

Maths – St Joseph's College

Subject vision statement

As informed by the National Curriculum, we recognise that mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. Throughout all Key Stages our students are given the opportunity to **develop mathematical fluency**, to **reason mathematically**, to **solve problems**, with the ultimate goal being for all students to reach their potential in both GCSE and A-Level examinations.

Intent statement

What: Students will develop in their understanding of both pure and applied mathematics. Students will have a strong understanding of each of the areas of pure maths (Number, Algebra, Geometry, Ratio and Proportion) and also applied mathematics (Statistics, Probability and Mechanics). Crucially, students will be able to spot the links between the different maths disciplines, will be able to solve problems involving multiple topics and should be able to explain their logic and reasoning to others.

How: From year 7 students will recap and build upon content taught at KS2 such as primes, factors and multiples and using the basic mathematical operations to deal with integers, fractions, decimals and percentages. We then introduce students to new concepts such as algebraic manipulation, graphs and sequences, and geometric constructions and concepts. In years 8 and 9 we continue to recap previously taught topics and build upon more abstract ideas throughout a cyclic curriculum. For KS3 students we will use GL assessments to monitor the progress of students, and to help identify areas of improvement. We use this to help inform potential changes to the curriculum throughout the year.

For KS4 students, starting from year 10 students are selected for either Higher Tier (Sets 1-5) or Foundation (sets 6-7). Within these tiers, students will be exposed to all topics within the GCSE curriculum, once again building upon their prior learning, and developing to complex ideas. Students within the top 3 sets are given the opportunity to sit GCSE further Maths (set 1) and GCSE statistics (sets 2 & 3), providing them with a greater depth of knowledge, and setting them up to achieve highly in their GCSE mathematics exams in year 11.

In KS5 students will sit either A-Level mathematics or Level 3 Core Mathematics depending on GCSE results. For A level mathematicians, we build a strong understanding of pure mathematics with new ideas such as calculus and logarithms and introduce advanced applied material through the Statistics and Mechanics module.

Core mathematicians focus on studying mathematics in context, with a strong emphasis on financial mathematics and the study of networks and models

Why: Mathematics is a fundamental skill that all young people should be capable of utilizing when they leave education. Our goal is for our students to leave school with the knowledge and understanding in numeracy so that they are able to thrive in the world of work.

Year 7						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Basic Number Skills	Introducing Geometry	Basics of Fractions, Decimals and Percentages	Intro to Algebra	Dealing with Ratio and Proportion	Transformations of shapes
Building on (knowledge, concepts and skills)	Order of operations, understanding place value, powers of 10. Four Basic operations	Recognising 2d shapes, finding perimeter and area by counting squares	Identifying common factors, applying four operations with integers and fractions of amounts	Identifying patterns and generating sequences of numbers. Use of letters to represent variables	Solving problems involving unequal sharing and grouping using knowledge of fractions	Describing positions on the full coordinate grid, translating shapes in the coordinate plane.
Building towards (knowledge, concepts and skills)	Perform operations to solve basic number problems, and to apply rounding to estimate values to simple problems	Calculating perimeter and area of 2d shapes. Dealing with angles in polygons	Converting between fractions, decimals and percentages. Solving problems involving FDP	Introduction to key terminology. Basic manipulation of algebraic terms. Plotting coordinates and simple algebraic graphs	Simplifying and dealing with ratios. Solving simple problems involving proportion Real life problems involving data	Perform enlargements, reflections, translations and rotations on 2d shapes.
Independent enrichment (wider reading and learning suggestions)	- Alex's <i>Adventures in Numberland</i> by Alex Bellos		Use of fractions decimals and percentages in life – discounts in shops	Identify where you use algebra in real life (shopping/ price lists)		Murderous Maths: Savage Shapes
SMSC	Place value within money	Discovering patterns in architecture, maximizing budgets.		Pi Day celebration/event	Junior Maths Challenge	
Careers	Banking	Architecture & Construction. Video game developing	Insurance Underwriter	Chemist	Chef, Bakers	Landscaper, Fashion Designer

Year 8						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Developing understanding of Numbers	Developing geometric reasoning	Compound units of measurement	Dealing with probability	Developing Algebra skills	Constructions, loci and Bearings
Building on (knowledge, concepts and skills)	Solving basic number problems, rounding and estimating	Calculating perimeter and area of 2-D shapes. Dealing with angles in polygons	Understand and convert between area and volume 3-D shapes. Converting compound units	Using fractions Finding probabilities of simple events Systematically list outcomes	Plotting coordinates and substituting integers into expressions	Identifying lines of symmetry Accurately constructing triangles from ASA, SSS and SAS information.
Building towards (knowledge, concepts and skills)	Finding squares, cube and roots of values. Decomposing integers into their prime factors to solve problems	Solving functional problems by finding the area or perimeter of compound shapes including parts of circles	Calculating the volume and surface area of prisms including cylinders. Calculating with compound measures	Using Venn Diagrams, relative frequency and theoretical probability to solve statistics problems	Expanding and Factorising linear and quadratic expressions Using algebra to construct arguments and prove identities	Use constructions to solve Loci problems. Solving problems involving bearings
Independent enrichment (wider reading and learning suggestions)	Murderous Maths: Awesome Arithmetricks		The Time and Space of Uncle Albert – Russell Stannard	Murderous Maths: Do You Feel Lucky		
SMSC	Exploring squares, cubes and roots in real life	Investigating Rangoli Patterns and Islamic Art		Pi Day celebration/event	Junior Maths Challenge	Navigating using a compass and a map
Careers	Accountant	Interior Decorator	Meteorologist	Insurance Underwriter	Air Traffic Controller. Rescuers	Civil Engineer, Architect, Animator

Year 9						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Coordinates and graphs	Advancing uses of Fractions, Decimals and Percentages	Developing practice with 2d and 3d shapes	Advancing algebra skills	Deeper understanding of numbers (pre-GCSE)	Introduction to Quadratics (Pre-GCSE)
Building on (knowledge, concepts and skills)	Finding gradient and y intercept from two given points and graphs. Rearranging equations	Building on ordering fractions with different denominators	Finding the area of quadrilaterals, Circles and Trapezium	Building on forming expression and collecting the like terms	Building on calculating fractions, decimal and percentages	Building on solving equations, factorisation. Using HCF and simplification
Building towards (knowledge, concepts and skills)	Building to understand parallel and perpendicular lines introducing tangents	Using the four operations with fractions including the use of negative numbers	Calculating the area of 3D shapes and working out the Volume. Using Pythagoras to work out the height of prism	Rearranging and solving equations. Introducing quadratic equations. Being able to factorise quadratics	Working out simple and compound interest on percentages and worded problem building towards ratio	Using table of values to plot a quadratic graph, being able to factorise quadratics. Finding out the solutions
Independent enrichment (wider reading and learning suggestions)	Online interactive games on Maths Pad	Using problem solving paragraph questions, use of real-life problems to solve fractions	History of Pythagoras Euclidea (online geometry game)		Difficult Riddles for Smart Kids – <i>M Prefontaine</i>	History of completing the square
SMSC	Using conversion graphs to convert currencies & quantities		Exploring Rangoli Patterns and symmetry in art	Pi Day celebration/event	Discussion of History of the exponential functions. (Euler numbers)	
Careers	Data Analyst	Pharmacist	Aerospace engineer	Constructions	Market Researcher	Auto Engineer

Year 10						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Dealing numbers and algebra	Using data and Statistics	Introduction to Trigonometry	Deeper geometric skills	Understanding probability	Constructions and Loci
Building on (knowledge, concepts and skills)	Order of operations, calculations, simplifying algebraic terms	Frequency tables, Averages, Scatter Diagrams, Time Series, Comparing Distributions	Pythagoras' Theorem, Trigonometry in right angle triangles	circumference and area of a circle. Solving problems with area or perimeter of compound shapes	Sets and Venn Diagrams, Tree diagrams	Bisecting angles and lines, drawing triangles, Bearings & Loci
Building towards (knowledge, concepts and skills)	Solving linear and quadratic equations and inequalities using range of strategies	Using measures of location and spread to solve statistics problems. Collecting and displaying data in a variety of ways	Application of Pythagoras' theorem. Using basic trigonometry to solve problems with missing sides or angles	Area of compound shapes, Surface area of 3D solids, Volume of 3D solids, Transformations	Using tree diagrams to represent outcomes of two or more events, with and without replacement	Understanding bearings to solve geometric problems. Using constructions and loci accurately
Independent enrichment (wider reading and learning suggestions)	The Number Detective – 100 puzzles to test your logical thinking		The Wonder of Geometry: A mathematical story – David Acheson	Podcast: A Brief History of Mathematics – Marcus du Sautoy	Does God Play Dice – Ian Stewart	Longitude – Dava Sobel
SMSC	The history of algebra discussion of ancient civilisations' maths skills	Data and fake news discussions – how can data be manipulated	How is trigonometry used in music? Intermediate Maths Challenge	Pi Day celebration/event	Moral issues of using probability to make predictions	
Careers		Economist	Architectural Engineers			Civil Engineer

Year 11						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Circle theorems	Advanced Algebraic Understanding	Multiplicative Reasoning & Vectors	Closing the gaps (exam Preparation) + further Maths	Closing the gaps (exam Preparation)	
Building on (knowledge, concepts and skills)	Recall parts of circles, and solve basic geometry problems involving circles	Constructing, sketching and solving quadratic equations	Perform operations with vectors	Trigonometry and geometry. Gradient of straight lines	Building on all GCSE content covered	
Building towards (knowledge, concepts and skills)	Derive and use the circle theorems to solve problems, and explain reasoning	Solve linear and quadratic inequalities and simultaneous equations. Recognise and apply difference of two squares rule to factorise	Use vectors to construct geometric arguments and proofs	Geometry problems using trigonometry – FM: solving trig equations estimating gradient of a curve by using tangents. FM: Differentiation and Matrices	Exam Skills – quick tips and tricks for getting the grades. Using the formula booklet. Problem solving questions	
Independent enrichment (wider reading and learning suggestions)	Euclidea – Phone app with geometry challenges to complete	The Code Book by Simon Singh	Proofs without words – Roger B Nelson	So you think you've got problems – Alex Bellos		
SMSC		Video: Black Heroes of Mathematics – Discussion of influential black mathematicians	Intermediate Maths Challenge	Pi Day celebration/event		
Careers	Architecture Video game design	Computer Programmer				

Year 12						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Advanced Algebra Techniques	Graphs and transformations	Trigonometry and Algebraic Methods	Vectors and applied mathematics	Introduction to Calculus	Exponentials, Logarithms & Statistics
Building on (knowledge, concepts and skills)	Solving quadratic equations and inequalities. Basic algebraic manipulation	Plotting and sketching linear/ quadratics/ equations of circles	Using Pythagoras, SOHCAHTOA and sine/cosine	Transforming shapes using vectors and solving simple problems involving vectors	Calculating the gradient of a straight line and estimating the area under a graph	Using laws of indices to solve problems. Sketching graphs of non-linear equations
Building towards (knowledge, concepts and skills)	The use of the discriminant, solving quadratic simultaneous equations and modelling with quadratics	Parallel and perpendicular gradients, equations of circles with centre (a, b) and transforming functions	Geometry problems involving triangles and finding solutions to trigonometric equations.	Using i and j unit vectors to solve geometric problems. Using vectors to solve mechanics problems	Using differentiation to solve problems with tangents and normals. Solve geometric problems involving area under curves	Solving problems using the laws of logarithms and exponential modelling. Using statistical models to solve problems with probability and hypothesis testing
Independent enrichment (wider reading and learning suggestions)	Videos: The Story of Maths (series) by Marcus du Sautoy		The Magical Maze – Ian Stewart	Research a famous mathematician – Calculus		A Beautiful Mind – Sylvia Nasar
SMSC	Senior Maths Challenge	Team Maths Challenge House Competition		Pi Day Event	The history of maths: the impact of Newton	
Careers		Banking Quantity surveyor		Computer Programmer	Civil engineer	Data Analyst/ Statistician

Year 13						
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Algebraic Methods, Functions and Sequences	Binomial Expansion and Trigonometry	Calculus and Parametric Equations	Vectors and Mechanics	Statistics	
Building on (knowledge, concepts and skills)	Proof using algebra and geometry. Functions and transformations of graphs	Binomial expansion with positive integer powers, and trigonometry using degrees	Basic differentiation and integration of polynomials	Vectors and geometric problems in two dimensions. Introduction of Forces and motion	Sampling and data collection, the binomial distribution and simple hypothesis tests	
Building towards (knowledge, concepts and skills)	Proof by contradiction, domain and range, inverse functions and modelling with arithmetic and geometric sequences	Binomial expansion with non-positive integer powers. Using radians to solve trigonometry problems. Sec, cosec and cot. Trig modelling	Advanced differentiation and integration techniques and applications to modelling/ numerical methods for finding roots	Vectors in three dimensions and applications to mechanics. Moments, forces, and friction. Static particles and projectiles	Greater use of statistical distributions (normal/binomial) and further hypothesis testing with correlation.	
Independent enrichment (wider reading and learning suggestions)	The prisoners Dilemma – William Poundstone	Things to make and do in the 4 th dimension – Matt Parker	Humble Pi – Matt Parker	Newton: The making of a genius		
SMSC	Senior maths challenge	Team Maths Challenge House Competition		Pi Day event	What place does maths have in the world	
Careers		Architecture, game development and 2d/3d design		Mechanical engineering	Finance and data modelling	

Core Maths						
	Autumn 1	Autumn 2	Spring 2	Spring 2	Summer 1	Summer 2
Topic	Analysis of Data	Maths For Personal Finance	Critical Analysis	Statistical Techniques	Critical Path & Risk Analysis	Graphical Techniques
Building on (knowledge, concepts and skills)	Collecting and sampling of data, representing data numerically and diagrammatically	Numerical calculations, use of percentages and application of interest	Presenting logical and reasoned arguments	Probability and estimation techniques. Understanding correlation and regression relationships.	Probability, expectations and diagrammatical representation of data	Functions, points of intersection, rates of change, growth and decay
Build towards (knowledge, concepts and skills)	Applying data analysis to case studies and articulating solutions to real life problems	Real life finance such as the cost of credit, taxation and mortgages	Communicating mathematical approaches and solutions	Normal distribution and confidence intervals	Analysing compound projects, constructing Gantt charts and risk analysis	Modelling and analysis by use of exponential functions in a real-life context
Independent enrichment (wider reading and learning suggestions)		The Millennium Problems – Keith Devlin	Proofs without words – Roger B Nelson	Measuring the Universe – Kitty Ferguson		The cracking code book – Simon Singh
SMSC	How is data being manipulated in the media		Mathematics is the universal language		Teamwork: how do Gantt charts help keep teams organised?	
Careers		Finance/Banking		Data Science	Engineering	