**Y10 – Mathematics programme of study**

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|  | Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
| Big Ideas | NUMBER: calculations and accuracyALGEBRA: InequalitiesGEOMETRY: volume and surface area | GEOMETRY:MeasuresConstructions and lociLines, angles and shapesALGEBRA:InequalitiesSequences, functions and graphs | ALGEBRA:Sequences, functions and graphsSTATISTICS:Statistical enquiryInterpretationNUMBER:Integers, powers and roots | GEOMETRY: Lines, angles and shapesPythagoras and trigonometryALGEBRA:Simplifying and substituting | ALGEBRA:Simplifying and substitutingForming and solving | NUMBER:FDRPRatio and Proportion |
| Topics | Find upper and lower bounds.Estimate answers to calculationsUse inequality notation to specify error intervals due to rounding.Specify error intervals from truncation.Find the upper and lower bounds of calculations with quantities given to a various degrees of accuracy.Solve linear inequalities with an unknown on one side.Solve linear inequalities with an unknown on both sidesCalculate the volume and surface area of triangular prismCalculate the volume and surface area of cylindersCalculate the volume and surface area of pyramids and spheres | Find the area of a 2D shape given the area of a similar shape and a ratio.Find the volume of a 3D solid given the volume of a similar solid and a ratio.Construct a triangle given SSS.Construct the perpendicular bisector of a line and an angleUnderstand the idea of a locus.Solve loci problems.Recognise congruence and similarityRepresent linear inequalities graphically.Solve simultaneous equations graphically | Use y = mx + c to identify parallel linesFind the equation of a line through two points or one point with a given gradientSketch graphs of quadratic, cubic and reciprocal functions from a table of valuesUse y = mx + c to identify perpendicular linesSolve problems involving the gradients of parallel and perpendicular straight-line graphsRecognise and use sequences of quadratic and geometric sequencesSketch graphs of exponential functionsFind the location of the median from grouped data.Construct and interpret a cumulative frequency diagram.Use a cumulative frequency diagram to estimate the median and interquartile range.Construct and interpret a box plot.Compare two sets of data using box plots.Simplify surds to the form a√b | Use the tangent/radius properties of a circleApply circle theoremsKnow the exact values of sine, cosine and tangent at key angles (0, 30, 45, 60, 90 degrees)Use Pythagoras’ Theorem in 3DUse the formula for area of a non-right-angled triangleFactorise quadratics in the form ax² + bx + c = 0 where a = 1.Recognise and factorise the difference of two squares. | Expand products of more than two binomials.Factorise quadratics in the form ax² + bx + c = 0 where a > 1.Factorise (and solve – HIGHER TIER ONLY) quadratics in the form ax² + bx + c = 0 where a = 1.Solve linear simultaneous equations.Rearrange formulae that include brackets, fractions and square roots.Rearrange formulae where the variable appears twice.Find approximate solutions to equations numerically using iteration.Factorise and solve quadratics in the form ax² + bx + c = 0 where a > 1.Solve quadratics using the quadratic formula. | Convert recurring decimals to fractions and fractions to recurring decimals.Use direct and inverse proportion graphically.Calculate direct and inverse proportion algebraically.Calculate direct and inverse proportion involving squares, cubes and roots. |
| 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.Half term assessment | Formative assessment every lesson.Range of learning & skill-based homework.Half term assessment | Formative assessment every lesson.Range of learning & skill-based homework.Half term assessment | Formative assessment every lesson.Range of learning & skill-based homework. | Formative assessment every lesson.Range of learning & skill-based homework.Half term assessment  | Formative assessment every lesson.Range of learning & skill-based homework.END OF YEAR ASSESSMENT |
| Linked learning | **Number:** The content taught in Year 10 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 throughout KS4.Wider Links: Secure foundations in number are critical to the study of all subjects and to the basic numeracy skills needed in life.**Algebra:** At earlier stages in their learning students will have started to generalise but are unlikely to have formalised this into algebraic statements. Therefore, during KS4 students are developing the foundations of their understanding of algebra, these are essential 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 10 builds on and reinforces the students’ understanding of concepts developed in prior learning and is developed further and applied to increasingly complex problems and contexts throughout KS4.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 10 builds on and reinforces the students’ understanding of concepts developed in prior learning and is developed further and applied to increasingly complex problems and contexts throughout KS4.Wider Links: The interpretation of data and its measures are skills used in a 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 | Some year 10 groups take part in the UKMT Intermediate Maths Challenge and some students take part in the Olympiad or Kangaroo rounds.Count Me In. Visiting STEM ambassadors. |
| 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 maths 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 maths 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 maths 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 maths 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 is developed throughout the data handling aspects of the curriculum and through error checking of others’ work. Maths requires and develops systematic and logical thinking and communication. |

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| 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.
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