

## Year 13 Mathematics

In Year 13 students continue the OCR A-Level course. This course develops students' understanding, reasoning and analysing skills as well as building new knowledge. Throughout the year, Year 12 work will be consolidated as well as the delivery of the new content. The course is taught through three main strands - Pure Maths (number/algebra), Statistics (probability/averages/graphs) and Mechanics (forces/motion). The course is taught by two teachers so students will be learning two different topics simultaneously. Lessons will involve a mix of teacher led lessons, individual work and group work. Students are encouraged to work together and to ask questions throughout.

At the end of Year 13 students will sit three papers all of equal weighting:

Paper 1 - Pure Maths.

Paper 2 - Pure Maths and Statistics (50-50 split).

Paper 3 - Pure Maths and Mechanics (50-50 split).

### Methods of deepening and securing knowledge:

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| <b>Interleaving</b>                    | Starter tasks are designed to check knowledge from not only the previous lesson, but also lessons earlier in the topic and sometimes even other topics within Maths which they will have covered previously.                                       |
| <b>Checkpoints/<br/>mini plenaries</b> | These are used within lessons to check understanding and address any misconceptions before moving on.  |
| <b>Homework</b>                        | Exam questions are used to provide plenty of practise at applying their knowledge to new situations.   |
| <b>Assessment<br/>for progress</b>     | At the end of each half term a cumulative assessment is given to cover work from that half term as well as chosen topics from previous half terms, to embed learning and give an experience of each of the three papers set at the end of Year 13. |

Autumn term 1

Autumn term 2

Spring term 1

Topic(s)

**Teacher A**

- **Normal distribution** - understand the normal distribution as a model of probability, calculate probabilities from the formula. Investigate the links between the normal and histograms. Make decisions about which distribution is appropriate in a given situation.
- **Partial fractions** - students will investigate and discover how to break a function down into the partial fractions that were added to produce it (inverse of adding algebraic fractions). Skills from using the binomial and integration will be used to find denominators.
- **Modulus function** - students will be introduced to the modulus function, its notation and key relationships. These will then be applied to solving equations and inequalities. Students will look at how the modulus affects graphs and be able to sketch a graph of the modulus of a linear function.
- **Binomial expansion** - building on Year 12 work, students will now work with binomial expansion when the index can be any rational number. The use of the modulus form will also be brought in.

**Teacher A**

- **Normal hypothesis** - students conduct a statistical hypothesis test for the mean of a normal distribution with known, given or assumed variance and interpret the results in context.
- **Points of inflection** - building on Year 12, students will look at differentiating  $\sin x$  and  $\cos x$ , including multiples. They will differentiate  $\ln x$ . These skills will then be used to find points of inflection on a curve, considering whether they are stationary points.
- **Product and quotient rule, chain rule** - students will apply their knowledge of differentiation to work with the product, quotient and chain rule. The chain rule includes connected rates of change and inverse functions.  
**Trigonometric identities** - building on Year 12 work, students will now work with radian measure, including use for arc length and area of sector. They will work with small angle approximations and be expected to know and use the exact values of  $\sin$  and  $\cos$  for multiples of  $\frac{\pi}{6}$ . Students will work with inverse trig ratios and their graphs looking for connections, e.g. secant and cotangent.
- **Numerical methods** - students will learn how sign change methods can be used to find roots of a function, considering bounds to determine accuracy. They will learn formal iterative methods as well as numerical integration.
- **Regression and correlation** - investigate and use PMCC to evaluate correlation between variables. Use PMCC to conduct and evaluate hypothesis tests.

**Teacher A**

- **Functions and modelling** - students will learn the definition of a function, its key vocabulary and notation. They will look at inverse and composite functions - both the graphs and rules of notation. Functions will be used to model situations, students will be asked to consider assumptions, refinements and limitations.
- **Further Integration** - building on last term, students will look at simple integration by parts. They will work with partial fractions where the denominator is a linear function.
- **Further Differential Equations** - students will evaluate the solution of simple first order differential equations with separable variables. They will interpret the solution of a differential equation in context, including identifying limitations.

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|  | <p><b>Teacher B</b></p> <ul style="list-style-type: none"> <li>• <b>Differential equations</b> - a differential equation involves a function and one or more of its derivatives. It is a method to describe how things change, e.g. population growth. Students will learn how to construct and solve first order differential equations.</li> <li>• <b>Proof by contradiction</b> - building on Year 12 work, recap logical steps and use of connectives. There will be a focus on irrational numbers and the infinity of primes.</li> <li>• <b>3D vectors</b> - building on Year 12, students will now work with 3D vectors, both as column vectors and in <math>xi + yj + zk</math> form. Vectors will build into kinematics.</li> <li>• <b>Vector and kinematics</b> - extend the use of suvat equations to use vectors for 2D motion.</li> </ul> | <p><b>Teacher B</b></p> <ul style="list-style-type: none"> <li>• <b>Forces</b> - building on Year 12, students will now extend their use of Newton's second and third laws to situations where forces now need to be resolved. Problems will include connected particles and pulleys. Students will work with frictional forces, using and applying the coefficient of friction.</li> <li>• <b>Area between 2 curves</b> - students use the definite integral to find the area between two curves or curve and a line, including parametrics.</li> <li>• <b>Integration</b> - building on Year 12, students will integrate exponentials, reciprocals, sine x and cosine x. Students will look at simple cases of integration by substitution.<br/><b>Projectiles</b> - students will model motion under gravity using vectors. They will model the motion of a projectile as a particle moving under gravity.</li> </ul> | <p><b>Teacher B</b></p> <ul style="list-style-type: none"> <li>• <b>Trigonometrical calculus</b> - students will work with double angle formulae. They will be able to prove these formulae and sketch graphs of functions, defining key features. Trig functions will be used to model real life situations involving vectors, kinematics and forces.</li> <li>• <b>Further parametrics</b> - students will find parametric equations of curves, converting between the cartesian and parametric form. This will include sketching. Parametric equations will be used to model situations numerically and in real life contexts.</li> </ul> |
| Assessment   | A Pure.<br>B Pure.  | A Pure.<br>B Pure and Mechanics.   | Mocks (previous summer exam).  |
| CEIAG <i>(Careers that are linked to that topic)</i> | Insurance and Finance.  |  |  |

|  | Spring term 2  | Summer term 1  | Summer term 2 |
|--|--|--|---------------|
| Topic(s)   | <b>Teacher A<br/>Revision</b><br><br><b>Teacher B<br/>Revision</b> | <b>Teacher A<br/>Revision</b><br><br><b>Teacher B<br/>Revision</b> |               |
| Assessment   | Practise papers.   | Practise papers.   |               |
| CEIAG <i>(Careers<br/>that are linked to<br/>that topic)</i> |  |  |               |

### Independent Study

Students will be set an hour of independent study a week from each teacher, this is expected to be handed in for marking at an agreed deadline. On top of this, it is expected that students do an additional two hours of private study - they can use books, websites (for example physics and maths tutor) or complete questions. This additional work needs to be evident within their maths files for half termly file checks. Work and interesting articles will also be put onto the A-Level Google Classroom to support students with this independent study.