

Year 10

Term	1	2	3	4	5	6
Topic Title	Equations and Inequalities (Chp 10) Sequences (Chp 21)	Measures and Accuracy (Chp 9) Calculations (Chp 17)	Probability (Chp 8) Probability of Combined Events (Chp 20)	Graphs 1 (Chp 14) Graphs 2 (Chp 18)	Units and Proportionality (Chp 22)	Working in 3D (Chp 15) Pythagoras and Trigonometry (Chp 19)
Rationale	Key numerical and algebraic skills are retained and reinforced through starters and retrieval practice. Routines are re-established with further emphasis towards identifying the mixture of concepts required within problem solving exam style questions. Equations/inequalities and sequences builds on from term 2 in year 9, prior knowledge is checked and students are moved on appropriately to develop these skills. Covering these topics now provide a strong foundation for future topics and other subject areas.	Further development of measure is embedded and incorporates the understanding of accuracy, bounds and estimation, building on from earlier years again in a spiral model. This will provide the strong base for deeper understanding and its application in problem solving situations.	Conditional probability is introduced following on from understanding mutually exclusive events and equally likely outcomes in ks3. Building on from term 6 in year 8 and various skills previously taught across the year, will give pupils the tools needed to question/critique various decisions in later life.	Developing graphs further from term 2 in year 8, however now the pupils can be encouraged to link this knowledge to the algebraic work covered in the first term. Interpreting these graphs links to many of the topics previously covered such as finding a gradient using Pythagoras.	Applying knowledge from term 5 in year 9, developing units and proportionality will allow the pupils to extended their skills to critically interpret and analyse information represented through graphs and tables. The ability to transfer mathematical skills between contexts is a vital part of learning in this subject. For example, familiarity with the concept of a rate enables students to solve a wide range of practical problems, such as fuel consumption, travel times, interest payments, taxation, and population growth. This topic requires various skills taught throughout the year.	Following on from the knowlege gained in term 3 and 6 in year 9, Pythagoras and trigonometry develops further work on triangles, leading into 3D work. This gives the pupils a further opportunity to build understanding and real-life applications of trigonometric based problems.
Prior knowledge	(1) Writing formulae and simple substitution, multiplying fractions, adding and subtracting negative numbers, expand a single bracket, collecting like terms, simplifying expressions involving multiplication, multiplying/dividing positive and negative numbers/factorise quadratics expressions, factorise simple expressions and forming equations. (2) Linear sequences, substitution, expand a single bracket, collect like terms, adding/subtracting positive and negative numbers, multiplying/dividing positive and negative numbers and solve quadratic equations.	(1) Use a calculator to work complex calculations, apply the order of operations, use and apply the various sequences such as square and cube numbers. Use compound measures. (2) Know square and cube numbers, multiply positive & negative numbers, associative law, order of operations, indices laws, addition/subtraction/division/multiplication of fractions, expanding brackets and simplifying expressions.	(1)Probability of a single event, calculating simple fractions, probability of an event nor happening, multiply/divide fractions, prime/factors and multiples of a number, add/subtract with decimals and solve one/two step equations. (2)Counting sets in Venn diagrams, solve one step equations, probability of a single event, simplify fractions, shade sets in Venn diagram and mutually exclusive events.	(1) Writing formulae and simple substitution, equation of a straight line, gradient of a line, know parallel lines have the same gradient, gradients of two perpendicular lines multiply together to give -1, know the graph of a quadratic function is a curve with a vertical line of symmetry, and a curve produced by a quadratic function is called a parabola. (2) Recognise linear and quadratic functions, complex calculations using a calculator, straight line graphs, manipulating powers, simultaneous equations using graphs, converting time, straight line graphs, money and four operations.	Metric units of measure, convert length, time, mass and area units, compare quantities using ratios, multiplication -short/long, round decimal numbers, square and cube roots, solve equations using inverse operations, function notation, gradient of a line and interpreting/drawing real life graphs.	(1) Addition, 2D shapes, multiplication facts, solve one step equations, area of 2D shapes such as parallelograms, trapeziums etc. Area of compound shapes and surface area of prisms. (2) Square and cube roots, round to significant figures, round decimal numbers, find the perimeter, change the subject of a formula, adding/subtracting and multiplying positive and negative numbers, collecting like terms and Adding/subtracting fractions.
Key knowledge/skills development	(1)Solving equations, quadratic, simultaneous and inequalities. (2)rules, linear and quadratic, special sequences	(1)Estimations and approximations, measures and accuracy. (2)Calculating with roots and indices, exact calculations (surds) standard form.	(1)Experimental and theoretical probability, experiments, mutually exclusive events. (2)The probability of combined events Sets, probability spaces, tree diagrams.	(1)Straight line graphs, distance time graphs. (2)Quadratic graphs, real life graphs, transformation of graphs.	Compound units, direct and inverse proportion, growth and decay.	(1)Volume and surface area, prisms, cones, pyramid. (2)3D Pythagoras, non-right angled triangles, vector geometry.
National Curriculum/specification links	(1) Solve linear equations including when the unknown appears on both sides. Solve quadratic equations using factorisation, completing the square and the quadratic formula. Solve a pair of linear or linear plus quadratic simultaneous equations. Use iterative processes to find approximate solutions to equations. Solve inequalities and display your solution on a number line or a graph. (2) Generate a sequence using a term-to-term or position-to-term rule. Recognise a linear sequence and find a formula for its nth term. Recognise a quadratic sequence and find a formula for its nth term. Recognise and use special sequences. AO1 -accurately carry out routine procedures or set tasks requiring multi-step solutions -Use and interpret notation correctly. AO2 -construct chains of reasoning to achieve a given result + interpret and communicate information accurately. AO3 - translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes.	(1) Use approximate values obtained by rounding to estimate calculations. Use an estimate to check an answer obtained using a calculator. Use, and convert between, standard units of length, mass, capacity and other measures including compound measures. Solve problems involving compound measure such as speed and density. Find upper and lower bounds on the value of a quantity that has been rounded. Find upper and lower bounds on expressions that involve quantities that have been rounded. (2) Perform calculations involving roots and indices, including negative and fractional indices. Perform exact calculations involving fractions, surds and π . Work with numbers in standard form.	1) Use experimental data to estimate probabilities and expected frequencies. Use tables to represent the theoretical probabilities and expected frequencies using the idea of equally likely events. Recognise mutually exclusive events and exhaustive events and know that the probabilities of mutually exclusive exhaustive events sum to 1. Compare theoretical probabilities with experimental probabilities. (2) Use tables and Venn diagrams to represent sets. Use a possibility space to represent the outcomes of two experiments and to calculate probabilities. Use a tree diagram to show the outcomes of one or more experiments and to calculate probabilities. Calculate conditional probabilities.	(1) Find and interpret the gradient and y-intercept of a line and relate these to the equation of the line in the form $y = mx + c$. Identify parallel and perpendicular lines using their equations. Draw line graphs and quadratic curves. Identify roots, intercepts and turning points of quadratic curves using graphical and algebraic methods. Use graphs to solve problems involving distance, speed and acceleration. (2) Recognise and draw graphs of cubic and reciprocal functions. Recognise and draw the graphs of exponential functions. Recognise and sketch the graphs of trigonometric functions. Recognise and sketch translations and reflections of graphs. Draw and interpret graphs of non-standard functions and use them in real-life problems. Approximate the gradient of a curve at a given point and the area under a graph. Interpret these values in real-life problems including kinematic graphs. Recognise and use simple equations of circles and find the tangent to a circle at a point.	Use compound measures. Convert between standard units of measure and compound units. Compare lengths, areas and volumes of similar shapes. Solve direct and inverse proportion problems. Describe direct and inverse proportion relationships using an equation. Recognise graphs showing direct and inverse proportion and interpret the gradient of a straight line graph. Find the instantaneous and average rate of change from a graph. Solve repeated proportional change problems.	(1) Draw and interpret plans and elevations of -3D shapes. Calculate the volume of cuboids and right prisms. Calculate the surface area and volume of spheres, pyramids, cones and composite shapes. Know and apply the relationship between lengths, areas and volumes of similar shapes. (2) Use Pythagoras' theorem to find a missing side in a right-angled triangle or the length of a line segment on a coordinate grid. Use trigonometric ratios to find missing lengths and angles in triangles. Find the exact values of $\sin \theta$ and $\cos \theta$ for key angles. Use the sine and cosine rules to find missing lengths and angles. Use the sine formula for the area of a triangle. Calculate with vectors and use them in geometric proofs.
Literacy	Types of sequences, linear and arithmetic meaning the same, geometric, fibonacci, quadratic. Term from a sequence. Difference in meaning of an inequality sign and equal sign, when they are appropriate and how this impacts solutions.	Exact calculations, when this would be favoured over calculated answers. Pi is an irrational number.	Bivariate data, compares the values of two variables by pairing each value of one with another. Mutually exclusive and independent events. Mode can be bimodal i.e 2 modes. Conditional probability. Dependent and independent events. Sample space.	Catersian coordinate system. Parallel, perpendicular definition. Origin (0,0). Intercept, to cut a line or surface with another.	The units of measurement give a clue to the relationships between the quantities.	Congruency and similar definition. Hypotenuse of right angled triangles. Transversal, to cross in french. Similar triangles have a constant ratio. Task - Create maths Bridges and Structures - develop an argument to choose the best design and the criteria to judge the winning design.
Numeracy	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.
STEM	Fibonacci sequence in the real world.	Bounds in engineering, tolerance levels in manufacturing. Standard form for writing large and small numbers.	Outliers and impact on data. Extrapolate and interpolation of data and when it is appropriate.	X, Y, Z coordinates can be used to define the position of a point in space. Gradient representation on graphs. Kinematic graphs	Coverting compound measures. Growth and decay seen in science. Speed, density, pressure, rates of change.	Pythagoras theorem has important applications in science, geography and engineering. It is used on navigation, construction and astronomy. Create maths Bridges and Structures require pupils to be constructive, creative and think strategically about simple structures. Working in groups, create structures from a single sheet of A4 paper, the tallest free-standing tower and the longest possible span between two end supports. They then have to decide upon the best design, giving the opportunity for them to discuss which criteria to use for awarding marks. Students also have to test bridge structures for strength, which will require a systematic approach to investigate the best combination of arches and spans to use with three, four or five strips of card.
Cross curricular links	Art - gold ratio and Fibonacci sequence	Bounds in engineering, tolerance levels in manufacturing. Standard form for writing large and small numbers	Geography, interpretation of data underpins the study of human populations and their physical environments. English, deriving quantitative, logical and spatial information is an important aspect of making meaning of texts.	History, students need to be able to imagine timelines and time frames to reconcile related events.		
Key vocabulary	(1) Linear, quadratic, equation, factorisation, completing the square, quadratic formula, simultaneous equation, substitution, inequality, iteration (2) Sequence, term, position, term-to-term rule, position-to-term rule, general rule/nth term, Linear, arithmetic sequence, triangular numbers, geometric sequence, Fibonacci sequence and quadratic sequence.	(1) Approximation, estimate, length, mass, volume, capacity, speed, density, accuracy, implied accuracy, upper bound, lower bound and error interval. (2) Index, Base, power, fractional index, Negative index, reciprocal, root, surd, approximation, surd form, exact calculation, standard form.	(1) Trial, outcome, event, impossible, certain, relative frequency, expected frequency, theoretical probability, Bias Biased and equally likely. (2) Set, Element member, universal set, empty set, Venn diagram, intersection, union, complement, tree diagram, frequency tree, frequency tree, conditional probability and independent.	(1) Gradient, y-intercept, quadratic function, parabola, turning point, root, kinematics, speed and acceleration. (2) Quadratic function, cubic function, reciprocal function, exponential function, asymptote, trigonometric function, periodic and tangent to a curve.	Speed, density, pressure, rate of change, similar directly proportional and inversely proportional.	(1) Face, edge, vertex, vertices, plan, elevation, net, surface area, volume, cross-section, prism, pyramid, cylinder, cone, sphere and frustum.

Year 11

Term	1	2	3	4	5	6
Topic Title	Expressions Formulae and functions	Calculations Factors, Powers and Roots Fractions, Decimals and Percentages Ratio and Proportion	Angles and Polygons Area and Volume Transformations Circles and Constructions	Organising and Representing Data Frequency Diagrams Scatter Graphs and Correlation Averages and Spread of Data Time Series	Final exam preparation Revision of topics identified from past paper analysis	Exam Period
Rationale	Pupils are now ready to develop fluency in the algebraic topics covered in term 2 in year 9/year 10 studies, to reason mathematically in order to solve problems by amalgamating their knowledge and identifying the appropriate mathematical strands.	Numerical topics covered in terms 1 and 5 in year 9/year 10 studies are practiced to develop fluency, to reason mathematically in order to solve problems by amalgamating their knowledge and identifying the appropriate methods that are required.	Shape, geometric properties and circle theorems covered in terms 3 and 6 in year 9/year 10 studies are recapped. Pupils are encouraged to identify links and apply their knowledge in a wide range of problem solving scenarios.	Data handling topics covered in term 4 in year 9/year 10 studies are revised, in order to solve problems by amalgamating their knowledge and identifying the appropriate mathematical strands.	Pupils consolidate all their previous knowledge in final targeted revision and past paper practice. Independent learning is encouraged through the regular use of feedback via personalised learning checklists.	
Prior knowledge	- Use and interpret algebraic notation - Substitute numerical values into formulae and expressions - Simplify and manipulate algebraic expressions to maintain equivalence understand and use standard mathematical formulae; rearrange formulae to change the subject	- Understand and use place value for decimals, measures and integers of any size - Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the inequality symbols - Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors/multiples, HCF and LCM, prime factorisation, including using product notation and the unique factorisation property - Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative - Use integer powers and associated real roots, recognised powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations - Interpret and compare numbers in standard form - Work interchangeably with terminating decimals and their corresponding fractions - Define percentage as 'number of parts per hundred' etc. - Interpret fractions and percentages as operators	- Derive and apply formulae to calculate and solve problems involving area, perimeter and volume - Calculate and solve problems involving area and perimeter - Draw and measure line segments and angles in geometric figures - Derive and use the standard ruler and compass constructions, recognise and use the perpendicular distance from a point to a line as the shortest distance to the line - Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric - Use the standard conventions for labelling the sides and angles of a triangle and know and use the criteria for congruence of triangles - Derive and illustrate properties of triangles, quadrilaterals, circles and other plane figures - Identify properties of, and describe the results of, translations, rotations and reflections - Identify and construct congruent triangles and construct similar shapes by enlargement - Apply the properties of angles at a point, angles at a point on a straight line, vertically	- Describe interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers) - Construct and interpret appropriate tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data and vertical line (or bar) charts for ungrouped and grouped numerical data - Describe simple mathematical relationships between two variables in observational and experimental contexts and illustrate using scatter graphs	All curriculum content	
Key knowledge/skills development	- Simplify and manipulate algebraic expressions (including surds and algebraic fractions) - Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs - Where appropriate, interpret simple expressions as functions with inputs and outputs	- (Estimate powers and roots of any given positive number) - Calculate with roots, and with integer (and fractional) indices - Calculate exactly with fractions, (surds) and multiples of pi; (simplify surd expressions involving squares and rationalise denominators) - Calculate with numbers in standard form - (Change recurring decimals into their corresponding fractions and vice versa) - Identify and work with fractions in ratio problems	- Interpret and use fractional (and negative) scale factors for enlargements - (describe the changes and invariance achieved by combinations of rotations, reflections and translations) - Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment - (apply and prove the standard circle theorems concerning angles, radii, tangents and chords and use them to prove related results) - Interpret and use bearings - Calculate arc lengths, angles and areas of sectors of circles - Calculate surface areas and volumes of spheres, pyramids, cones and composite solids - Apply the concepts of congruence and similarity, including the relationships between lengths, (areas and volumes) in similar figures	- Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling - Interpret and construct tables and line graphs for time series data - (Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs and know their appropriate use) - Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: ~ appropriate graphical representation involving discrete, continuous and grouped data (including box plots) ~ appropriate measures of central tendency (including modal class) and spread (including quartiles and inter-quartile range) - Apply statistics to describe a population	All curriculum content	
National Curriculum/specification links	Develop fluency and consolidate their algebraic and mathematical capability from KS3 and year 10 in order to reason mathematically and present a solution to a problem	Develop fluency and consolidate their numerical and multiplicative reasoning capability from KS3 and year 10 in order to reason mathematically and present a solution to a problem	Develop fluency and consolidate their geometric and trigonometric capability from KS3 and year 10 in order to reason logically and present a solution to a problem	Develop fluency and consolidate their statistical and mathematical capability from KS3 and year 10 in order to reason analytically and present a balanced and reasoned solution to a problem	Exam preparation	
Literacy	Reinforce literacy identified within Year 7 - 10	Reinforce literacy identified within Year 7 - 10	Reinforce literacy identified within Year 7 - 10	Reinforce literacy identified within Year 7 - 10	Reinforce definition of command words such as calculate, work out, estimate and what is expected of them in an exam context.	
Numeracy	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.	Numeracy is embedded within all mathematical content. All numerical concepts are taught using uniform methods of best practice as identified in the national curriculum guidance, and followed by all curriculum subjects.
STEM	Reinforce STEM identified in Year 7 - 10 curriculum	Reinforce STEM identified in Year 7 - 10 curriculum	Reinforce STEM identified in Year 7 - 10 curriculum	Reinforce STEM identified in Year 7 - 10 curriculum		
Cross curricular links	Geography - Population density Science - Formulae DT - Force, pressure, area, density	Science - Comparisons Music - Ratio History - Proportion (population splits) Art - Canvas proportions, vanishing points DT - Recipes	DT - Measurements, conversions, design, accuracy Science - Volume of material / gases Geography - Maps and scaling	PE - Analysing performance data Science - Analysing experimental data Humanities - Showing information over time / geographical area Science - Analysis	NA	
Key vocabulary	Like terms, simplify, expression, expand, factorise, substitute, formula, equation, inverse, sequence, term, linear, nth term, geometric sequence. Integer, decimal place, approximately, estimate, partition, place value, power, decimal point, highest common factor and lowest common multiple. Decomposition, prime, square number, square root. Operation, recurring decimal, remainder.	Fractions, decimals and percentages, terminating decimal, recurring decimal, equivalent, numerator, denominator, improper fraction, mixed number. Ratio, simplest form proportion, unitary method, direct proportion. Common denominator, equivalent fraction, improper fraction, mixed number, percentage, terminating decimal. Estimate, factor, remainder. Direct proportion, proportion, ratio, scale, unitary method."	Length, mass, capacity, perimeter, area, scale, imperial, metric, circumference, radius, diameter. Horizontal, vertical, linear, function, straight-line graph, real-life graph, distance-time graph, time-series graph, coordinates, equation, formula. Object, image, transformation, rotation, reflection, translation, enlargement, scale factor, symmetry, rotational symmetry, tessellation. Construct, bisect, perpendicular, locus (loci) congruent, bearing, equidistance, scale drawing. Parallel, quadrilateral, polygon, regular shape, tessellation, interior angle, exterior angle. Face, edge, vertex, net, surface area, volume, cross-section, prism, pyramid, plan view, side elevation, front elevation. Area, parallelogram, perimeter, surface area, trapezium, volume. Expression, formula, like terms, simplify, subject, substitute, term, variable. Enlargement, reflection, reflection symmetry, rotation, rotational symmetry, scale factor, transformation, translation"	Primary data, secondary data, discrete data, continuous data, frequency diagram, bar chart, pie chart, hypothesis, population, sample, scatter diagram, correlation, time series, average, range stem-and-leaf diagram. Probability, trial, outcome, event, tree diagram, sample space diagram, experiment, bias, mutually exclusive, relative frequency, independent probability, experimental probability. Common denominator, equivalent fraction, improper fraction, mixed number, percentage, terminating decimal. Estimate, factor, remainder. Direct proportion, proportion, ratio, scale, unitary method	NA	