Subject: **Maths** KS4 Curriculum Mapping

	Year 10 Foundation	Year 10 Higher
HT1	**Calculations** - Determine a multiplier to enable a given increase or decrease by a percentage. - Identify the reciprocal of an integer, decimal or fraction. Divide fractions by multiplying the first fraction by the reciprocal of the second. Divide decimals by converting to equivalent fractions and simplifying. - **The number system** - Use the equivalence of x0.1 and ÷10, x0.01 and ÷100 etc. to multiply and divide by powers of 10. Use a given calculation to find the answer to a related calculation - Use rounding and approximation to estimate the answer to decimal calculations.	**Calculations** -Solve problems involving repeated proportional or percentage changes, including compound interest -Represent repeated proportional change using a multiplier raised to a power. **The number system** -Understand and use the difference between rational and irrational numbers -Simplify surds, rationalise the denominator and expand brackets involving surds.
HT2	**Indices** - Use prime factors to find the HCF and LCM of larger numbers. To reason about the properties about the prime factorisations of squares and cubes. To find the prime factorisation of products and powers - Substitute into a function expressed as f(x). Form expressions from function machines, including powers and roots. Change the subject of a **multistep** formula. Distinguish between formulae, expressions, and equations **Equations, identities and formulae** Solve equations – fractional unknowns on both sides Inequalities Change subject of formula **Quadratic expressions and equations** Expand double brackets Factorise quadratic expressions – including difference of two squares Solve quadratic equations equal to zero Solve quadratic equations by factorisation **Ratio and scale** Equivalent ratios Share – given total or part Link ratios and fractions Combine ratios Algebraic Ratio and scales	**Indices** - Solve problems involving calculating with integer powers, roots and numbers in standard form -Check answers for correct order of magnitude - Use all necessary functions of a scientific calculator appropriately **Equations and formulae** - Solve linear inequalities in two variables and identify correct regions on a graph - Manipulate algebraic expressions including algebraic fractions, using expansion, factorising, rearranging and simplifying - Rearrange harder formulae including cases where the subject appears twice or a power of the subject appears. **Constructions** - Apply loci to spatial problems involving shapes and paths - Use straight edge and compasses to produce standard constructions including the midpoint and perpendicular bisector of a line segment, the perpendicular from a point to a line, and the bisector of an angle.

HT3	**Working with fractions** Fraction of an amount Increase and decrease by a fraction Equivalent and mixed numbers Add, subtract multiply and divide Solve problems with fractions **Non-calculator methods** Place value and integers and decimals Compare and order numbers Add, subtract, multiply and divide with integers and decimals Directed number Order of operations Related calculations **Straight line graphs** Plot straight line graphs Find solutions to equations Explore gradients $y = mx + c$ Find the equation from a graph Find the mid-point of a line segment Equation of a line from given coordinates Real life graphs	**Proportion** -Understand direct and inverse proportion including reciprocal graphs -Form and use equations to solve word and other problems involving direct or inverse proportion including relating algebraic solutions to graphical representations of the equations. -
HT4	**Probability** Single events List outcomes Relative frequency Sample space diagrams Two-way tables Frequency trees Independent and dependent events Probability trees **Perimeter, Area and Volume** 2D and 3D shapes Perimeter, Area – compound including shapes Circles – circumference and area Volume of prism Nets Surface area of prism	**Mensuration** - Solve a variety of problems involving Pythagoras' theorem and right angled trigonometry, including with bearings. - Know and apply 1/2abSinC to any triangle. **Graphs and sequences** - Understand and use the gradient properties of parallel and perpendicular lines. -Construct graphs of quadratic, cubic, circular and exponential functions - Solve problems involving intersection of a line with a curve (including circles).

HT5	**Interpret data** Averages and range Ungrouped and groups frequency tables Compare distributions Types of data Sampling Scatter graphs Interpolation and extrapolations **Non-linear graphs** Quadratic graphs Intercepts and roots Cubic graphs **Angles** Angles round a point, form a straight line, vertically opposite Angles in a triangle, quadrilateral. Interior and exterior angles of a polygon Parallel lines - alternate, corresponding and co-interior Prove geometric facts	**Transformations** - Calculate and represent graphically the sum of two vectors, the difference of two vectors and a scalar multiple of a vector - Calculate the resultant of two vectors - Understand and use the commutative and associative properties of vector addition - Enlarge by any scale factor and understand the effect of enlargement on area and volume - **Angles** - Solve problems involving angle facts for 2D shapes and between parallel lines - Use the Circle Theorems and know and use their proofs - INCLUDING alternate segment theorem, and problems involving tangents meeting] -
HT6	**Graphs and diagrams** Pictograms Line and bar charts Dual and composite charts Pie charts – draw and interpret Time series graphs Frequency polygons **Vectors** Understand and represent vectors Translate vectors Scalar Add and subtract vectors **Factors and powers** Factors multiples and primes Prime factorisation HCF and LCM Squares, cubes, powers and roots Negative indices **Pythagoras Theorem and Trigonometry** Finding unknown sides in a right-angled triangle Use tangent, sine and cosine to find unknown sides and angles	**Probability** - Solve complex problems involving probability, including those requiring algebraic manipulation and complex conditional probability. Interpret, connect and use multiple representations of outcomes including sample space diagrams, Venn diagrams and tree diagrams. **Statistics** - Use and interpret the median, inter-quartile range and range for discrete data presented in a frequency table, to include the drawing of box plots. - Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data; find the median, quartiles, percentiles and interquartile range.

	Year 11 Foundation	Year 11 Higher
HT1	**Calculations** - Use multipliers to solve problems involving repeated percentage change, compound interest and reverse percentages. - Convert between fractions, decimals and percentages to find the most appropriate method to use in a calculation. **The number system** - Solve problems involving numbers expressed in standard index form with and without a calculator. - Recognise that measurements given to the nearest whole unit may be inaccurate by up to half a unit in either direction.	**Calculations** - Use iterative processes - Understand and generate recursive sequences - Set up solve and interpret Growth and Decay problems **The number system** - Identify the upper and lower bounds of measures provided to a given degree of accuracy - Use upper and lower bounds to identify the range in values of a compound measure - Use the product rule for counting. - Use a formal algebraic method to convert a recurring decimal into a fraction.
HT2	**Indices** - Understand that even powers and roots are always positive but odd can be positive or negative. - Substitute values into complex expressions and formulae involving powers and roots - Simplify algebraic expressions using multiplication and division of integer powers. - Use algebraic manipulation skills to prove simple identities (using 2n and 2n+1 to represent odd and even numbers) and multiples. - **Equations and formulae** - Factorise quadratic expressions including the difference of two squares. - Solve pairs of linear simultaneous equations through elimination and substitution. - **Proportion**	**Indices** - Use fractional, negative and zero powers in simplifying numerical expressions, including using inverse operations - Solve equations involving indices and different bases and rearrange formulae where the subject is non-linear - Use algebraic manipulation skills to prove identities and form arguments (using 2n and 2n+1 to represent odd and even numbers) - Use fractional, negative and zero powers in simplifying numerical expressions, including using inverse operations - Solve equations involving Indices and different bases and rearrange formulae where the subject is non-linear. **Equations and formulae** - Rearrange quadratic equations and solve by completing the square and using the quadratic formula - Use generalisations and algebraic proofs to solve problems - Manipulate algebraic fractions and solve related equations

	- For problems involving direct and inverse proportion, write relationships and recognise graphs.	

		- Expand the product of more than two binomials - Solve equations with algebraic fractions - Solve a pair of simultaneous equations where one is quadratic or in the form $x^2 + y^2 = r^2$ - Solve quadratic inequalities - Deduce, use and interpret inverse and composite functions
HT3	**Mensuration** - Know and use formulae for volume and surface area of all prisms, pyramids, spheres and cones, including frustums. – Pythagoras' theorem - Identify the hypotenuse in a right angles triangle. Use the formula $a^2 + b^2 = c^2$, to calculate a missing side - Solve problems involving compound measures such as density or speed using proportional reasoning. - **Graphs and sequences** - Find gradient and intercept of line given in the form y = mx + c and other forms such as 3x + 2y = 12. - Find the equation of a line or the midpoint given two coordinates. - Find the equation of a line from a single coordinate and the equation of a parallel line. - Plot simple quadratic, cubic and reciprocal functions. Solve a quadratic by identifying its roots on a graph.	**Proportion** - Solve multi-stage geometric and algebraic problems using an understanding of proportionality. **Mensuration** - Solve complex problems involving volume and surface area of pyramids, cylinders, cones, frustums and spheres - Solve problems involving sectors, arc lengths and segments, including those requiring complex algebraic manipulation and trigonometry
HT4	**Transformations** - Recognise, visualise and construct enlargements using positive and fractional scale factors; identify the centre and scale factor of enlargement. - Understand and use column vectors. - Transform 2D shapes by a combination of reflection, rotation and translation including the use of vector notation. - Describe the resultant image as a **single** transformation. **Angles** - Explore the angle and side ratios of equilateral and isosceles right angles triangles. - Use an understanding of similar shapes to find missing sides and angles within right angled triangles. - Know exact values of sin cos tan 30 45 60 and 90. **Probability** - Use Venn diagrams to solve problems with probability. - Use tree diagrams to calculate probabilities of successive or combined events. Apply the AND/OR rule for combined or successive events.	**Graphs and sequences** - Find the nth term of a quadratic sequence - Recognise and use geometric sequences (including common ratio of a surd) - Locate turning points of a quadratic function by completing the square - Apply the concept of instantaneous and average rates of change by looking at gradients of tangents and chords to a curve, including circles - Interpret areas under graphs and gradients of graphs in real life contexts e.g. area under velocity-time graph is displacement - Understand and use speed and acceleration calculations. **Transformations** - Apply vector methods for simple geometric proofs - Recognise when lines are parallel using vectors - Recognise when three or more points are co-linear using vectors, vectors to show three or more points are collinear - Transform the graph of any function f(x): f(x) + a, f(x + b), af(x) and f(ax) where a and b are integers - Recognise transformations of functions and be able to express a transformed function in algebraic form - Apply transformations to the graphs of sine and cosine functions.

HT5	**Statistics** - Scatter graphs Understand and use the fact that correlation doesn't imply causation. Draw a line of best fit by eye. Use a line of best fit to interpolate or extrapolate values. - Plot a time series graph. Interpret a time series graph, including identifying seasonality and trends. **Revision of all units and completion of practice papers**	**Angles** - Use the sine and cosine rules to solve 2-D problems - - Solve multi-stage Trigonometric Problems - Use trigonometric relationships in 3-D contexts, including finding the angles between a line and a plane - Use the sine and cosine rules to solve 2-D and 3-D problems. **Statistics** - Draw and interpret histograms for grouped data - Understand frequency density - Identify seasonality and trends in time series, from tables or diagrams - Interpret graphs modelling real situations - Select a representative sample from a population using random and stratified sampling - Criticise a range of sampling methods. - **Revision of all units and completion of practice papers**
HT6	**Revision of all units and completion of practice papers**	**Revision of all units and completion of practice papers**