**Y11 – Mathematics programme of study**

Normal typeface denotes programme of study for students sitting the Foundation tier.

**Bold typeface denotes programme of study for students, whose tier is undetermined at the start of Year 11 (cross-over topics).**

***Bold italic typeface denotes programme of study for students sitting the Higher tier.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
| Big Ideas | Geometry:  Lines, angles and shapes;  Area and perimeter  Algebra:  Manipulation of expressions and forming & solving equations  Number: Fractions, percentages, ratio and indices  **Algebra: Inequalities**  **Number: Accuracy, bounds and interval. Percentages. Indices and standard form**  **Geometry:**  **Circles**  ***Statistics: Probability***  ***Algebra:***  ***Simplifying and substitution; Forming and solving***  ***Number: surds***  ***Geometry: Pythagoras and trigonometry*** | Algebra: Sequences and graphs  Geometry:  Volume and surface area; Transformations  Number: Calculations and accuracy  **Geometry: Pythagoras and trigonometry**  **Number: Ratio and proportion**  **Algebra: Simplifying and substituting**  ***Algebra:***  ***Sequences, functions and graphs; Inequalities Number: Ratio and proportion***  ***Geometry:***  ***Measures*** | Algebra: Forming and solving equations  Statistics: Statistical Inquiry; Data and Interpreting Results  Geometry:  Transformations  Pythagoras and Trigonometry; Constructions and Loci  **Algebra:**  **Sequences, functions and graphs; Forming and solving**  **Geometry:**  **Lines, angles and shape; Transformations**  ***Geometry:***  ***Lines, angles and shape;***  ***Transformations; Volume and surface area***  ***Statistics: Statistical enquiry and interpretation*** | Statistics: Probability  Revision of key topics identified from PPEs  **Statistics: Statistical enquiry; Interpretation; Probability**  **Geometry: Volume and surface area**  **Revision of key topics identified from PPEs**  ***Revision of key topics identified from PPEs*** | Topics based on progress over time for each class personalised by teacher  **Topics based on progress over time for each class personalised by teacher**  ***Topics based on progress over time for each class personalised by teacher*** |  |
| Topics | - Use and explain angle properties including interior and exterior angles of polygons.  - Calculate the area and perimeter of polygons, including circles  - Simplify, expand and factorise expressions, substitution, solve equations  - Find fractions and percentage of an amount, simple and compound interest. Simplifying ratio  -HCF, LCM  **- Solve and represent linear inequalities.**  **- Specifying error intervals and bounds due to rounding and truncation.**  **- Use and evaluate positive, negative and fractional indices; convert to and calculate with numbers in standard form**  **- Calculate the area of sector and lengths of arcs**  ***- Calculate probability of successive dependent events and interpret conditional probability***  ***- Expand and factorise quadratics***  ***- Simplify algebraic fractions by factorising***  ***- Solve and interpret quadratics by factorising, the quadratic formula and completing the square***  ***- Solve simultaneous equations***  ***- Use Pythagoras Theorem in 3D; Use the Sine rule, Cosine rule and area of a non-right-angle triangle. Sketch trigonometry graphs*** | - Describing sequences and find the nth term  - Draw and interpret linear and quadratic graphs  - Represent 3D shapes as nets and plans  - Find the surface area and volume of prisms  - Rotation and reflection  - Round to sig fig and dp, estimation and error intervals  **- Use Pythagoras Theorem in 3D; Use SOHCAHTOA in right angled triangles and area of a non-right-angle triangle**  **- Use ratio to solve problems about currencies and exchange rates**  **- Calculate direct and inverse proportion including involving powers and roots**  **- Expanding and factorising two or more brackets**  ***- Identify and use parallel and perpendicular graphs***  ***- Recognise and transform graphs***  ***- Estimate gradients and the area under curves***  ***- Calculate nth term of a quadratic sequence; Recognise and use geometric sequences***  ***- Interpret functions including inverse and composite functions***  ***- Solve and represent quadratic inequalities***  ***- Calculate exponential decay and direct and inverse proportion, including with powers and roots***  ***- Use area and volume of similar shapes*** | - Form and solve equations; Change the subject of a formula  - Organise and interpret data including two-way tables, frequency tables, scatter graphs, pie charts, stem and leaf diagrams  - Use averages and range to interpret data  - Translations and enlargement  - Use Pythagoras Theorem  - Construct line and angle bisectors  - Read and draw bearings  **- Find the equation of a straight line; Use parallel and perpendicular lines**  **- Use geometric and quadratic sequences**  **- Calculate interior and exterior angles**  **- Recognise congruence and similarity**  **- Rotation, reflection, translation, enlargement**  **- Solve and rearrange linear equations and simultaneous equations**  ***- Prove circle theorems***  ***- Understand the relationship between parallel vectors***  ***- Describe changes and invariance in transformations***  ***- Construct and interpret histograms***  ***- Estimate population size using Petersen capture-recapture model***  ***- Calculate volume and surface area of pyramids, spheres and frustums*** | - Use probability trees to find the probability of successive independent events  - Use Venn diagrams to calculate probability  - Use relative frequency  **- Estimate averages from grouped data**  **- Construct and interpret cumulative frequency diagrams and box plots**  **- Use probability trees to find the probability of events**  **- Use Venn diagrams to calculate probability**  **- Calculate the volume and surface area of triangular prism, cylinder, pyramid and spheres** |  |  |
| Skills | **Use of equipment:** use of mathematical equipment, tracing paper, graph paper; efficient use of a scientific calculator.  **Problem solving:** apply techniques in a range of contexts, interpret and solve multi stage problems.  **Critical thinking:** Make conclusions, identify errors in own and others working or answers.  **Construction and use of diagrams and graphical representation:** correct use of axes, selection of diagram is appropriate to the data. | | | | | |
| Assessment | Formative assessment every lesson.  Range of learning & skill-based homework. | Formative assessment every lesson.  Range of learning & skill-based homework.  Full PPE – 3 papers | Formative assessment every lesson.  Range of learning & skill-based homework. | Formative assessment every lesson.  Range of learning & skill-based homework.  Full PPE – 3 papers | Formative assessment every lesson.  Range of learning & skill-based homework.  Terminal assessment | Terminal assessment |
| Linked learning | **Number:** The content taught in Year 11 builds on and reinforces the students’ clear and accurate calculation, knowledge and understanding of the number skills and relationships developed through their prior learning and is a critical underpinning to study of mathematics.  Wider Links: Secure foundations in number are critical to the study of all subjects and to the basic numeracy skills needed in life.  **Algebra:** The content taught in Year 11 builds on and reinforces the students’ understanding of the algebraic foundations formed so far. Students can generalise solutions and link algebra with other area of mathematics, in particular geometry. These ideas are central to study of mathematics if a student is to progress to higher grades.  Wider Links: The use of formulae, graphs of functions and the formation and solution of equations arise in a wide range of subjects and contexts but is particularly likely in Science, Geography, ICT, Business, DT, Food and PE.  **Geometry:** The content taught in Year 11 builds on and reinforces the students’ understanding of concepts developed in prior learning and is developed further and applied to increasingly complex problems.  Wider Links: Appreciation and application of geometric rules and relationships have particular importance in DT, Art, Science and Geography.  **Handling Data:** The content taught in Year 11 builds on and reinforces the students’ understanding of concepts developed in prior learning and is developed further and applied to increasingly complex problems.  Wider Links: The interpretation of data and its measures are skills used in almost all subjects and are pivotal to our ability to understand and analyse the world around us and think critically about evidence or conclusions we are presented with.  Learning components at the start of lessons remind students of prior learning and emphasis links to prior topics | | | | | |
| Literacy | Mathematical vocabulary, terminology, and definitions.  Interpretation and conclusions based on graphs and statistics.  Construction and communication of argument and proof. | | | | | |
| Enrichment | Count Me In runs once a week after school, supporting students with their homework or any other mathematical questions they have  CLIMB sessions run for Y11 weekly. They focus on key areas of misconceptions identified in PPEs or class work. A member of the maths department running the revision session and students are invited to the relative after school sessions. CLIMB revision sessions using start after the first set of PPEs. | | | | | |
| SMSC Links | **Spiritual Development within Mathematics**  Developing a logical approach and the ability to recall and reason, along with questioning the way in which the world works promotes the spiritual growth of our students. In mathematics lessons, pupils are always encouraged to delve deeper into their understanding of Mathematics and how it relates and can be used to explain the world around them.  We are enthusiastic about the subject and to use a range of teaching strategies that allow pupils to be creative (i.e. tessellating shapes) or imaginative (i.e. designing exam questions) whilst offering opportunities for students to working through the “don’t get it” moments and experience the satisfaction of that “eureka” when an idea is understood.  Mathematics, as the science of numbers can be used to   * Explain naturally occurring patterns/sequences or symmetry such as is seen in a snowflake, or the seeds in a sunflower. * Consider the concept of infinity (and beyond), the golden ratio and pi to convey the “beauty in the maths”.   **Moral Development within Mathematics**  The moral development of pupils is evident in much of the curriculum where maths is used in real life contexts and the students are able to apply the skills required to solve various problems and understand how decisions are made dependent upon the outcomes of the problem. Through these scenarios, students understand that certain choices may have different consequences and outcomes. We believe and hope to develop an awareness that mathematics is not strictly limited to problems that result in right/wrong solutions.  An obvious topic for this theme will develop when looking at percentages, more specifically in comparing rates of interest on borrowing money where the role of “loan sharks” could be explored and discussed. Additionally, many “data handling” topics lend themselves to developing this theme further:   * The importance of understanding which “average” is used by different forms of media and why they may have made that choice? * The use of misleading graphs and the interpretation of data to support or refute a claim. * Stereotypical bias when teaching questionnaires and samples.   **Social Development within Mathematics**  Using and applying mathematics involves being able to solve problems and being able to do this individually, as part of a team or pair when a task requires it, is fundamental. Students are encouraged to communicate mathematically when discussing, explaining and presenting ideas, through which they are able to develop their mathematical reasoning skills.  Developing self-awareness and the ability to support other students allows effective use of self and peer reviewing to be used, which enables students to have an accurate understanding of their strengths and weaknesses. It is therefore essential that seating plans are used that support each other’s learning and teachers use their professional judgment ensuring the most effective classroom layout is used to support different activities.  We enable our students to enjoy their success in mathematics and will celebrate accordingly whilst supporting any short-term failure through interventions as and when required. Social development is aided further by fostering a problem-solving approach to any work set that encourages students to breaking tasks into smaller manageable parts, often with the assistance of other students.  **Cultural Development within Mathematics**  Mathematics is the universal language of the world and we aim to develop a realization that many topics we learn today have travelled across the world and are used internationally. Inevitably when introducing many topics, discussions will take place about their origins and the cultural influences that influenced the development of these topics i.e. Ancient Greece and the birth of geometry or tessellations in Rangoli patterns. | | | | | |
| Impact | Basic numeracy is an essential life skill that allows students to operate in society and understand the world around them. Students are required to master techniques and develop sufficient understanding to apply them correctly in a range of contexts. Students develop cognitive recall as they must memorise key formulae and recall them accurately. They develop resilience and problem-solving skills through questions that require a combination of techniques to be applied or introduces novel contexts. Critical thinking and analysis are developed throughout the data handling aspects of the curriculum and through error checking of others’ work. Mathematics requires and develops systematic and logical thinking and communication. | | | | | |

|  |
| --- |
| Ways to support student learning in this subject |
| * Encourage the completion of homework. * Discuss maths lessons and their progress. * Involve and engage students with maths in their everyday life. * Encourage a positive attitude towards maths. * Encourage the use of online platforms to allow students to take increasing responsibility for their own learning and progress and for revision prior to assessments. * Encourage students to purchase appropriate revision guides and workbooks for independent revision and practice. |