

Subject Curriculum Overview for Academic Year 2023/2024

Subject: Mathematics		Subject Leader: Mr S Card	Year 10 Higher	AUTUMN TERM
Topic	Key Learning Points		Key Vocabulary	Assessments
Unit 1 - Number	<p>Key Knowledge</p> <ul style="list-style-type: none"> Permutations means the ways a group of items can be arranged in ordered sets (the order of the arrangement matters) e.g. 123: 123, 132, 213, 231, 312, 321. Combinations means the ways of selecting items from a collection in unordered sets (the order of the arrangement doesn't matter) or sometimes allowing for repetition e.g. 123: 111, 112, 122, 222 etc. To estimate means to make an approximate calculation, based on rounding. A prime factor is a prime number that divides exactly into another given number. In prime factorisation, a number is written as the product of its prime factors. An index (exponent, power or order) is a small number placed to the upper right of a base number which shows how many copies of the base number are multiplied together. Standard Form is a method for writing numbers as a number between 1 and 10 multiplied by a power of 10 i.e. $876 = 8.76 \times 10^2$. Surd is another name for an irrational number. A surd is a real number that can be written as a nonrepeating or nonterminating decimal but not as a fraction. To rationalise the denominator means to manipulate a surd denominator so that it becomes an integer. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Use pictures or lists of combinations to help to solve problems. Calculate combinations and permutations to help to solve problems. Use rounding to be able to estimate an answer. Use place value to answer questions. Write a number as the product of its prime factors. Find the HCF and LCM of two numbers. Use powers and roots in calculations. Multiply and divide using index laws. Work out a power raised to a power. Use negative indices. Use fractional indices. Write a number in standard form. 		Combination Permutation Estimating Prime Factor Indices Standard Form Surd Rationalise Denominator	Units 1-2 will be assessed before the Autumn half term holiday

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	<ul style="list-style-type: none"> Calculate with numbers in standard form. Understand the difference between rational and irrational numbers. Simplify a surd. Rationalise a denominator. 		Units 1-2 will be assessed before the Autumn half term holiday
Unit 2- Algebra	<p>Key Knowledge</p> <ul style="list-style-type: none"> Factorise means finding the factors of an expression. Factorising is the reverse of expanding brackets. Solving an equation involves finding numerical values for all the variables that make the equation true. The substitution of numbers means to swap numbers for variables to simplify or solve expressions and equations. An expression is one or a group of terms. It may include variables, constants, operators and grouping symbols. A Formula is a mathematical rule written using symbols, usually as an equation describing a certain relationship between quantities. An identity is an equation that holds true for all of its variables, e.g. $a/2 = a \times 0.5$. An Arithmetic Sequence is a common number sequence where the same value is added each time. A Geometric number sequence is one where successive numbers are multiplied by the same value each time. A Quadratic Sequence is one where the second difference is the same value added each time. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Use the rules of indices to simplify algebraic expressions. Expand brackets. Factorise algebraic expressions. Solve equations involving brackets and numerical fractions. Use equations to solve problems. Substitute numbers into formulae. Rearrange formulae. Distinguish between expressions, equations, formulae and identities. Find the general term or nth term of an arithmetic sequence. Determine whether a particular number is a term of a given arithmetic sequence. 	<p>Factorise</p> <p>Solve</p> <p>Substitute</p> <p>Rearrange</p> <p>Expressions</p> <p>Equations</p> <p>Formulae</p> <p>Identities</p> <p>Arithmetic</p> <p>Geometric</p> <p>Quadratic</p>	

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	<ul style="list-style-type: none"> Solve problems using geometric sequences. Work out terms in Fibonacci sequences. Find the nth term of a quadratic sequence. Expand the product of two brackets. Use the difference of two squares. Factorise quadratics expressions of the form '$x^2 + bx + c$'. 		
Unit 3 – Interpreting and Representing Data	<p>Key Knowledge</p> <ul style="list-style-type: none"> A Stem and Leaf is a data display that shows groups of data arranged by place value. A Frequency Polygon is a line graph which joins the midpoints of the top of the bars on a frequency histogram. A time series graph shows data fluctuations over time and is used to predict trends, cycles and seasonality. A scatter plot is a diagram where points are plotted to show the relationship (correlation) between two variables. The Mean is the total of all the scores or amounts, divided by, how many scores or amounts there were. The Median a type of average which is the middle value of an ordered set of data values. The Mode in a set of scores, values or numbers the mode is the one that occurs the most. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Construct and use back-to-back stem and leaf diagrams. Construct and use frequency polygons and pie charts. Plot and interpret time series graphs. Use trends to predict what might happen in the future. Plot and interpret scatter graphs. Determine whether or not there is a linear relationship between two variables. Draw a line of best fit on a scatter graph. Use the line of best fit to predict values. Decide which average is best for a set of data. Estimate the mean and range from a grouped frequency table. Find the modal class and the class containing the median. Construct and use two-way tables. Choose appropriate diagrams to display data. Recognise misleading graphs. 	<p>Stem and Leaf Frequency Polygon Time Series Scatter Mean Median Mode Class</p>	<p>Units 3-5 will be assessed before the Christmas holiday</p>

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Unit 4 – Fractions, Ratios and Percentages	<p>Key Knowledge</p> <ul style="list-style-type: none"> A reciprocal is one of two numbers whose product is 1 i.e. $n \times 1/n = 1$. It may be written as $1/n$ or n^{-1}. To get the reciprocal of a number, divide 1 by the number. A Ratio is commonly a comparison of two values of the same kind, which may be written as a to b, a:b or as a fraction a/b. being in proportion means that two ratios or fractions are of equal value. a decimal which has repeating digits or a repeating pattern of digits. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Add, subtract, multiply and divide fractions and mixed numbers. Find the reciprocal of an integer, decimal or fraction. Write ratios in the form $1 : n$ or $n : 1$. Compare ratios. Find quantities using ratios. Solve problems involving ratios. Use bar models to help solve problems. Convert between currencies and measures. Recognise and use direct proportion. Solve problems involving ratios and proportion. Calculate using percentages and ratios. Work out percentage increases and decreases. Solve real-life problems involving percentages. Calculate using fractions, decimals and percentages. Convert a recurring decimal to a fraction. 	Reciprocal Ratio Currency Proportion Increase Decrease Recurring	Units 3-5 will be assessed before the Christmas holiday
Unit 5 – Angles and Trigonometry	<p>Key Knowledge</p> <ul style="list-style-type: none"> An exterior angle is the angle formed outside a polygon when one side is extended. An interior angle is the angle within a polygon. A polygon is a plane shape having three or more straight sides. The Hypotenuse is the longest side on a right-angled triangle. Pythagoras' theorem says that the area of the square built upon the hypotenuse of a right-angled triangle is equal to the sum of the areas of the squares upon the remaining sides or $c^2 = a^2 + b^2$. 	Sum Exterior Interior Polygon Hypotenuse Pythagoras Trigonometric Sine Cosine Tangent	

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	<ul style="list-style-type: none">• Trigonometry is the branch of mathematics that deals with triangles and their sides and angles.• In a right-angled triangle Sine is a ratio of the length of the opposite side to the length of the hypotenuse.• In a right-angled triangle Cosine is a ratio of the length of the adjacent side to the length of the hypotenuse.• In a right-angled triangle Tangent is a ratio of the length of the opposite side to the length of the adjacent side. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none">• Derive and use the sum of angles in a triangle and in a quadrilateral.• Derive and use the fact that the exterior angle of a triangle is equal to the sum of the two opposite interior angles.• Calculate the sum of the interior angles of a polygon.• Use the interior angles of polygons to solve problems.• Use x for the unknown to help you solve problems.• Know the sum of the exterior angles of a polygon.• Use the angles of polygons to solve problems.• Calculate the length of the hypotenuse in a right-angled triangle.• Solve problems using Pythagoras' theorem.• Calculate the length of a shorter side in a right-angled triangle.• Solve problems using Pythagoras' theorem.• Use trigonometric ratios to find lengths in a right-angled triangle.• Use trigonometric ratios to solve problems.• Find angles of elevation and angles of depression.• Use trigonometric ratios to calculate an angle in a right-angled triangle.• Use trigonometric ratios to solve problems.• Know the exact values of the sine, cosine and tangent of some angles.		Units 3-5 will be assessed before the Christmas holiday
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Subject: Mathematics		Subject Leader: Mr S Card	Year 10 Higher	SPRING TERM
Topic	Key Learning Points		Key Vocabulary	Assessments
Unit 6 – Graphs	<p>Key Knowledge</p> <ul style="list-style-type: none"> • gradient is the steepness and direction of a line as read from left to right. • The intersect is where the line plotted crosses the y axis. • Speed is how fast something is moving, how far it travels in a given time. speed = distance ÷ time. • Velocity is a measure of the rate of motion of a body expressed as the rate of change of its position in a particular direction with time. • Midpoint is the point in the middle of a line segment, that is, a point dividing a line segment in half. • Parallel lines are equidistant, that is, the same distance apart, never touching. • Perpendicular means lines at right angles to each other, the horizon or another object. • quadratic equations contain terms with powers no higher than two, often in the form $ax^2 + bx + c = 0$ where x is the variable. • an object is symmetrical when one half is a mirror image of the other half. • A cubic expression is an expression, polynomial or equation of degree 3, degree 3 or to the power of 3 means cubed. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> • Find the gradient and y-intercept from a linear equation. • Rearrange an equation into the form $y = mx + c$. • Compare two graphs from their equations. • Plot graphs with equations $ax + by = c$. • Sketch graphs using the gradient and intercepts. • Find the equation of a line, given its gradient and one point on the line. • Find the gradient of a line through two points. • Draw and interpret distance/time graphs. • Calculate average speed from a distance/time graph. • Understand velocity/time graphs. • Find acceleration and distance from velocity/time graphs. • Draw and interpret real-life linear graphs. • Recognise direct proportion. 		Gradient Intercept Speed Distance Velocity Proportion Midpoint Line Segment Parallel Perpendicular Quadratic Symmetry Cubic	Units 6 and 7 will be assessed before the Spring half term holiday

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	<ul style="list-style-type: none"> • Draw and use a line of best fit. • Find the coordinates of the midpoint of a line segment. • Find the gradient and length of a line segment. • Find the equations of lines parallel or perpendicular to a given line. • Draw quadratic graphs. • Solve quadratic equations using graphs. • Identify the line of symmetry of a quadratic graph. • Interpret quadratic graphs relating to real-life situations. • Draw graphs of cubic functions. • Solve cubic equations using graphs. • Draw graphs of reciprocal functions. • Recognise a graph from its shape. • Interpret linear and non-linear real-life graphs. • Draw the graph of a circle. 		
Unit 7 – Area and Volume	<p>Key Knowledge</p> <ul style="list-style-type: none"> • Area is the size a surface takes up. • Perimeter is the distance around the outside of a shape, calculated by adding the length of all sides together. • The metric system is a decimal system of measurement based on 10. • An arc is a section of a curve, part of a circle. • A semi-circle is half of a circle, bounded by the diameter and an arc. • A prism is a solid three-dimensional shape with two identical, parallel polygon bases. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> • Find the area and perimeter of compound shapes. • Recall and use the formula for the area of a trapezium. • Convert between metric units of area. • Write error intervals for rounded values. • Calculate upper and lower bounds. • Convert between metric units of volume. • Calculate volumes and surface areas of prisms. • Calculate the area and circumference of a circle. • Calculate area and circumference in terms of π. • Calculate the perimeter and area of semicircles and quarter circles. • Calculate arc lengths, angles and areas of sectors of circles. • Calculate volume and surface area of a cylinder and a sphere. 	<p>Area Perimeter Metric Error Interval Surface Area Arc Semicircle Prism</p>	<p>Units 6 and 7 will be assessed before the Spring half term holiday</p>

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	<ul style="list-style-type: none"> Solve problems involving volumes and surface areas. Calculate volume and surface area of pyramids and cones. Use a flow diagram to help you solve problems. 		
Unit 8 – Transformations and Constructions	<p>Key Knowledge</p> <ul style="list-style-type: none"> A plan view is a technical drawing showing the details of an object viewed from directly above. A side elevation is the height of an object above a given level, often the bottom of the shape. Rotation means to turn an object around a centre point. The angle of rotation is measured in degrees. In a reflection, a shape is flipped over a mirror line or line of reflection to face the opposite direction. Translation means to move an item in any direction without rotating it. Enlargement is a transformation where a shape is made larger(or smaller if reversed) without changing its position or direction. A vector is a mathematical quantity used to describe the motion of objects. A vector has both magnitude and direction and may be described using letters, coordinates matrices or arrows. In scale drawings – scale is the ratio of the measurement on the drawing compared to the measurement of the original subject. A bearing is the angle of direction in relation to a north-south line. It is measured in degrees from the north in a clockwise direction. Bisect means to divide into two equal sections, cut in half. A locus is a set of points that satisfy a particular condition or rule. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Draw plans and elevations of 3D solids. Reflect a 2D shape in a mirror line. Rotate a 2D shape around a centre of rotation. Describe reflections and rotations. Carry out and describe combinations of reflections. Enlarge shapes by fractional and negative scale factors about a centre of enlargement. Translate a shape using a vector. Carry out and describe combinations of different transformations. Draw and use scales on maps and scale drawings. 	Plan Elevation Rotation Reflection Translation Enlargement Vector Scale Bearings Perpendicular Bisector Loci	Units 8-10 will be assessed before the Easter holiday

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	<ul style="list-style-type: none"> Solve problems involving bearings. Construct triangles using a ruler and compasses. Construct the perpendicular bisector of a line. Construct the shortest distance from a point to a line using a ruler and compasses. Bisect an angle using a ruler and compasses. Construct angles using a ruler and compasses. Construct shapes made from triangles using a ruler and compasses. Draw a locus. Use loci to solve problems. 		
Unit 9 – Equations and Inequalities	<p>Key Knowledge</p> <ul style="list-style-type: none"> quadratic equations contain terms with powers no higher than two, often in the form $ax^2 + bx + c = 0$ where x is the variable. Completing the square is a technique for converting a quadratic polynomial into a form which is solvable or easier to manipulate, if it cannot be factorised. Simultaneous equations involve two unknowns in two or more equations, which require both equations to be solved at the same time (simultaneously). <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Solve inequalities and show the solution on a number line and using set notation. Rearrange and solve quadratic equations. Find the roots of quadratic equations. Solve more complex quadratic equations. Use the quadratic formula to solve a quadratic equation. Complete the square for a quadratic expression. Solve quadratic equations by completing the square. Solve simple simultaneous equations. Solve simultaneous equations for real-life situations. Use simultaneous equations to find the equation of a straight line. Solve linear simultaneous equations where both equations are multiplied. Write equations involving two unknowns to describe real-life situations, and then solve them. 	<p>Quadratic Complete the Square Simultaneous</p>	<p>Units 8-10 will be assessed before the Easter holiday</p>

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Unit 10 - Probability	<p>Key Knowledge</p> <ul style="list-style-type: none"> The product is the result when two numbers are multiplied. Two-way tables are used to study the relationship between categorical variables. Mutually exclusive means two events that cannot happen at the same time in a probability experiment. The probability for mutually exclusive events is 0. In theoretical probability the probability of an outcome is a number between 0 and 1 that indicates the chance or likelihood of an event happening. A Frequency Tree is a diagram used to organise the outcomes of two or more events with various possible outcomes. A Venn diagram is a diagram using circles or other shapes, to show the relationship between sets. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Use the product rule for finding the number of outcomes for two or more events. Use two-way tables and sample space diagrams to solve probability problems. Identify mutually exclusive outcomes and events. Find the probabilities of mutually exclusive outcomes and events. Solve probability problems. Estimate the expected results for experimental and theoretical probabilities. Compare real results with theoretical expected values to decide if a game is fair. Draw and use frequency trees. Calculate probabilities of independent events. Use probability tree diagrams to solve problems. Decide if two events are independent. Draw and use tree diagrams to solve conditional probability problems. Use two-way tables to calculate conditional probability. Use set notation. Use Venn diagrams to solve conditional probability problems. 	<p>Product Rule Sample Space Mutually Exclusive Experimental Theoretical Frequency Tree Conditional Venn Diagram</p>	<p>Units 8-10 will be assessed before the Easter holiday</p>
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Subject: Mathematics		Subject Leader: Mr S Card	Year 10 Higher	SUMMER TERM
Topic	Key Learning Points		Key Vocabulary	Assessments
Unit 11 – Multiplicative Reasoning	<p>Key Knowledge</p> <ul style="list-style-type: none"> Compound growth is growth that is calculated on both the principal and any accrued growth added to the sum. Compound decay is loss that is calculated on both the principal and any accrued loss subtracted from the sum. Acceleration is the rate at which velocity changes with time, in terms of both speed and direction. Congruent means having the same shape and the same size In scale drawings – scale is the ratio of the measurement on the drawing compared to the measurement of the original subject. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> Find an amount after repeated percentage changes. Solve growth and decay problems. Solve problems using an iterative process. Calculate rates. Convert between metric speed measures. Use a formula to calculate speed and acceleration. Solve problems involving compound measures. Use relationships involving ratio. Use direct and indirect proportion. Show that two triangles are congruent. Know the conditions of congruence. Prove shapes are congruent. Solve problems involving congruence. Use geometric sketching to help solve congruency problems. Use the ratio of corresponding sides to work out scale factors. Find missing lengths on similar shapes. Use geometric sketching to help solve similarity problems. Use similar triangles to work out lengths in real life. Use the link between linear scale factor and area scale factor to solve problems. Use the links between scale factors for length, area and volume to solve problems. 		<p>Growth Decay Acceleration Congruency Scale factor</p>	<p>Units 11-12 will be assessed before the Summer half term holiday</p>

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Unit 12 – Further Statistics	<p>Key Knowledge</p> <ul style="list-style-type: none"> • Random means without any particular order or pattern. Picking at random means a chance pick from a number of items, like drawing a number out of a hat. • A sample is a section of a whole group. • Cumulative Frequency is a running total of frequencies. • Quartiles are found using medians to divide a data set into quarters. • Quartile 1 (Q1) is the median of the lower half of the values • Quartile 3 (Q3) is the median of the upper half of the values. • The Interquartile range is Q3 subtract Q1 • A Box Plot is a diagram or graph using a number line to show the distribution of a set of data. • A Histogram is a graph using bars to represent frequency distribution where, bar heights represent the score frequency density and area is frequency. There are no spaces between the bars. <p>Applying Knowledge/Methods</p> <ul style="list-style-type: none"> • Use random numbers to select a random sample. • Understand the assumptions made when using a sample to predict results for a population. • Use the Petersen capture–recapture method. • Draw and interpret cumulative frequency tables and graphs. • Work out the median, quartiles and interquartile range from a cumulative frequency graph. • Find the quartiles and the interquartile range from stem-and-leaf diagrams. • Draw and interpret box plots. • Understand frequency density. • Draw histograms. • Interpret histograms. • Solve problems by comparing distributions. 	<p>Random Sample Cumulative Frequency Quartile Inter Quartile Box Plot Histogram</p>	<p>Units 11-12 will be assessed before the Summer half term holiday</p>
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How parents can support learning in the subject this academic year

At the beginning of each new block of work, students will stick a **Knowledge Checklist** into their orange book. This contains a list of the learning objectives for the block (given above), key vocabulary which has been carefully defined and important facts that the students need to know. Helping students to learn the vocabulary and key knowledge will be hugely beneficial to their progress. These can be used for pre-learning to gain an insight into what is coming up, consolidation of understanding or catching up on work missed.

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Practice is important so please encourage students to complete homework on a weekly basis, suggest they attend Maths Club (Monday after school) which allows them to work on any aspect of their maths with support from several teachers or develop their interest in other areas of maths. Talking and using maths at home is a great way to link maths to everyday situations, for instance scaling up or down ingredients for a recipe, discussing time or money, estimating costs, looking at best value products in the supermarket, converting between units of measure etc.

Due to the hierarchical structure of Mathematics, it is vital that students catch up on any work missed through absences. If a student is absent they are expected to use their Knowledge Checklist to locate a video clip which will explain the work. Students should copy down the examples and work through the questions given. When they return they will need to copy up the missed notes from another student. If they need support with the work then please encourage them to attend Maths Club where staff will be there to help and support.

Recommended Reading

Humble Pi – A comedy of maths errors – Matt Parker
The man who knew infinity – Robert Kanigel
Flatterland – Ian Stewart
Can you solve my problems – Alex Bellos
The number Mysteries – Marcus du Sautoy
Math with bad drawings: Illuminating the ideas that shape our reality – Ben Orlin

Points to note

Students are expected to bring a scientific calculator to every maths lesson. The model we currently recommend is the Casio Classwiz FX-83GTX-S. This calculator can be purchased through the school via Parentpay.