Mathematics – Year 10

	Year 10 – Block A	Year 10 – Block B
What do we teach?	Specification: Pearson Edexcel Level 1/Level 2 GCSE (9 - 1) in Mathematics (1MA1)	
	Angles and angle properties review Circle Theorems Probability Algebraic thinking and Problem Solving Direct and Inverse Proportion Pythagoras and Trigonometry Depth and Problem Solving 2-D and 3-D	Vectors FDP Review Functions Graphs and Equations of graphs Area and Volume of 2-D and 3-D shapes Measures of Location
How does this meet the National curriculum?	Students develop the 3 core skills of: fluency, reasoning and problem solving Students are taught the fundamentals of mathematics, through varied and frequent practice with increasingly complex problems over time, building on knowledge from KS3. Within circle theorems and Pythagoras and Trigonometry, students prove theorems, apply them to help solve problems in a variety of contexts moving from 2-D to 3-D trigonometry. Students link Algebra and FDP from KS3 to problems of proportionality and inverse proportionality and within probability investigate how to calculate the probability of multiple events using this to then calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.	Mathematics is seen as an interconnected subject in which students need to be able to move fluently and seamlessly between representations of mathematical ideas. In the study of vectors, students describe translations as 2D vectors and apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; {use vectors to construct geometric arguments and proofs}. With functions, students interpret simple expressions as functions with inputs and outputs; {interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function. When working with graphs, students are taught how to: sketch translations and reflections of the graph of a given function, plot and interpret graphs (including reciprocal graphs {and exponential graphs, and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration ,calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs.
Why does this knowledge matter?	Mathematics is a creative and highly inter-connected discipline providing the solution to a wide variety of complex and intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. Through delivering a high-quality mathematics curriculum covering the 4 main areas of Mathematics: Number, Algebra, Geometry, Handling Data in line with National Curriculum requirements, we can fully prepare our students a foundation for understanding the world, the ability to reason mathematically, think on their feet as well outside the box and problem solve with confidence. The link between algebra, number and geometry this term will help student have a better appreciation of the beauty and power of mathematics, and foster a sense of enjoyment and curiosity which is needed across all their subjects and are valued skills in the world of higher education and the workplace.	In this term, we aim to provide students with the skills to make connections between prior learning and new concepts and ideas around algebraic processes and graphical solutions. We also hope to enable students to link algebra with higher order problems solving, functions and proof work, which helps them to link their learning to such things as algebraic and geometric proofs with vectors. This knowledge is important because it facilitates cross-disciplinary learning such as with resultant forces and motion and kinematics in Science. Measures of locations such as Means. Medians and modes and ranges, gives students an appreciation of the data handling Model of, Collection, collation, analysis, conclusion and refinement, which is important or further study of Mathematics at KS5 and gives students the skills of inference, and questioning and challenging conclusions, which are key cross-disciplinary skills for both academic study, personal development and the world of work.
Why do we teach in this sequence?	Students need to have a sound understanding of angles and geometric properties of shapes from KS3 in order to derive, use and apply circle theorems. Students can build on what they know about the anatomy of a circle and angles in isosceles triangles and parallel lines to find missing angles and sides in problems involving circles. After this we aim to use knowledge from year 9 around algebraic processing skills, ratios and equations of straight lines to enable students to solve direct and inverse proportionality problems. The final block on Pythagoras and Trigonometry in 3-D, builds on the 2-D work done in year 9 using Trig and Pythagoras ratios.	A fractions, decimals and percentages (FDP) review at the start of this block give students the opportunity to reflect on key number skills that will link to all subsequent topics for this year. By then studying functions, focusing on what they mean, how to represent them and how they work, students are better equipped to link a different types of functions, (linear, quadratic, cubic) to different types of graphs. Knowing how to calculate the areas, and volumes of various composite 2-D and 3-D shapes, provides students with the knowledge to relate them to 2-D and 3-D enlargements using scale factors, which is part of the year 11 geometry scheme. Measures of location and what they represent, provides the background for development into dispersion calculations and representing data using more sophisticated diagrams, such as histograms and frequency curves in year 11.
What career links are made?	All careers where decision making is needed require problem solving, logic and reasoning and mathematics with problem solving helps students develop these skills. Examples of careers that use high levels of problem solving would be: Teaching, Accountantancy. IT Programmer, Logistics manager, Event planner, Urban and Regional Planner. Careers that make use of Pythagoras, Trigonometry and all aspects of shape, and space would be: Architecture, Cartographer and Photogrammetrist, Drafter, Mechanical Engineer, Surveyor, Astronomer, Physicist, to name a few.	People that use algebraic techniques and graphing in their jobs include: Architects, surveyors, and cartographers Engineers, drafters and engineering technicians, Life& Physical scientists, Social scientists, Actuaries, Chemists, Chiropractors, Dentists, Optometrists. Statistics and Probability is useful for people in the following careers: Data analyst, Data scientist, Financial risk analyst, Investment analyst, Market researcher, Mortgage advisor, Civil Servant, Government Advisor are just some examples.

Mathematics – Year 11

	Year 11 – Block A	Year 11 – Block B
What do we teach?	Specification: Pearson Edexcel Level 1/Level 2 GCSE (9 - 1) in Mathematics (1MA1)	
	Indices and Standard Form Calculations Geometric Reasoning using vectors, angle properties Constructions Congruence and Similarity and Enlargements (LSF, ASF, VSF) Loci Geometric proofs of theorems	Analysis of data represented as charts or graphs Comparing data sets from graphs, (conclusions, predictions and inferences) Transformations, Reflections, Rotations Enlargements using scale factors (2-D and 3-D) problem solving Translations using translation column vectors Vector proofs Algebraic methods
How does this meet the National curriculum?	Students develop the 3 core skills of: fluency, reasoning and problem solving Students are taught to consolidate their numerical and mathematical capability learnt in stage 3 and extend their understanding of the number system to include powers, roots {and fractional indices}. They are taught to select and use appropriate calculation strategies to solve increasingly complex problems, including exact calculations involving multiples of π {and surds}, use of standard form. In Geometry they make and test conjectures about the generalisations that underlie patterns and relationships; look for proofs or counter-examples; begin to use algebra to support and construct arguments {and proofs}. Students are able to reason deductively in geometry, number and algebra, including using geometrical constructions. They are taught to select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem.	Students continue to develop their reasoning and problem solving skills. They explore what can and cannot be inferred in statistical and probabilistic settings, and express their arguments formally. They are taught to assess the validity of an argument and the accuracy of a given way of presenting information. Vector and algebraic proofs and methods enable students to model situations mathematically and express the results using a range of formal mathematical representations, reflecting on how their solutions may have been affected by any modelling assumptions. This is included in the study of transformations, namely translations, reflections, rotations and enlargements. They are taught to select appropriate concepts, methods and techniques to apply to 2-D and 3-D enlargements using scale factors and interpret their solution in the context of the given problem.
Why does this knowledge matter?	Teaching constructions reinforces the abstract ideas of length and angle size. This allows students to connect mapping objects in the classroom to real-world contexts regarding direction and place. Understanding of spatial relationships is an important concept in the role of problem solving and higher-order thinking skills. Students learn how to postulate and prove concepts, they tap into a deeper stage of mathematics. Geometrical proofs offer students a clear introduction to logical arguments, which is central to all mathematics. They show the exact relationship between reason and equations.	Data handling make sense of problems and persevere in solving them. use of data with students making conjectures about the form and meaning of data and planning how to use it. They are taught to compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity. All the topics taught this term are important concepts for further study of Mathematics at KS5 encouraging students in logical reasoning and mental rigor.
Why do we teach in this sequence?	Building on their knowledge of constructions and loci students can then apply this to problems involving length, area and volume scale factors. Students can also make links with Algebra to do simple geometric proofs which provide a foundation for higher order vector proofs in Block B.	This block is the culmination of all key skills needed for successful completion of shape and space, algebraic methods, general number, statistical analysis, and data handling. Vector proofs and algebra are the last set of higher order questions that students will focus on which tests their ability to apply algebraic techniques to geometrical proofs.
What career links are made?	Architects, civil engineers, landscape architects and town planners are among many other professionals that have to be able to produce accurate plans and have high problem solving skills.	Analysis of data is used by people in the following careers: Data analyst, Data scientist, Financial risk analyst, Investment analyst, Market researcher, Mortgage advisor, Civil Servant, Government Advisor. Architects, draughtsman and cartographers are some of the professions that rely on people have a good sense of space and shape.