fortismere **Maths KS4 Curriculum Map 2022-23**

Yr 9 (KS4)	Topic Area	Knowledge and skills that are taught	Knowledge/Skills revisited	What does good look like?	Resources/support at home
Autumn 1	Algebra	Algebraic Manipulation		Algebra basics: understand notation and correct language, add/subtract/multiply/divide expressions, collect like terms, simplify, index laws, substitution	Resources used in lessons and revision materials uploaded on GC. Mathswatch Assignments
				Use instances of index laws, including use of zero, fractional and negative powers	
				Multiply a single term over a bracket	
				Factorise by taking out a common factor	
				Expand the product of two linear expressions	
				Factorise quadratic expressions of the form x2 + bx + c;	
		Solving Equations		Set up and solve linear equations: including equations with unknowns on both sides, containing brackets, containing negative coefficients, containing fractional coefficients	
				Change the subject of a simple formula, i.e. linear one-step, such as x = 4y;	
				Change the subject of a formula, including cases where the subject is on both sides of the original formula, or involving fractions and small powers of the subject;	
				Use iteration to find approximate solutions to equations, for simple equations in the first instance, then quadratic and cubic equations.	
				Use iteration (x_n+1 = 2 + 1/x_n) to find approximate solutions to an equation to a certain degree of accuracy	

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		Inequalities		Use the correct notation to show inclusive and exclusive inequalities;	
				Show inequalities on number lines;	
				Construct inequalities to represent a set shown on a number line;	
				Write down whole number values that satisfy an inequality;	
				Solve simple linear inequalities in one variable, and represent the solution set on a number line;	
				Solve two inequalities in x, find the solution sets and compare them to see which value of x satisfies both;	
		Sequences		Recognise simple sequences including at the most basic level odd, even, triangular, square and cube numbers and Fibonacci-type sequences	
				Generate sequences of numbers and describe in words a term-to-term sequence or position-to-term sequence	
				The nth term of an arithmetic sequence;	
				Continue a quadratic sequence and use the nth term to generate terms	
				Find the nth term of quadratic sequences	
				Distinguish between arithmetic and geometric sequences	
				Recognise and use simple geometric progressions	
				Continue geometric progression and find term to term rule, including negative, fraction and decimal terms;	
				Solve problems involving sequences from real life situations.	
Autumn 2	Fractions, Decimals, Percentages + Ratio	Basic FDP		Convert between fractions, decimals and percentages	
				Compare and order fractions, decimals and integers	
				Convert recurring decimals into their corresponding fractions and vice versa	

	and Surds			Apply the four operations to integers, decimals and fractions (including mixed) – all both positive and negative	
				Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate	
				Find the reciprocal of an integer, decimal or fraction.	
				I can 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	
		Fractions/Percentages of Quantities		Find a fraction or percentage of an amount	
				Express a given number as a fraction of another	
				Work out the original value before a fraction of an amount is given	
				Express one quantity as a percentage of another and calculate percentage change	
				Increase and decrease by a given percentage using calculator (multiplier) and non-calculator methods	
				Work out the original value before a given percentage change	
				Simple interest	
				Compound interest and depreciation	
		Ratio and Proportion		Ratio basics: identify a ratio from picture, equivalent ratios, simplify ratios, express in the form 1:n or n:1	
				Work with fractions in ratio problems	
				Convert between ratios and linear functions	
				Share a quantity in a ratio, given the total, one part of the ratio or the difference	
				Combine 2 two-part ratios into a single three-part ratio	

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				Use and interpret scale factors, scale diagrams and maps	
				Apply ratio to real-life problems (such as those involving conversion, comparison, scaling, mixing, recipes, concentrations, best buys)	
				Solve worded problems involving direct and inverse proportion	
		Surds		Understand what a surd is	
				Simplify surds	
				Calculations with surds: add/subract/multiply/divide - including multiplying out brackets	
				Rationalise the denominator	
Spring 1	Pythagoras and linear graphs	Pythagoras		Use Pythagoras' Theorem in 2D - find the missing side of a right-angled triangle	
				Given three sides of a triangle, I can justify if it is right-angled or not.	
				I can give an answer to the use of Pythagoras' Theorem in surd form.	
		Linear graphs		Identify and plot points in all four quadrants;	
				Plot and draw graphs of y = a, x = a, y = x and y = –x, and recognise lines parallel to axes	
				Gradient of a line	
				Use the form y = mx + c for the equation of a straight line, understanding m is gradient and c is y-intercept	
				Find the equation of a straight line from a graph in the form y = mx + c (given a diagram, given one point and gradient, or given 2 points)	
				Plot and draw graphs of straight lines of the form y = mx + c with and without a table of values;	
				Parallel lines - understand parallel lines have the same gradient, find the equation of a parallel line	

				Perpendicular lines - understand the product of gradients of perpendicular lines is -1, find the equation of a perpendicular line	
				Use the form ax + by = c for the equation of a straight line	
				Find the coordinates of the midpoint of a line segment with a diagram given and coordinates;	
				Calculate the length of a line segment given the coordinates of the end points (using Pythagoras)	
Spring 2	Angles and constructions	Angles in polygons		Basic angle facts: acute, obtuse, right angle, opposite angles, angles on a straight line, angles around a point	
				Classify types of triangles and types of quadrilaterals (e.g. isosceles, scalene, kite, rhombus)	
				Find missing angles in different types of triangle	
				Find missing angles in different types of quadrilateral	
				Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding, alternate, co-interior angles, giving reasons;	
				Use the sum of the exterior angles of any polygon is 360°;	
				Use the sum of the interior angles of an n-sided polygon;	
				Use the sum of the interior angle and the exterior angle is 180°;	
				Calculate the angles of regular and irregular polygons and use these to solve problems;	
				Use angle facts to demonstrate how shapes would ‘fit together’, and understand tesellation of regular polygons	
		Constructions and loci		Understand and draw front and side elevations and plans of shapes made from simple solids;	
				Given the front and side elevations and the plan of a solid, draw a	

				sketch of the 3D solid; Use and interpret maps and scale drawings, using a variety of scales and units; Read and construct scale drawings, drawing lines and shapes to scale; Understand, draw and measure bearings; Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings Use the standard ruler and compass constructions: bisect a given angle; construct a perpendicular to a given line from/at a given point; construct angles of 90°, 45°; perpendicular bisector of a line segment; Construct: a region bounded by a circle and an intersecting line; a given distance from a point and a given distance from a line; equal distances from two points or two line segments; regions which may be defined by 'nearer to' or 'greater than'; Find and describe regions satisfying a combination of loci, including in 3D; Use constructions to solve loci problems including with bearings; Know that the perpendicular distance from a point to a line is the shortest distance to the line.	
Summer 1	Data Handling	Classifying Data		Sort, classify and tabulate data and discrete or continuous quantitative data; Specify the problem and plan: decide what data to collect and what analysis is needed	

				Understand what is meant by a sample and a population;	
				Understand how different sample sizes may affect the reliability of conclusions drawn;	
				Identify possible sources of bias and plan to minimise it;	
		Charts		Produce and interpret bar charts	
				Produce and interpret pictograms	
				Produce and interpret stem and leaf diagrams	
				Produce and interpret pie charts:	
				find the mode and the frequency represented by each sector of a pie chart	
				compare data from different charts	
		Presenting Data		Calculate mean and range, find median and mode from small data set;	
				Calculate the mean, mode, median and range from a frequency table (discrete data);	
				Compare the mean and range of two distributions, or median or mode as appropriate;	
				Recognise the advantages and disadvantages between measures of average;	
				Construct and interpret grouped frequency tables for continuous data:	
				- for grouped data, find the interval which contains the median and the modal class;	
				- estimate the mean with grouped data; understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values.- -	
				Produce and interpret frequency polygons for grouped data:	

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				Design and use two-way tables for discrete and grouped data;	
				Use information provided to complete a two-way table;	
				Construct and interpret time–series graphs, comment on trends;	
				Draw and interpret scatter graphs	
				Draw lines of best fit by eye, understanding what these represent	
				Identify outliers and ignore them on scatter graphs; explain an isolated point on a scatter graph;	
				Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.	
				Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem;	
		Cumulative Frequency and Box Plots		Construct and interpret cumulative frequency tables;	
				Construct and interpret cumulative frequency graphs. From the graph	
				- estimate frequency greater/less than a given value;	
				- find the median and quartile values and interquartile range; Compare the mean and range of two distributions, or median and interquartile range, as appropriate; Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions;	
				Produce box plots from raw data and when given quartiles, median and identify any outliers;	
		Histograms		Know the appropriate uses of histograms;	
				Construct and interpret histograms from class intervals with unequal width;	

				From histograms: - complete a grouped frequency table; - understand and define frequency density; Estimate the mean from a histogram; Estimate the median from a histogram with unequal class widths or any other information from a histogram, such as the number of people in a given interval.	
Summer 2	Similarity and graphs	Proof of congruence and similarity		Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and pair of compasses constructions; Solve angle problems by first proving congruence; Understand similarity of triangles and of other plane shapes, and use this to make geometric inferences; Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor; Use formal geometric proof for the similarity of two given triangles;	
		Length area and volume enlargement		Understand the effect of enlargement on angles, perimeter, area and volume of shapes and solids; Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of two corresponding sides, using integer or fraction scale factors; Write the lengths, areas and volumes of two shapes as ratios in their simplest form; Find missing lengths, areas and volumes in similar 3D solids;	

				Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids;	
				Use the relationship between enlargement and areas and volumes of simple shapes and solids;	
		Non-linear graphs		Recognise a linear, quadratic, cubic, reciprocal, exponential and circle graph from its shape;	
				Generate points and plot graphs of quadratic functions, using table of values	
				Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function	
				Interpret graphs of quadratic functions from real-life problems	
				Draw graphs of simple cubic functions using tables of values	
				Interpret graphs of simple cubic functions, including finding solutions to cubic equations	
				Draw graphs of the reciprocal function using tables of values;	
				Draw graphs of exponential functions using table of values	
				Identify and interpret roots, intercepts, turning points of quadratic functions graphically	
		Applications of graphs		Interpret and analyse information presented in a range of linear graphs:	
				use gradients to interpret how one variable changes in relation to another;	
				Find approximate solutions to a linear equation from a graph;	
				Identify direct proportion from a graph;	
				Draw and interpret straight-line graphs for real-life situations, including conversion graphs, fuel bills, fixed charge and cost per item;	

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				Draw distance–time and velocity–time graphs;	
				I can calculate or estimate gradients of graphs and areas under graphs (including quadratic and non-linear graphs).	
				Understand gradient of a speed-time graph gives acceleration and area under a speed-time graph gives area	
				I can interpret results in cases such as distance–time graphs and velocity–time graphs.	

Yr 10 (KS4)	Topic Area	Knowledge and skills that are taught	Knowledge/Skills revisited	What does good look like?	Resources/support at home
Autumn 1	Trigonometry and Shape	Area and perimeter		Perimeter of regular 2D shapes and compound shapes	
				Area of a trapezium and a parallelogram	
				Surface area of a prism	
				Circumference of a circle	
				Area of a circle	
				Use the π button on a calculator; and keep answers in terms of π	
				Surface area of a cylinder	
				Calculate perimeters and areas of composite shapes made from circles and parts of circles (including semicircles, quarter-circles, combinations of these and also incorporating other polygons);	
				Calculate arc lengths, angles and areas of sectors of circles;	
				Pythagoras' Theorem in 2D: find missing sides in a right-angled triangles	

Pythagoras

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				Given three sides of a triangle, justify if it is right-angled or not.	
				I can give an answer to the use of Pythagoras' Theorem in surd form.	
		Trigonometry		Use the trigonometric ratios sine, cosine and tan to find angles and lengths in right angle triangles	
				Use the trigonometric ratios to solve 2D problems	
				Find angles of elevation and depression in problem-solving questions	
				Apply trigonometry and pythagoras in 3D shapes	
				Know and apply Area = ab sin C to calculate the area, sides or angles of any triangle.	
				Know the sine and cosine rules, and use to solve 2D problems (including involving bearings).	
				Use the sine and cosine rules to solve 3D problems.	
		Bearings		Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings	
				Apply trigonometry in the context of bearings	
Autumn 2	Algebra 2	Quadratic equations		Define a 'quadratic' expression	
				Factorise quadratic expressions of the form x2 + bx + c;	
				Factorise a quadratic expression x2 – a2 using the difference of two squares;	
				Solve quadratic equations by factorising	
				I can generate points and plot graphs of simple quadratic functions, then more general quadratic functions	

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				I can find approximate solutions to quadratic equations using a graph	
				I can interpret graphs of quadratic functions from real-life problems	
				I can identify the line of symmetry of a quadratic graph and interpret roots, intercepts and turning points of quadratic graphs.	
				I can factorise quadratic expressions in the form ax2 + bx + c	
				I can solve quadratic equations by factorisation and completing the square	
				I can solve quadratic equations that need rearranging	
				I can set up and solve quadratic equations (problem-solving)	
				I can solve quadratic equations by using the quadratic formula	
		Simultaneous equations and inequalities		I can use elimination or substitution to solve simultaneous equations (where both equations are linear)	
				I can set up and solve a pair of linear simultaneous equations in two variables, including to represent a situation and interpret the solution in the context of the problem	
				Solve simultaneous equations by using a graph (understanding solution is the point of intersetion of 2 lines)	
				Solve simultaneous equations in two unknowns: linear / quadratic; linear / x2 + y2 = r2;	
				I can show inequalities on number lines	
				I can write down whole number values that satisfy an inequality	
				I can solve simple linear inequalities in one variable, and represent the solution set on a number line	
				I can solve two linear inequalities in x, find the solution sets and compare them to see which value of x satisfies both solve linear inequalities in two variables algebraically;	

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				I can use the correct notation to show inclusive and exclusive inequalities.	
		Algebraic fractions and surds		I can simplify algebraic fractions	
				I can multiply and divide algebraic fractions	
				I can solve quadratic equations arising from algebraic fraction equations;	
				I can rationalise the denominator involving surds	
Spring 1	Probability and proportion			Write probabilities using fractions, percentages or decimals;	
				Understand and use experimental and theoretical measures of probability, including relative frequency to include outcomes using dice, spinners, coins, etc;	
				Estimate the number of times an event will occur, given the probability and the number of trials;	
				Find the probability of successive events, such as several throws of a single dice;	
				List all outcomes for single events, and combined events, systematically;	
				Draw sample space diagrams and use them for adding simple probabilities;	
				Know that the sum of the probabilities of all outcomes is 1;	
				Use 1 – p as the probability of an event not occurring where p is the probability of the event occurring;	
		Basic understanding of probability		Compare experimental data and theoretical probabilities;	
				Compare relative frequencies from samples of different sizes.	
		Direct and inverse proportion		Express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when A:B are in the ratio 3:5, A is 3/5 B. When 4a = 7b, then a = 7b/4 or a:b is 7:4;	

				Solve proportion problems using the unitary method; Work out which product offers best value and consider rates of pay; Work out the multiplier for repeated proportional change as a single decimal number; Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation; Understand and use compound measures and: convert between metric speed measures; convert between density measures; convert between pressure measures; Calculate an unknown quantity from quantities that vary in direct or inverse proportion; Recognise when values are in direct proportion by reference to the graph form, and use a graph to find the value of k in y = kx; Set up and use equations to solve word and other problems involving direct proportion Relate algebraic solutions to graphical representation of the equations; Recognise when values are in inverse proportion by reference to the graph form; Set up and use equations to solve word and other problems involving inverse proportion, and relate algebraic solutions to graphical representation of the equations. Use kinematics formulae from the formulae sheet to calculate speed, acceleration, etc (with variables defined in the question); I can solve problems involving direct proportion, including graphical and algebraic representations; Use y = kx to solve direct proportion	

				problems, including questions where students find k, and then use k to find another value;	
				I understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y; interpret equations and solve problems that describe inverse proportion	
				I can interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion	
Spring 2	Transformations and 3D Shapes	Surface Area and Volume		Convert between metric measures of volume and capacity, e.g. 1 ml = 1 cm3;	
				Convert between metric measures of length, mass and volume;	
				Draw sketches of 3D solids using plan, side and front projections	
				Find the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures;	
				Find the volume and surface area of a cylinder;	
				Recall and use the formula for volume of pyramid;	
				Find the surface area of a pyramid;	
				Use the formulae for volume and surface area of spheres and cones;	
				Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders;	
				Use volume to solve problems;	
				Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones;	

		Transformations		Recognise and describe rotations – know that that they are specified by a centre and an angle;	
				Rotate 2D shapes using the origin or any other point (not necessarily on a coordinate grid);	
				Identify the equation of a line of symmetry;	
				Recognise and describe reflections on a coordinate grid – know to include the mirror line as a simple algebraic equation, $x = a$, $y = a$, $y = x$, $y = -x$ and lines not parallel to the axes;	
				Reflect 2D shapes using specified mirror lines including lines parallel to the axes and also $y = x$ and $y = -x$;	
				Recognise and describe single translations using column vectors on a coordinate grid;	
				Translate a given shape by a vector;	
				Understand the effect of one translation followed by another, in terms of column vectors (to introduce vectors in a concrete way);	
				Enlarge a shape on a grid without a centre specified;	
				Describe and transform 2D shapes using enlargements by a positive integer,	
				Know that an enlargement on a grid is specified by a centre and a scale factor;	
				Identify the scale factor of an enlargement of a shape;	
				Enlarge a given shape using a given centre as the centre of enlargement by counting distances from centre, and find the centre of enlargement by drawing;	
				Describe and transform 2D shapes using enlargements by a positive integer, positive fractional, and negative scale factor;	
				Find areas after enlargement and compare with before enlargement, to	

				deduce multiplicative relationship (area scale factor); given the areas of two shapes, one an enlargement of the other, find the scale factor of the enlargement (whole number values only);	
				Distinguish properties that are preserved under particular transformations;	
				Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations;	
				Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements;	
				Describe the changes and invariance achieved by combinations of rotations, reflections and translations.	
Summer 1	Bounds, angles and geometry 2	Upper and Lower Bounds		Calculate the upper and lowers bounds of numbers given to varying degrees of accuracy;	
				Use inequality notation to specify an error interval due to truncation or rounding.	
				Calculate the upper and lower bounds of an expression involving the four operations;	
				Find the upper and lower bounds in real-life situations using measurements given to appropriate degrees of accuracy;	
				Find the upper and lower bounds of calculations involving perimeters, areas and volumes of 2D and 3D shapes;	
				Calculate the upper and lower bounds of calculations, particularly when working with measurements;	
		Basic angle facts and angles in polygons		FOUNDATION - repeat Unit 5 - Angles and Construction - last seen in Year 9	
				Also can use this half term to revisit any other topics needed (in preparation for upcoming Y10 mocks)	

		Circle Theorems (Higher only)		Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment;	
				Prove and use the facts that:	
				the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference;	
				the angle in a semicircle is a right angle;	
				the perpendicular from the centre of a circle to a chord bisects the chord;	
				angles in the same segment are equal;	
				alternate segment theorem;	
				opposite angles of a cyclic quadrilateral sum to 180°;	
				Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;	
				Find and give reasons for missing angles on diagrams using:	
				circle theorems;	
				isosceles triangles (radius properties) in circles;	
				the fact that the angle between a tangent and radius is 90°;	
				the fact that tangents from an external point are equal in length.	
		Coordinate geometry with circles (Higher Only)		Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines;	
				Find the equation of a tangent to a circle at a given point, by:	
				finding the gradient of the radius that meets the circle at that point (circles can have centre origin or other given point)	

				finding the gradient of the tangent perpendicular to it;	
				Equation of a circle with centre the origin	
				Recognise and construct the graph of a circle using x2 + y2 = r2 for radius r centred at the origin of coordinates.	
Summer 2		Vectors		Understand and use vector notation, including column notation, and understand and interpret vectors as displacement in the plane with an associated direction.	
				Understand that 2a is parallel to a and twice its length, and that a is parallel to –a in the opposite direction.	
				Represent vectors, combinations of vectors and scalar multiples in the plane pictorially.	
				Calculate the sum of two vectors, the difference of two vectors and a scalar multiple of a vector using column vectors (including algebraic terms).	
				Find the length of a vector using Pythagoras' Theorem.	
				Calculate the resultant of two vectors.	
				Solve geometric problems in 2D where vectors are divided in a given ratio.	
				Produce geometrical proofs to prove points are collinear and vectors/lines are parallel.	

Yr 11 (KS4)	Topic Area	Knowledge and skills that are taught	Knowledge/Skills revisited	What does good look like?	Resources/support at home
Autumn 1	Algebra 3	Quadratic equations		I can define a 'quadratic' expression and multiply together two algebraic expressions with brackets	

				I can square a linear expression (x + 1)2	
				I can factorise quadratic expressions of the form x2 + bx + c;	
				I can factorise a quadratic expression x2 – a2 using the difference of two squares;	
				I can solve quadratic equations by factorising	
				I can generate points and plot graphs of simple quadratic functions, then more general quadratic functions	
				I can find approximate solutions to quadratic equations using a graph	
				I can interpret graphs of quadratic functions from real-life problems	
				I can identify the line of symmetry of a quadratic graph and interpret roots, intercepts and turning points of quadratic graphs.	
				I can factorise quadratic expressions in the form ax2 + bx + c	
				I can solve quadratic equations by factorisation and completing the square	
				I can solve quadratic equations that need rearranging	
				I can set up and solve quadratic equations (problem-solving)	
				I can solve quadratic equations by using the quadratic formula	
		Solving equations, inequalities , simultaneously		I can use elimination or substitution to solve simultaneous equations (where both equations are linear)	
				Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns: linear / linear, including where both need multiplying; linear / quadratic; linear / x2 + y2 = r2;	
				I can set up and solve a pair of linear simultaneous equations in two variables, including to represent a situation and interpret the solution in the context of the problem	
				I can show inequalities on number lines	

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				I can write down whole number values that satisfy an inequality	
				I can solve simple linear inequalities in one variable, and represent the solution set on a number line	
				I can solve two linear inequalities in x, find the solution sets and compare them to see which value of x satisfies both solve linear inequalities in two variables algebraically;	
				I can use the correct notation to show inclusive and exclusive inequalities.	
		Surds and algebraic fractions		I can rationalise the denominator involving surds	
				I can simplify algebraic fractions	
				I can multiply and divide algebraic fractions	
				I can solve quadratic equations arising from algebraic fraction equations;	
				I can change the subject of a formula, including cases where the subject occurs on both sides of the formula, or where a power of the subject appears;	
				I can change the subject of a formula where all variables are in the denominators;	
		Proofs and functions (Higher Only)		I can solve 'Show that' and proof questions using consecutive integers (n, n + 1), squares a2, b2, even numbers 2n, odd numbers 2n +1;	
				I can use function notation	
				I know that f –1(x) refers to the inverse function and find the inverse of a linear function	
				For two functions f(x) and g(x), I can find gf(x). (composite functions)	
Autumn 2	Trigonometry and graphs	Coordinate geometry		I can identify and plot points in all four quadrants	
				I can find the coordinates of the midpoint of a line segment with a diagram given and/or coordinates	
				I can calculate the length of a line segment given the coordinates of the end points	
				Find the equation of the line through one point with a given gradient;	

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				Find the equation of the line through two given points.	
				Plot and draw graphs of y = a, x = a, y = x and y = –x, drawing and recognising lines parallel to axes, plus y = x and y = –x;	
				Identify and interpret the gradient of a line segment;	
				Identify and interpret the gradient and y-intercept of a linear graph given by equations of the form y = mx + c;	
				Find the equation of a straight line from a graph in the form y = mx + c;	
				Plot and draw graphs of straight lines of the form y = mx + c with and without a table of values;	
				Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line;	
				Find the equation of a straight line from a graph in the form ax + by = c; Plot and draw graphs of straight lines in the form ax + by = c;	
		Applications of graphs		Interpret and analyse information presented in a range of linear graphs:	
				use gradients to interpret how one variable changes in relation to another;	
				find approximate solutions to a linear equation from a graph;	
				identify direct proportion from a graph;	
				find the equation of a line of best fit (scatter graphs) to model the relationship between quantities and comment on its practical implications	
				Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape;	
				Generate points and plot graphs of simple quadratic functions, then more general quadratic functions;	
				Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function;	
				Interpret graphs of quadratic functions from real-life problems;	
				Draw graphs of simple cubic functions using tables of values;	

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				Interpret graphs of simple cubic functions, including finding solutions to cubic equations;	
				Draw graphs of the reciprocal function with x ≠ 0 using tables of values;	
				Draw circles, centre the origin, equation x2 + y2 = r2.	
				I can draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item;	
				I can draw distance–time and velocity–time graphs;	
				Use graphs to calculate various measures (of individual sections), including: unit price (gradient), average speed, distance, time, acceleration; including using enclosed areas by counting squares or using areas of trapezia, rectangles and triangles;	
		PYthagoras' Theorem and Trigonometric Ratios		I understand, recall and use Pythagoras' Theorem in 2D: · Calculate the length of the hypotenuse in a right-angled triangle (including decimal lengths and a range of units); · Find the length of a shorter side in a right-angled triangle	
				Given three sides of a triangle, I can justify if it is right-angled or not.	
				I can give an answer to the use of Pythagoras' Theorem in surd form.	
				I understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures;	
				I can use the trigonometric ratios to solve 2D problems	
				I can find angles of elevation and depression in problem-solving questions	
				I Understand, draw and measure bearings; calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings	
				Solve geometrical problems on coordinate axes (i.e. Find the angle between a line and a plane.)	

				Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations.	
				Understand the language of planes, and recognise the diagonals of a cuboid.; Calculate the length of a diagonal of a cuboid.	
				I can apply trigonometry and pythagoras in 3D shapes	
		Advanced trigonometry (Higher Only)		Know and apply Area = ab sin C to calculate the area, sides or angles of any triangle.	
				Know the sine and cosine rules, and use to solve 2D problems (including involving bearings).	
				Use the sine and cosine rules to solve 3D problems.	
				Recognise, sketch and interpret graphs of the trigonometric functions (in degrees)	
				y = sin x, y = cos x and y = tan x for angles of any size.	
				Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45° , 60° and 90° and exact value of tan θ for θ = 0°, 30°, 45° and 60° and find them from graphs.	
		Vectors (Higher Only)		Understand and use vector notation, including column notation, and understand and interpret vectors as displacement in the plane with an associated direction.	
				Understand that 2a is parallel to a and twice its length, and that a is parallel to –a in the opposite direction.	
				Represent vectors, combinations of vectors and scalar multiples in the plane pictorially.	
				Calculate the sum of two vectors, the difference of two vectors and a scalar multiple of a vector using column vectors (including algebraic terms).	
				Find the length of a vector using Pythagoras' Theorem.	
				Calculate the resultant of two vectors.	
				Solve geometric problems in 2D where vectors are divided in a given	

				ratio.	
				Produce geometrical proofs to prove points are collinear and vectors/lines are parallel.	
		Graph transformations (Higher Only)		Recognise, sketch and interpret graphs of the reciprocal function (with $x \neq 0$) and state the value of x for which the equation is not defined;	
				Recognise, sketch and interpret graphs of exponential functions $y = kx$ for positive values of k and integer values of x;	
				Set up, solve and interpret the answers in growth and decay problems;	
				Interpret and analyse transformations of graphs of functions and write the functions algebraically, e.g. write the equation of $f(x) + a$, or $f(x – a)$:	
				apply to the graph of $y = f(x)$ the transformations $y = –f(x)$, $y = f(–x)$ for linear, quadratic, cubic functions;	
				apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(x + a)$ for linear, quadratic, cubic functions;	
				Apply to the graph of $y = f(x)$ the transformations $y = –f(x)$, $y = f(–x)$ for sine, cosine and tan functions f(x).	
				Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(x + a)$ for sine, cosine and tan functions f(x).	
		Rates of change (Higher Only)		Estimate area under a quadratic or other graph by dividing it into trapezia;	
				Interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient;	
				Interpret the gradient of non-linear graph in curved distance–time and velocity–time graphs:	
				for a non-linear distance–time graph, estimate the speed at one point in time, from the tangent, and the average speed over several seconds by finding the gradient of the chord;	
				for a non-linear velocity–time graph, estimate the acceleration at one point in time, from the tangent, and the average acceleration over several seconds by finding the gradient of the chord;	
				Interpret the gradient of a linear or non-linear graph in financial contexts;	

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				Interpret the area under a linear or non-linear graph in real-life contexts; Interpret the rate of change of graphs of containers filling and emptying; Interpret the rate of change of unit price in price graphs.	
Spring 1		Coordinate geometry with circles		Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines; Find the equation of a tangent to a circle at a given point, by: - finding the gradient of the radius that meets the circle at that point (circles all centre the origin); - finding the gradient of the tangent perpendicular to it; - using the given point; Recognise and construct the graph of a circle using x2 + y2 = r2 for radius r centred at the origin of coordinates.	
		Functions		Recognise, sketch and interpret graphs of the reciprocal function with x ≠ 0 State the value of x for which the equation is not defined; Recognise, sketch and interpret graphs of exponential functions y = kx for positive values of k and integer values of x; Use calculators to explore exponential growth and decay; Set up, solve and interpret the answers in growth and decay problems; Interpret and analyse transformations of graphs of functions and write the functions algebraically, e.g. write the equation of f(x) + a, or f(x – a): apply to the graph of y = f(x) the transformations y = –f(x), y = f(–x) for linear, quadratic, cubic functions; apply to the graph of y = f(x) the transformations y = f(x) + a, y = f(x + a) for linear, quadratic, cubic functions;	
		Rates of change		Estimate area under a quadratic or other graph by dividing it into trapezia;	

				Interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient;	
				Interpret the gradient of non-linear graph in curved distance–time and velocity–time graphs:	
				- for a non-linear distance–time graph, estimate the speed at one point in time, from the tangent, and the average speed over several seconds by finding the gradient of the chord;	
				- for a non-linear velocity–time graph, estimate the acceleration at one point in time, from the tangent, and the average acceleration over several seconds by finding the gradient of the chord;	
				Interpret the gradient of a linear or non-linear graph in financial contexts;	
				Interpret the area under a linear or non-linear graph in real-life contexts;	
				Interpret the rate of change of graphs of containers filling and emptying;	
				Interpret the rate of change of unit price in price graphs.	
		Direct and inverse proportion		Recognise and interpret graphs showing direct and inverse proportion;	
				Identify direct proportion from a table of values, by comparing ratios of values, for x squared and x cubed relationships;	
				Write statements of proportionality for quantities proportional to the square, cube or other power of another quantity;	
				Set up and use equations to solve word and other problems involving direct proportion;	
				Use y = kx to solve direct proportion problems, including questions where students find k, and then use k to find another value;	
				Solve problems involving inverse proportion using graphs by plotting and reading values from graphs;	

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				Solve problems involving inverse proportionality; Set up and use equations to solve word and other problems involving direct proportion or inverse proportion. Recognise and interpret graphs showing direct and inverse proportion; Identify direct proportion from a table of values, by comparing ratios of values, for x squared and x cubed relationships; Write statements of proportionality for quantities proportional to the square, cube or other power of another quantity; Set up and use equations to solve word and other problems involving direct proportion; Use y = kx to solve direct proportion problems, including questions where students find k, and then use k to find another value; Solve problems involving inverse proportion using graphs by plotting and reading values from graphs; Solve problems involving inverse proportionality; Set up and use equations to solve word and other problems involving direct proportion or inverse proportion.	
Spring 2		Bespoke Scheme of Work			
Summer 1		Bespoke Scheme of Work			
Summer 2					