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| **Year 10 – Mathematics – 2024-25**  |
| **Curriculum intent** | Through mathematics lessons we promote mathematical thinking to allow all students to achieve their mathematical potential and engage in the study of mathematics. Using a mastery style approach to mathematics allows all students to develop their fluency, reasoning and problem-solving using representations of mathematical ideas. As students progress, topics from previous studies with be interleaved into future learning so students develop application and skill links between different areas of mathematics.In Year 10, students begin their GCSE studies with geometric reasoning by looking more formally at and applying their mathematical reasoning to be able to prove congruency or similarity. Applications of trigonometric ratios are further explored. Higher tier students will study how trigonometry is applied to all triangles through use of the sine and cosine rules. Algebraic skills are enhanced by exploring how equations and inequalities can be represented in different ways – algebraically, using models and or/graphs: including how to form and solve simultaneous equations using a variety of different methods. In term 2, students will return to geometry, looking at angles, bearings and 2D shapes, before moving onto 3D shapes. Higher tier students will start to explore circle theorems. They will work with vectors, including vector arithmetic and vector geometry. Proportional reasoning skills are developed by looking at ratio, fractions, percentages, and interest. This will be applied to a variety of problems from different contexts such as currency conversions, compound interest and exponential change. Reasoning skills will be enhanced further through calculating with probability, including the use of different representations such as frequency tables, Venn diagrams and tree diagrams.As Year 10 continues, students will study data handling – looking at the limitations of data, representing data and evaluating different measures of location and dispersion. They will be encouraged to consider and to be critical of how reliable the data is, and whether it is safe to extrapolate using data which will be presented to them in a variety of forms. Returning to number skills, students will enhance and develop their non-calculator methods for calculations by considering number theory. They will work with primes, powers, roots, and standard index form. Higher tier students will learn about fractional indices, surds, rational/irrational numbers including how to calculate with them. They will work with more complex algebraic fractions and with limits of accuracy. Throughout the year, students will have the opportunity to review and retrieve their understanding from earlier learning. They will be building a secure understanding on which to move into Year 11 where their mathematical journey will continue. |
| **Term** | **Autumn 1** | **Autumn 2** | **Spring 1** | **Spring 2** | **Summer 1** | **Summer 2** |
| **Knowledge** | * Congruence, Similarity, and Enlargement
* Trigonometry
 | * Representing Solutions of Equations and Inequalities
* Simultaneous Equations
 | * Angles and Bearings
* Working with Circles
* Vectors
 | * Ratios and Fractions
* Percentages and Interest
* Probability
 | * Collecting, Representing, and Interpreting data
* Non-calculator Methods
 | * Types of Number and Sequences
* Indices and Roots
* Manipulating Expressions
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| **Term** | **Autumn 1** | **Autumn 2** | **Spring 1** | **Spring 2** | **Summer 1** | **Summer 2** |
| **Skills****Higher Tier Skills in Bold.** | * Extend and formalise knowledge of ratio and proportion in working with geometry and measures.
* Compare lengths, areas and volumes using ratio notation and/or scale factors.
* Make links to similarity.
* Interpret and use fractional **(and negative)** scale factors for enlargement.
* Apply the concepts of congruence and similarity, including the relationships between lengths, **(areas and volumes)** in similar shapes.
* Make and test conjectures about the generalisations that underlie patterns and relationships – look for proofs and counterproofs.
* Develop their mathematical knowledge by solving problems and evaluating outcomes including multi-step problems.
* Extend and formalise knowledge of ratio and proportion in working with trigonometric ratios.
* Apply Pythagoras’ Theorem and trigonometric ratios to find angles and lengths in right-angled triangles in two- **(and three-)** dimensional figures.
* Know the exact values of $sinθ, cosθ, tanθ$ for required angles.
* **Know and apply the sine rule and cosine rule to find unknown lengths and angles.**
* **Know and apply to calculate the area, sides, or angles of any triangle.**
* Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems.
 | * Extend understanding of algebraic simplification and manipulation to include quadratic expressions.
* Translate simple situations or procedures into algebraic expressions or formulae.
* Derive an equation and solve it.
* Recognise, sketch and interpret graphs of linear functions.
* **Factorise quadratic expressions of the form** $x^{2}+bx+c$
* **Solve quadratic equations by factorising.**
* Solve linear inequalities in one **(or two)** variable**(s)** **and quadratic inequalities in one variable.**
* Represent the solution set on a number line, **(using set notation and on a graph).**
* Model situations mathematically and express the results using a range of formal mathematical representations.
* Derive and solve simultaneous equations.
* Solve two simultaneous equations in two variables (linear/linear or **linear/quadratic**) algebraically.
* Recognise, sketch and interpret graphs of linear functions and quadratic functions.
 | * Interpret and use bearings.
* Compare lengths using scale factors.
* Apply Pythagoras’ Theorem and trigonometric ratios to find angles and lengths in right-angled triangles in two-dimensional figures.
* Know the exact values of $sinθ, cosθ, tanθ$ for required angles.
* **Know and apply the sine rule and cosine rule to find unknown lengths and angles.**
* Use mathematical language and properties precisely.
* Reason deductively in geometry, number and algebra using geometrical constructions.
* Identify and apply circle definitions and properties including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment.
* Calculate surface areas and volumes of spheres, pyramids, cones, and composite solids.
* **Apply and prove standard circle theorems concerning angles radii, tangents and chords and use them to prove related results.**
* Describe translations as 2D vectors.
* Apply addition and subtraction of vectors, multiplication of vectors by a scalar.
* Apply diagrammatic and column representation of vectors.
* **Use vectors to construct geometric arguments and proofs.**
 | * Use ratio notation including reduction to simplest form.
* Divide a quantity into two parts in a given *part : part* or *part : whole* ratio.
* Relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions.
* Use compound units such as speed, unit pricing and density to solve problems.
* Compare lengths, areas and volumes using ratio notation and/or scale factors – make links to similarity.
* Consolidation of content from KS3 on percentages.
* Express one quantity as a percentage of another.
* Compare two quantities using percentages and work with percentages greater than 100.
* Solve problems involving percentage change, including percentage increase, decrease and original value problems and simple interest in financial mathematics.
* Set up, solve and interpret the answers in growth and decay problems including compound interest **(and work with general iterative processes.)**
* Know that the probability of an exhaustive set of mutually exclusive events sum to one.
* Use a probability model to predict the outcomes of future experiments.
* Calculate the probability of independent and dependent combined events using probability trees.
* **Calculate and interpret conditional probabilities using expected frequencies with two-way tables, tree diagrams and Venn diagrams.**
 | * Use, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete and continuous data.
* Construct and interpret frequency tables, bar charts, pictograms, vertical line charts for ungrouped and grouped data.
* Describe, interpret, and compare graphical representations involving discrete, continuous and grouped data including calculations of the mean, median, mode and spread of the data.
* Infer properties of populations whilst knowing the limitations of sampling.
* **Construct and interpret diagrams for grouped date and discrete data, for example, histograms and cumulative frequency graphs, including boxplots.**
* **Interpret, analyse, and compare measures of spread including modal class, quartiles and interquartile range.**
* Calculate exactly with fractions, **(surds)** and multiples of $π$.
* **Simplify surd expressions involving squares and rationalise denominators.**
* **Change recurring decimals into their corresponding fractions and vice versa.**
* Apply and interpret limits of accuracy when rounding or truncating **(including upper and lower bounds).**
 | * Identify, use, and calculate with factors, multiples, primes, HCF and LCM.
* Describe and continue sequences.
* Recognise and use sequences of triangular numbers, simple arithmetic progressions and Fibonacci type sequences, quadratic sequences, and simple geometric progressions.
* Deduce expressions to calculate the nth term of linear **(and quadratic)** sequences.
* Recognise and use sequences of square and cube numbers.
* **Estimate powers and roots of any given number.**
* Calculate with roots, and with integer **(and fractional)** indices.
* Calculate with numbers in standard form $A×10^{n}$.
* Simplify expressions involving sums, products and powers including the laws of indices.
* Simplify and manipulate algebraic expressions **including those involving surds and algebraic fractions** by factorising quadratic expressions.
* Know the difference between an equation and an identity.
* Argue mathematically to show algebraic expressions are equivalent.
* **Use algebra to support and construct proofs.**
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| **Assessments** | * In class assessments.
* End of unit assessments.
 | * In class assessments.
* End of unit assessments.
 | * In class assessments.
* End of unit assessments.
 | * In class assessments.
* End of unit assessments.
 | * In class assessments.
* End of unit assessments.
* Mock examinations.
 | * In class assessments.
* End of unit assessments.
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| **Enrichment** | * Try out some of the UKMT Intermediate Challenge questions – some students get the chance to enter in January!) https://www.interactive-maths.com/ukmt-random-question-generator.html
* Did you know you can use Sparx Maths for independent work in addition to your homework? https://www.sparxmaths.uk/
* Use Corbettmaths for extra resources such as videos and topic worksheets. https://corbettmaths.com/
 | * If you’ve been selected for the UKMT Intermediate Challenge questions – get some extra practice in!

https://www.interactive-maths.com/ukmt-random-question-generator.html * Prepare for the end of term assessment by using the following websites: https://corbettmaths.com/

https://www.mathsgenie.co.uk/ Want to graph your simultaneous equations? Try Desmos to use their graphing calculator to check the graphs of your equations. https://www.desmos.com/ | * Try doing some online practice papers – can you answer the demon questions on this website? https://www.onmaths.com/
* Looking for some challenging problem-solving questions – try https://parallel.org.uk/
* Need to graph your equations? Try Desmos to use their graphing calculator to check the graphs of your equations. https://www.desmos.com/
* Curious about geometry and want some challenges? Check out the activities on NRich. https://nrich.maths.org/11361
 | * Want to see how to apply your number problem-solving skills? Check out the activities on NRich – Number. https://nrich.maths.org/11359
* NRich also have lots of problem-solving skills related to probability and statistics on: https://nrich.maths.org/11362
 | * Have you checked out the following websites for extra revision resources? https://corbettmaths.com/

https://www.mathsgenie.co.uk/ https://www.onmaths.com/* In the book “If the World Were a Village” the authors imagine the world as a village and show different world statistics in terms of the number of villagers. Can you represent your own country in a similar way? Use the NRich activity below to get started. https://nrich.maths.org/picturingtheworld
 | * Can you solve this problem? What number, when multiplied by itself, is equal to 27 x 147?
* What is the smallest number divisible by 1, 2, 3, 4, 5, 6, 7, 8 and 9?
* What about this problem involving indices?Five numbers are arranged in order from least to greatest:$$x,x^{3}, x^{4}, x^{2}, x^{0}$$

Where does $-x^{-1}$ belong in the list above? |