from a large set of grouped data. **Constructing** and using a line of best fit to estimate missing values. **Identifying** further lines of enquiry and reasons for outliers in data. **Drawing** line graphs to represent grouped data and back-to-back stem and leaf diagrams. **Writing** a report to show survey results. (4) **Enlarging** 2D shapes using positive whole number scale factor and centre of enlargement. **Finding** the centre of enlargement by drawing lines on a grid and understanding that the scale factor is the ratio of corresponding lengths. **Enlarging** 2D shapes using negative integer and fractional scale factors. **Calculating** percentage change and finding original value using inverse operations. **Solving** problems using compound measures, constant rates and related formulae. **Solving** problems involving direct and inverse proportion and best-buy.	(5) **Using** scales on maps and diagrams to solve problems. **Constructing** and drawing diagrams to scale. **Making** accurate constructions using drawing equipment. **Constructing** accurate triangles and nets of solids involving triangles. (6) **Using** the n^{th} term to generate an arithmetic sequence. **Finding** the n^{th} term of an arithmetic sequence. **Recognising** and continuing geometric and quadratic (non-linear sequence). **Representing** inequalities on a number line. **Finding** the integer values that satisfy an inequality. **Constructing** and solving equations including fractions or powers. **Writing** formulae connecting variables in direct or inverse proportion. **Using** algebra to solve problems involving direct or inverse proportion.	(7) **Calculating** and solving problems involving the circumference of a circle. **Estimating** calculations involving pi (π). **Calculating** and solving problems involving the area of a circle. **Finding** the length of an unknown side of a right-angled triangle using Pythagoras' theorem. **Solving** problems involving right-angled triangles. **Calculating** the volume and surface area of right prisms and cylinder. **Converting** between m^3, cm^3 and mm^3. **Finding** the lower and upper bounds for a measurement. **Calculating** percentage error intervals.	(8) **Understanding** and using the equation of a straight line: y = mx + c. **Drawing** a graph from its equation by working out points. **Writing** the equation of a line parallel to another line. **Comparing** graph lines using their equations. **Drawing** the graphs with equations in the form ax + by = c. **Rearranging** equations of graphs into the form y = mx + c. **Solving** simultaneous equations by drawing graphs. **Solving** problems using simultaneous equations. **Drawing** graphs with quadratic equations in the form $y = x^2$. **Interpreting** graphs of quadratic functions. **Drawing** and interpreting graphs showing inverse proportion and non-linear graphs. (9) **Identifying** and working out the probabilities of mutually exclusive outcomes and events. **Calculating** estimates of probability from experiments. **Understanding** whether a dice or spinner is unbiased. **Listing** all the possible outcomes of one or two events in a sample diagram and deciding if a game is fair. **Showing** all the possible outcomes of two events in a two-way table. **Calculating** probabilities from two-way tables. **Drawing** Venn diagrams. **Calculating** probabilities from Venn diagrams.	(10) **Using** congruent shapes to solve problems about triangles and other polygons. **Working** out whether shapes are similar, congruent or neither. **Solving** problems involving similar triangles. **Using** conventions for naming the sides of a right-angled triangle. **Working** out the tangent, sine and cosine ratio of any angle. **Using** the tangent, sine and cosine ratio to work out an unknown side of a right-angled triangle. **Using** the trigonometric ratios to work out an unknown angle in a right-angled triangle.
Language for Life (Key terms/Vocabulary)	(1) Index, indices (powers), root, BIDMAS, brackets, nested, round, adjust, overestimate, underestimate, unit, prefix, standard form, base number. (2) Variable, unknown, isolate, inverse, balance, BIDMAS, equation, expression, identity, formula, formulae, subject, rearrange, base, index, indices, factorise, highest common factor (HCF), algebraic, numeric, expand, and collect like terms.	(3) Data, primary, secondary, qualitative, quantitative, discrete, continuous, population, sample, hypothesis, bias, random sample, data collection sheet, grouped frequency table, median, mean, estimate, midpoint, class interval, correlation, positive, negative, line of best fit. (4) Centre of enlargement, object, image, scale factor, corresponding, original value 100%, increase, interest, decrease, depreciate, reduce, difference, actual change, percentage profit, unit of measurement, speed, distance, time, density, mass, volume, pressure, force, area.	(5) Scale, ratio, unit of measurement, unit ratio, unitary form, construct, pair of compasses, ruler, protractor, perpendicular, right-angle, bisect, perpendicular bisector, angle bisector, line segment, perpendicular distance, solid. (6) Position, term, common difference, coefficient, zero term, common ratio, common second difference, less than, greater than, equal to, solve, satisfy, inverse, isolate, expression, equation, formula, constant (k), gradient, relationship, gamma, proportional to.	(7) Circumference, pi, centre, radius, radii, diameter, semicircle, quarter circle, hypotenuse, Pythagoras' theorem, surd, right prism, volume, surface area, cross-section, length, unit of measurement, lower bound, upper bound, error interval.	(8) Gradient, coefficient, y-intercept, parallel, coordinates, rearrange, inverse, simultaneous equations, point of intersection, eliminate, isolate, substitute, parabola, symmetry, inverse proportion, step graph, piecewise graph. (9) Fraction, decimal, percentage, event, outcome, mutually exclusive, exhaustive, experimental, theoretical, successful outcomes, total outcomes, relative frequency, biased, fair, unbiased, sample space diagram, possibility space, two-way table, row, column, total, Venn diagram, label, set, element, intersection, union, compliment.	(10) Congruent, similar, equal angles, enlargement, scale factor, corresponding, Side, Angle, SSS, ASA, SAS, AAS, RHS, included side, included angle, opposite, adjacent, hypotenuse, SINe, COSine, TANgent, SOH CAH TOA, angle, theta, inverse.

Extended writing Opportunities	N/A	N/A	N/A	N/A	N/A	After the end of year assessment pupils write a reflection based on the assessment.
Maths Across the Curriculum	(1) **Standard form** is important in physics when working with the speed of light and distances between galaxies which can be enormous, as well as in biology when studying the size of bacteria or in chemistry when looking at atoms as they are so small to see with our naked eye. (2) **Pupils** learn the fundamental concepts of algebra that are used in subjects such as biology, chemistry, physics, computer science and geography. **Factors** is a concept that links to common morals or ideology which may arise in subjects such as religious studies, modern foreign languages, English language and literature, history and geography.	(3) **Pupils** learn statistical techniques that are used in many other subjects such as science, geography and psychology. (4) **Multiplicative reasoning** is an understanding of grouping according to an underlying pattern or structure. It contributes to an understanding of place value and makes it possible for pupils to see different kinds of relationships between numbers or shapes. **Pupils** learn about enlargement which can be used in subjects such as art and design and technology, as well as compound measures which is frequently used in physics.	(5) **Ratios** and proportionality arise in subjects such as food technology, design and technology, science and geography. (6) **Sequences** and pattern recognition is a transferrable skill that can be utilised when analysing poetry in English. It is also useful in data analysis during scientific experiments and music.	(7) **Converting** between metric units is used in subjects such as science, food technology and geography. **Calculating** areas is used in science and design and technology.	(8) **Pupils'** fundamental understanding of graphs can help them solve problems and analyse scientific studies. Graphs are also important in geography such as when collecting and representing data from field trips or for weather investigations. (9) **Experimental** probabilities are used in scientific experiments and field research in geography.	(10) **Angles** are commonly used in physics but will also be expected to use and measure them in KS3 geography.
Links to careers/ aspirations	(1) **Pupils** will acquire key skills for careers in finance and accounting. (2) **Pupils** learn the fundamental concepts of algebra that are used in careers involving astrology, architecture, computer engineering, market research analysis, finance and economy.	(3) **Pupils** learn to use fundamental statistical techniques that are widely used in a range of professions from sports commentator to community management. (4) **Pupils'** understanding of multiplicative reasoning is fundamental to preventing many life-threatening or disastrous consequences in the medical, agricultural, and chemical industries. The administration of correct doses in medicine, the accurate mix of chemicals in pesticides, and the accurate conversion between metric and imperial units of measure are a few examples.	(5) **Pupils** learn how to accurately draw angles which is a key skill in drawing plans in architecture. (6) **Pattern recognition** is an extremely valuable tool in careers involving statistical analysis, market research and economy.	(7) **Knowledge** of Pythagoras' theorem is used in many industries. In architecture, it aids in the construction of stable buildings and bridges. Astronomers used lengths of the sides of a triangle and angles to find distances between stars, while in the timber industry trees must be cut at the correct angle so that it does not fall on equipment.	(8) **Graphs** are the visual representation of data. Graphs are used for statistical analysis and to make complex mathematical concepts easier to understand. Although many professionals use graphs in their work, science and mathematical occupations use graphs extensively. (9) **Experimental** probability is prevalent in the pharmaceutical and scientific research industries.	(10) **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.
Cultural Capital	(1) **Estimating** is an important part of our everyday experience, from budgeting to making sense of problems and persevering in solving them. Without estimation skills, pupils would not be able to determine if an answer is within a reasonable and acceptable range. (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) **Multiplicative reasoning** skills are applied when converting from one currency to another and when calculating winnings on a bet. You can use multiplicative reasoning to calculate the cost of food and drinks you need for a party as well as the recipe to prepare a certain meal.	(5) **Studying construction** allows pupils to broaden their appreciation for architecture. Every building such as schools, libraries, houses, apartment complexes, and movie theatres, is the product of mathematical principles applied to design and construction. Before construction workers can build a habitable structure, an architect must design it. Architects apply their construction and drawing skills to plan their blueprints or initial sketch designs. (6) **Pattern recognition** is sometimes referred to as the most important skill in mathematics. Pupils learn that this is also true for day-to-day life whether it be noticing a pattern between eating habits and weight or sleeping habits and mood, the recognition of a pattern can often be the first step on the journey to make change.	(7) **Pupils** learn how to convert between different metric units which can help broaden their understanding of their diet. This is particularly useful for pupils to understand just how much fizzy or energy drinks they are consuming within a period of time such as a day or a week.	(8) **Understanding graphs** can aid pupils in understanding information relayed to them from retailers or price comparison sites. Allowing them to make better informed decisions. (9) **Pupils** learn about different interest rates which in turn will empower them to make more informed decisions when choosing bank accounts, finance deals or credit cards.	(10) **Pupils** will appreciate that despite having obvious similarities quadrilateral shapes are not all the same. This process of appreciating all the properties of 2D shapes can then be linked to stigma and stereotyping in society.
Practical Application of Skills	**(1)** **Pupils** can use their understanding of estimation when shopping in the grocery store and trying to stay within a budget, for example, you estimate the cost of the items you put in your cart to keep a running total in your head. (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) **Understanding** and recognising bias can empower pupils to avoid being influenced by media campaigns. (4) **Pupils** can use their understanding of multiplicative reasoning for tasks such as exchanging between currencies and adapting recipes.	(5) **Pupils** will be able to use a map if ever in a remote location where mobile phones are not of use. (6) **Pupils** can use their understanding of pattern recognition to improve their ability to plan journeys, noticing the patterns of what times areas tend to have more traffic or public transport is most busy.	(7) **Converting** between metric units of area and volume can be used to purchase the correct amount of a product such as carpets, tiles, laminate flooring or liquids.	(8) **Understanding graphs** can aid pupils in understanding information relayed to them from retailers or price comparison sites. Allowing them to make better informed decisions. (9) **Pupils** can calculate their own experimental probabilities to inform decision making.	(10) **Identifying** congruence can help when shopping in furniture stores such as Ikea, as often the same pieces of furniture are presented in a multitude of positions in different displays. Recognising the congruence may help in the purchasing of that item, particularly if the item details are missing from the item discovered in a preferable position.