Curriculum Overview – Mathematics 2021 – 2022

At Pate's we aim to build on the knowledge gained from the plethora of feeder schools that we take from. We develop mathematical fluency and reasoning in increasingly complex problems within the same domains that students have already studied, namely number, algebra, ratio and proportion, Geometry and statistics. At key stage three we focus on three strands: Problem Solving, Accuracy and Written Communication. Using these strands we encourage independent thinking, especially with our in house 'pink problem solving' homeworks which are designed to engage students and develop mathematical mastery of the topics taught. We aim to lay a foundation of knowledge that can be drawn upon when students begin their journey in to key stage 4 (GCSE). Every student in year 7 & 8 is entered into the UKMT maths challenge which allows them to excel in mathematics not necessarily within the normal schemes of work.

Due to the linear nature of mathematics every topic taught builds upon each other, therefore we continue to look at elements of the course from year 7 through to year 11. Following the Edexcel GCSE syllabus we initially recap information from key stage 3, then teach the students how to apply their knowledge and eventually generalise by using algebra. Our students are prepared well if they wish to continue to study mathematics at A-Level. However, if Key stage 4 (GCSE) is the end of their mathematical journey we pride ourselves on creating mathematicians that are able to have an awareness of mathematics in the wider world and are equipped with transferable skills such as problem solving, lateral & logical thinking and high levels of numeracy.

Mathematics within the sixth form is a hugely popular course. Our curriculum follows the OCR(MEI) syllabus comprising of three main elements, namely Pure, Mechanics and Statistics. Initially we develop the student's algebraic knowledge as this permeates throughout the A-Level course. We develop the applied elements that are used within other subjects, such as kinematics and Newton's Laws that aid the content in Physics. In statistics (alongside other material) we study 'collecting and interpreting data' which is widely used in Biology, Psychology and Geography.

Our further mathematicians also follow the OCR(MEI) curriculum and study their A-Level maths and further maths in parallel. They benefit from four specialist teachers delivering the Further pure, Statistics, Mechanics and Pure content. Each student has the opportunity to work with mathematicians from GCHQ and also attend a MAT and STEP course to prepare them fully for the challenge of mathematics at university.

Key Stage 3

Year 7	Year 8	Year 9
Special Numbers	Integers, Powers and Roots	Pythagoras' Theorem
Fractions	Expressions and formulae	Algebra, Expanding and Factors
Ratio and proportion	Angles	Fractions, Decimals and Percentages
Expressions, Formulae and Equations	Perimeters, Areas and Volumes	Trigonometry
Sequences	Transformations	Indices
Lines and Angles	Percentages	Standard Form
Probability	Straight line graphs	Simultaneous Equations
Shape and Construction	Bearings and Scale drawing	Graphs
	Equations	Areas and Volumes
	Data	Similar and congruent shapes, Constructions
		Inequalities
		Probability

Key Stage 4 – Edexcel GCSE Mathematics (9-1)

Year 10	Year 11
Types of Numbers, Surds & Indices	Using Graphs: Inequalities, Equations
Algebraic Expressions	Angles and Constructions
Ratio and Proportion	Probability, including combinations and venn diagrams
Linear Graphs and non-linear graphs including areas and tangents	Using Transformations: Congruence, Similarity & Vectors
Statistics – Averages, Stem and leaf, Scatter graphs	Iteration and sequences
Number Calculations	Trigonometry Graphs & Equations
Quadratic Equations	REVISION AND EXAM PREPARATION
Pythagoras and Trigonometry	
Statistics - Sampling, Frequency polygons, Cumulative frequency, Box plots, Histograms	
Introduction to function notation. Composite and Inverse functions	
Review: Algebraic fractions, Equations, simultaneous equations	

Key Stage 5 – A Level/Pre U Exam Board: Mathematics OCR(MEI) H640

Year 12		Year 13	
Teacher A	**Teacher B**	**Teacher A**	**Teacher B**
Problem Solving	Surds and indices	Trigonometry	Functions
Coordinate geometry	Quadratic functions	Sequences and Series	Trigonometric Functions
Graphs and transformations	Equations and inequalities	Trigonometric Identities	Differentiation
Kinematics	Polynomials	Algebra	Further Differentiation
Vectors	The binomial expansion	Parametric Equations	Integration
Trigonometry	Probability	Vectors	Differential Equations
Forces and Newton's laws of motion	Conditional Probability	Numerical Methods	Probability
Exponentials and logarithms	Probability distributions	Kinematics	Probability Distributions
Variable acceleration	Differentiation	Forces and Motion	Hypothesis Testing
	Data collection	Moments	
	Data processing, presentation and interpretation	Projectiles	
	Integration	Friction	
	Binomial theorem		
	Statistical hypothesis testing using the binomial distribution		

Key Stage 5 – A Level/Pre U Exam Board: Further Mathematics B OCR(MEI) H645

Year 12			
Teacher A Pure/Further Pure	**Teacher B Pure/Further Pure**	**Teacher C Mechanics**	**Teacher D Statistics**
Language of Maths	Matrices and transformations	Kinematics	Probability
Surds and indices	Coordinate geometry	Force and motion	Collecting & interpreting
Quadratic functions	Matrices : Determinants and inverses	Vectors	Bivariate data 1
Equations and inequalities	Trigonometry	Force & motion	PMCC & y on x regression
Polynomials	Vectors 1: Lines	Projectiles	Large Data Set project
Graphs and transformations	Trigonometry - radians	Friction	Binomial Distribution (including hypothesis testing)
The binomial expansion	Complex numbers: Introduction, argand diagram, modulus, argument and loci	Moments	Statistical distributions
Roots of equations	Exponentials and logarithms	Non-constant acceleration	Statistical hypothesis testing
Differentiation	Vectors 2: planes	Kinematics	Sampling Distribution of the mean
Integration	Coordinate geometry	Dimensional Analysis	Bivariate data 2
A.Ps , G.Ps		Work Energy & Power	Spearman's rank correlation coefficient
Sequences and series : Summing series, induction			

Key Stage 5 – A Level/Pre U Exam Board: Further Mathematics B OCR(MEI) H645

Year 13			
Teacher A Pure/Further Pure	**Teacher B Pure/Further Pure**	**Teacher C Mechanics**	**Teacher D Statistics**
Teacher A year 13 Pure work	Teacher B year 13 Pure work	Impulse and Momentum	Discrete Random Variables
Inverse Trig Calculus	Polars	Centre of Mass	Discrete Probability
Improper Integrals/Mean Values	Matrices & Transformations	MINOR/MAJOR CHOICE	Chi^2
1st order Differential equations	Maclaurin	Volumes of Revolution	Bivariate data - x on y after y on x recap
Hyperbolics	Complex Nos 1: De Moivre's theorem	Centre of Mass by integration	MINOR/MAJOR CHOICE
2nd order Differential equations	Vectors	Elastic Springs and Strings	Probability (Bayes)
	Complex Nos 2: De Moivre's applications	Oblique Impact	Continuous Random Variables
		Circular Motion	Expectation Algebra
		Simple Harmonic Motion	Confidence Intervals
		Variable Force	Hypothesis Testing
		Projectiles on slopes	Simulation