RUSHCLIFFE
SPENCER ACADEMY

SUBJECT	MATHS	YEAR	Year 13

Why do we study maths? The maths curriculum provides me with the knowledge I need to be mathematically fluent and develops my mathematical reasoning and problem-solving skills.

What will I learn about this year?	What have I learnt about before?
Algebra	
Simplifying rational expressions and decomposing rational functions into partial fractions Extending the binomial expansion to $(1+x)^n$ for any rational value of n, $\|x\| < 1$ Working with sequences generated by a simple iterative relation Arithmetic and geometric sequences and series Proof by contradiction Locating roots of f(x)=o by considering a change of sign and finding approximate solutions to equations using iterative methods including fixed point iteration and the Newton-Raphson method Converting between parametric and cartesian forms of equations of curves and using parametric equations in modelling	Expanding products of two or more binomials and recognising difference of two squares Simplifying and manipulating expressions involving algebraic fractions Polynomials – finding products and quotients of two polynomials, using the Factor Theorem and sketching polynomials The binomial expansion of $(a+bx)^n$, where n is a positive integer Finding approximate solutions to equations numerically using iteration Types of sequences and finding the nth term of linear and quadratic sequences
Calculus	
Differentiation - Differentiating $e^{kx}, a^{kx}, lnx, sinkx, coskx$ *and* $tankx$, differentiating sinx and cosx using differentiation from first principles Differentiating using the chain rule, product rule and quotient rule included problems involving connected rates of change and inverse functions Differentiate functions defined implicitly or parametrically Identifying points of inflection Integration – Integrate $e^{kx}, \frac{1}{x}, sinkx$ *and* $coskx$ and using partial fractions Evaluating definite integrals and using them to find the area between two curves Defining integration as the limit of a sum and estimating areas under a curve using the trapezium rule Integration by substitution and by parts Solving differential equations by separation of variables	Differentiating x^n for rational values of n and proving results using differentiation from first principles Identifying and classifying stationary points Integration – Defining integration as the inverse of differentiation and integrating x^n (excluding n=-1) Using the Fundamental Theorem of Calculus Evaluating definite integrals and using them to find the area under a curve
Trigonometry	
Definitions and graphs of the secant, cosecant and cotangent functions Trigonometric identities $\sec^2 x \equiv 1 + tan^2 x$ and $cosec^2 x \equiv 1 + \cot^2 x$ and using them to construct proofs Using of formula for $sin(A \pm B)$, $cos(A \pm B)$ and $tan(A \pm B)$ and double angle formulae Using expression $acos\theta + bsin\theta$ the the equivalent forms of $rsin(\theta \pm \alpha)$ or $rcos(\theta \pm \alpha)$	Definitions and graphs of the sine, cosine and tangent functions Trigonometric identities $tan\theta \equiv \frac{sin\theta}{cos\theta}$ and $\sin^2 x + \cos^2 x \equiv 1$ and using them to construct proofs Solving trigonometric equations in a given interval Radians as a unit for measuring angle- inverse trigonometric functions, arcs and sectors and small angle approximations (Yr13 content)
Vectors and Mechanics	
Vectors – Working with vectors and solving geometrical problems in 3D Mechanics - Kinematics – Using calculus to find acceleration, velocity and displacement, using the formulae for constant acceleration, including motion under gravity extend to 2D with vectors Modelling projectiles motion in 2D Forces and Newton's laws – Using Newton's first, second and third law for motion in a in 2D where forces need to be resolved and modelling friction Using moments in simple static contexts	Vectors – Working with vectors in 2D, calculating magnitude and direction of a vector and finding and using position vectors Adding vectors diagrammatically and adding vectors and multiplying them by scalars in both **i, j** form and column vector form Using vectors to geometrical problems Mechanics – Kinematics – interpreting graphs for motion in a straight line, using calculus to find acceleration, velocity and displacement, deriving and using the formulae for constant acceleration Forces and Newton's laws – Using Newton's first, second and third law for motion in a straight line, including problems involving smooth pulleys and connected particles
Statistics	
Calculating conditional probability, including from tree diagrams, two way tables and venn diagrams The Normal Distribution and calculating probabilities using the normal distribution Conducting a statistical hypothesis test for the mean in a normal distribution Conducting a statistical hypothesis test for correlation coefficients	Statistics - Interpreting measures of central tendency and spread, extending to standard deviation, identifying outliers Different sampling methods and their limitations diagrams Presenting data - cumulative frequency, box plots, histograms Working with a large data set Interpreting scatter diagrams and regression lines for bivariate data Probability - Identifying independent events and mutually exclusive events Calculating probabilities from two-way tables and tree diagrams Using discrete probability distributions including the binomial distribution Conducting a statistical hypothesis test for the proportion in a binomial distribution

Where can I find out more?

Humans – Matt Haig
The Simpsons and their Mathematical Secrets – Simon Singh
The Art of Statistics – David Speigelhalter
How To Make The World Add Up – Tim Harford
The Tiger That Isn't – Michael Blastland
Fermat's Last Theorem - Simon Singh
Factfulness – Hans Rosling
Humble Pi: A comedy of maths errors - Matt Parker
Hello World, How to be Human in the age of the machine - Dr Hannah Fry
Power in Numbers: The Rebel Women of Mathematics - Talithia Williams