Subject	Y13 Core Knowledge – Autumn/Spring/Summer term	How to support students' learning
Maths - Further Maths	**Autumn Term** **Vectors -** 1. Form the equation of a plane. 2. Find the angle between two planes. 3. Form the equation of a line in three dimensions in vector or Cartesian form. 4. Find the point of intersection of a line and a plane. 5. Find the angle between a line and a plane. **Matrices -** 6. Find the determinant of a 3x3 matrix and explain its geometrical significance. 7. Find the inverse of a non-singular 3x3 matrix. 8. Use matrices to solve simultaneous linear equations. **Further calculus -** 9. Evaluate improper integrals where either the integrand is undefined at a value in the interval of integration, or the interval of integration expends to infinity. 10. Differentiate inverse trigonometric functions. 11. Use the method of partial fractions in integration, including where the denominator has a quadratic factor of the form ax2+c and one linear term. **Spring/Summer Term** **Maclaurin series -** 12. Find the Maclaurin series of a function, including the general term. 13. Recognise and use the Maclaurin series of standard functions. **Complex numbers -** 14. Use de Moivre's theorem to simplify expressions involving powers of complex numbers. 15. Find the nth roots of a complex number. 16. Use the exponential form of a complex number. **Vectors 2 -** 17. Find the distance from a point to a line in two or three dimensions. 18. Find the shortest distance between two skew lines.	• Integral – Notes, videos and exercises for each topic https://integralmaths.org/ • Physics & Maths Tutor – Past exam papers available online. Plus, exam revision materials. https://www.physicsandmathstutor.com/ • Exam Solutions – Past exam papers available online. Plus, exam revision materials. • https://www.examsolutions.net/as-maths/ocr/ • Desmos – A graphing app for plotting all types of equations. • https://www.desmos.com/calculator • Geogebra – A program that allows you to explore all kinds of geometry, algebra, and graphs https://www.geogebra.org/ • NRICH – This website aims to enrich the mathematical experiences of all learners https://nrich.maths.org/post-16 • Math Centre – Includes revision and learning tools • https://www.mathcentre.ac.uk/ • Maths Careers – Provides a range of resources, information, and signposting to help those working in mathematics https://www.mathscareers.org.uk/ • AMSP – Provides a range of resources, information and maths events. https://amsp.org.uk/students/a-level/resources • Numberphile – Contains videos and podcasts about numbers. Topics range from the sublime to the ridiculous… from historic discoveries to latest breakthroughs. • https://www.numberphile.com/

	First order differential equations - 19. Formulate a differential equation from verbal descriptions involving rates of change. 20. Use separation of variables to solve a first order separable differential equation to find both general and particular solutions. **Second order differential equations -** 21. Understand and use the relationship between different cases of the solution and the nature of the auxiliary equation. 22. Solve coupled first order simultaneous linear differential equations involving one independent variable and two dependent variables.	• Birmingham Popular Maths Lectures - The Birmingham Popular Mathematics Lectures are open to all members of the public and the University who are interested in the study of Mathematics. They are particularly suitable for those studying Mathematics at A Level. The lectures are free of charge and run on the last Wednesday of each month, between October and March, at 7pm. https://www.birmingham.ac.uk/schools/mathematics/news-and-events/birmingham-popular-maths-lecture.aspx • Maths Library – While not a necessity for success in the course, if your child is interested in mathematics they can explore our maths library, ask them to see Miss Griffiths in E5 if they would like to browse through the interesting reads we have in our collection.