# Subject Curriculum Overview for Academic Year 2024/2025

| Subject: Mathematics | Subject Leader: Mr S Card | Year 11 Higher | |
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| **Topic** | **Key Learning Points** | **Key Vocabulary** | **Assessments** |
| Unit 1 – Equations and graphs | **Key Knowledge**<br>• Simultaneous equations involve two unknowns in two or more equations, which require both equations to be solved at the same time (simultaneously)<br>• Quadratic equations contain terms with powers no higher than two, often in the form $ax^2 + bx + c = 0$ where x is the variable<br>• The quadratic formula is $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$<br>• 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<br><br>**Applying Knowledge/Methods**<br>• Solve simultaneous equations graphically<br>• Represent inequalities on a graph<br>• Interpret graphs of inequalities<br>• Find roots of quadratic equations<br>• Sketch quadratic graphs<br>• Solve quadratic inequalities<br>• Expand triple brackets<br>• Find the roots of cubic equations<br>• Sketch graphs of cubic equations<br>• Solve quadratic and cubic equations using an iterative process | Simultaneous equation<br>Inequality<br>Roots<br>Turning points<br>Quadratic<br>Cubic<br>Iterative | Units 1 and 2 will be assessed by October half term. |

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| Unit 2 – Circle theorems | **Key Knowledge**<br>• Two radii and a chord make an isosceles triangle<br>• The perpendicular line from the centre to the chord will always bisect the chord (split it into two equal lengths)<br>• Angles formed from two points on the circumference of a circle are equal to other angles, in the same arc, formed from those two points (known as angles subtended from the same arc)<br>• Angles formed by drawing lines from the ends of the diameter of a circle to its circumference form a right angle.<br>• A tangent to a circle is a straight line which touches the circle at only one point (so it does not cross the circle- it just touches it).<br>• A tangent to a circle forms a right angle with the circle's radius, at the point of contact of the tangent.<br>• If two tangents are drawn to a circle and they cross, the lengths of the two tangents (from the point where they touch the circle to the point where they cross) will be the same.<br>• The angle formed at the centre of the circle by lines originating from two points on the circle's circumference is double the angle formed on the circumference of the circle by lines originating from the same points.<br>• A cyclic quadrilateral is a four-sided figure in a circle, with each vertex (corner) of the quadrilateral touching the circumference of the circle. The opposite angles of such a quadrilateral add up to 180 degrees.<br>• The alternate segment theorem (also known as the tangent-chord theorem) states that in any circle, the angle between a chord and a tangent through one of the end points of the chord is equal to the angle in the alternate segment.<br><br>**Applying Knowledge/Methods**<br>• Understand and use facts about chord and their distances from the centre of a circle<br>• Solve problems involving chords and radii<br>• Understand and use facts about tangents at a point and from a point | Radius/ Radii<br>Chord<br>Perpendicular<br>Centre<br>Bisect<br>Circumference<br>Subtended<br>Arc<br>Tangent<br>Cyclic quadrilateral | Units 1 and 2 will be assessed by October half term |

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| | • Solve angle and length problems involving circles and tangents<br>• Understand, prove and use facts about angles subtended at the centre and the circumference of circles<br>• Understand, prove and use facts about the angle in a semi-circle<br>• Understand, prove and use facts about angles subtended at the circumference of a circle.<br>• Understand, prove and use facts about cyclic quadrilaterals.<br>• Prove the alternate segment theorem.<br>• Solve angle problems using circle theorems.<br>• Find the equation of the tangent to a circle at a given point. | | |
| Unit 3 – More algebra | **Key Knowledge**<br>• As with numerical fractions, when adding or subtracting algebraic fractions, we must first find a common denominator<br>• 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.<br>• To rationalise the denominator means to manipulate a surd denominator so that it becomes and integer.<br>• F(x) is an example of function notation<br>• Fg(x) is an example of composite function notation<br>• $F^{-1}(x)$ is an example of inverse function notation<br><br>**Applying Knowledge/Methods**<br>• Change the subject of a formula where the power or root of the subject appears<br>• Change the subject of a formula where the subject appears twice<br>• Add and subtract algebraic fractions<br>• Multiply and divide algebraic fractions<br>• Change the subject of a formula involving fractions where all the variables are in the denominators<br>• Simplify algebraic fractions<br>• Add and subtract more complex algebraic fractions<br>• Multiply and divide more complex algebraic fractions<br>• Prove a result using algebra | Formula<br>Power<br>Root<br>Surd<br>Irrational<br>Rationalise<br>Function<br>Composite<br>Inverse | Units 3 and 4 will be assessed by end of Autumn Term |

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| | • Simplify expressions involving surds<br>• Expand expressions involving surds<br>• Rationalise the denominator of a fraction<br>• Solve equations involving algebraic fractions<br>• Use function notation<br>• Find composite functions<br>• Find inverse functions | | |
| Unit 4 – Vectors and geometric proof | **Key Knowledge**<br>• The magnitude of a vector is the size of a vector. It can be calculated using Pythagoras' Theorem<br>• A resultant vector is the vector sum of two or more individual vectors<br><br>**Applying Knowledge/Methods**<br>• Understand and use vector notation<br>• Work out the magnitude of a vector<br>• Calculate using vectors and represent solutions graphically<br>• Identify when vectors are parallel<br>• Calculate the resultant of two vectors<br>• Solve problems using vectors<br>• Use the resultant of two vectors to solve vector problems<br>• Express points as position vectors<br>• Prove lines are parallel<br>• Prove points are collinear<br>• Solve geometric problems in two dimensions using vector methods, including where vectors are divided in a given ratio.<br>• Apply vector methods for simple geometric proofs. | Magnitude<br>Parallel<br>Resultant<br>Collinear<br>Geometric | Units 3 and 4 will be assessed by end of Autumn Term |
| Unit 5 - ICT | 4 ICT units will be taught as part of the Maths Curriculum<br><br>1. Context based Number Problems<br>***Rationale: Be able to explain what abstraction is.*** | Abstraction<br>Sequences | Units 5, 6 and 7 will be assessed by February Half Term. |

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| | 2. Surface area problems<br>***Rationale: Be able to apply abstraction to solve set problems.***<br><br>3. Finding the nth term of Linear and Quadratic Sequences<br>***Rationale: Be able to explain what pattern recognition is.***<br><br>4. Solving Sequences Problems<br>***Rationale: Be able to apply pattern recognition to solve set problems.*** | | |
| Unit 6 – More trigonometry | **Key Knowledge**<br>• 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 $c^2 = a^2 + b^2$.<br>• Trigonometry is the branch of mathematics that deals with triangles and their sides and angles.<br>• In a right-angled triangle Sine is a ratio of the length of the opposite side to the length of the hypotenuse.<br>• In a right-angled triangle Cosine is a ratio of the length of the adjacent side to the length of the hypotenuse.<br>• In a right-angled triangle Tangent is a ratio of the length of the opposite side to the length of the adjacent side.<br>• To find the area of a triangle, we can use the formula $\frac{1}{2}abSin(c)$<br><br>**Applying Knowledge/Methods**<br>• Understand how to find the sine of any angle<br>• Draw the graph of the sine function and use it to solve equations<br>• Understand how to find the cosine of any angle<br>• Draw the graph of the cosine function and use it to solve equations<br>• Understand how to find the tangent of any angle<br>• Draw the graph of the tangent function and use it to solve equations<br>• Use the sine rule to solve 2D problems<br>• Use the cosine rule to solve 2D problems<br>• Use $\frac{1}{2}abSin(c)$ to find the area of a triangle | Pythagoras' Theorem<br>Sine<br>Cosine<br>Tangent<br>Bearings<br>Trigonometric | |

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| | • Solve bearings problems using trigonometry<br>• Use Pythagoras' Theorem in 3D<br>• Use trigonometry in 3D<br>• Before transformations on trigonometric graphs<br>• Recognise transformations on trigonometric graphs | | |
| Unit 7 – Proportion and graphs | **Key Knowledge**<br>• y α x means y is directly proportional to x. The associated equation is y = kx<br>• y α $\frac{1}{x}$ means y is inversely proportional to x. The associated equation is y = $\frac{k}{x}$<br>• y α $x^2$ means y is directly proportional to x. The associated equation is y = $kx^2$<br>• y α $\frac{1}{x^2}$ means y is inversely proportional to x. The associated equation is y = $\frac{k}{x^2}$<br>• y α $x^3$ means y is directly proportional to x. The associated equation is y = $kx^3$<br>• y α $\frac{1}{x^3}$ means y is inversely proportional to x. The associated equation is y = $\frac{k}{x^3}$<br><br>**Applying Knowledge/Methods**<br>• Write and use equations involving direct proportion<br>• Write and use equations to solve problems involving direct proportion<br>• Solve problems involving square and cubic proportionality<br>• Write and use equations involving inverse proportion<br>• Write and use equations to solve problems involving inverse proportion<br>• Use and recognise graphs showing inverse proportion<br>• Recognise and draw graphs of exponential functions | Directional proportional<br>Inversely proportional<br>Exponential<br>Tangent<br>Translation<br>Reflection | Units 5 and 6 will be assessed by February Half Term. |

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| | • Match equations to their graphs<br>• Calculate the gradient of a tangent at a point<br>• Estimate the area under a non-linear graph<br>• Understand the relationship between translating a graph and the change in its function notation<br>• Understand the effect reflecting a curve in one of the axes has on its function form. | | |

## 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.

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

Murderous Maths Series – Poskitt Kjartan
Look into my eyes (Ruby Redfort) – Lauren Child
The number devil: A Mathematical adventure – Hans Magnus Enzensberger
Alex's adventures in Numberland – Alex Bellos
Can you solve my problems? – Allex Bellos
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.