MATHEMATICS

Year 11

What are the aims and intentions of this curriculum?

The aim of our Key Stage 4 Curriculum is to enable students to:

- Develop fluent knowledge, skills and understanding of mathematical methods and concepts
- To make the connection with the KS3 curriculum
- Acquire, select and apply mathematical techniques to solve problems
- Reason mathematically, make deductions and inferences and draw conclusions
- Comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

Throughout KS4: Students will need to keep working on key skills as they occur within other topics, as well as when the skills are being explicitly addressed. These include: Addition, subtraction, multiplication and division; order of operations; fractions, decimals and percentages; rounding and estimation; and algebraic notation.

Term	Topics	Knowledge and key terms	Skills developed	Assessment
Summer 2	• Probability ➢ Sample spaces ➢ The probability scale Most able: ➢ Conditional probability	**Students will be able to:** • Use knowledge of Populations and samples (Capture and Recapture) • Understand and use Sample spaces and listing • Systematically list outcomes using a variety of representations • Review and consolidate theoretical and experimental probability • **Use Probability of combined events, including tree diagrams and use of Venn diagrams to problem solve.** • **Understand what is meant by conditional probability** • **Calculate conditional probabilities** • **Establish whether two events are independent** • **Solve more complex problems involving tree diagrams** • Understand that different trials of an experiment may produce different outcomes • Solving simultaneous equations one linear and one quadratic	• **Make deductions and inferences** of complex information and draw conclusions • **Interpret and communicate** complex information accurately • **Assess the validity** of a complex argument and critically evaluate a given way of presenting information • Branches on a probability tree have a sum of one as they are mutually exclusive. • Conditional probability is where the outcome of a future event is dependent on the outcome of a previous event. • Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams	• Pixi Maths RAG • Maths Takeaway • Maths Watch homework • **AO1: Use and apply standard techniques** • **AO2: Reason, interpret and communicate mathematically** • **AO3: Solve problems within mathematics**

	• Algebra ➢ Further simultaneous equations ➢ Algebraic fractions •	• Simplify algebraic fractions and solve an algebraic fractional equation. • Manipulate algebraic fractions use mainly common denominators to add and subtract algebraic fractions • Use graphs to solve system of equations Revisit Quadratic Inequalities.	• argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula •	**and in other contexts**
Autumn 1	• Number • Indices, Surds • Algebra (Consolidating Year 10 Algebra) • Complex Quadratic equations • Quadratic Inequalities • Circle Theorems	**Students will be able to:** • Know and use the laws of indices. • **Simplify surd expressions involving squares including expanding brackets and rationalise denominators** • Simplify and manipulate algebraic expressions involving **algebraic fractions** • Simplifying, expanding and factorising single brackets, substitution, solving linear equation and inequalities. • Review basics, solving equations, rearranging and solving equations and Inequalities. Linear simultaneous equations, Simplifying and expanding quadratic brackets. • Simplify and manipulate algebraic expressions (**including those involving surds and algebraic fractions)** by expanding products of two or more binomials. • **Find roots of an equation by completing the square and using the quadratic formula.** • **Solve quadratic inequalities in one variable and identifying the regions** • Express solutions to inequalities using set notation • **Solve two simultaneous equations in two variables where one is quadratic algebraically** • **Review the equation of a circle –Finding the point of intersection of a circle and a line.**	• Evaluate simple fractional and negative indices in the form • Understand what a surd is and simplify basic surds. • Solve equations with algebra and indices mixed. • Consolidate their numerical and mathematical capability from key stage 3 • Select and use appropriate calculation strategies to solve increasingly complex problems • Extend fluency with expressions and equations from key stage 3, to include quadratic equations, simultaneous equations and inequalities • Use mathematical language and properties precisely • Recognise and use the equation of a circle, centre the origin • Derive and use the key facts for circle geometry	• Pixi Maths RAG • Maths Takeaway • Mathswatch homework • **AO1: Use and apply standard techniques** • **AO2: Reason, interpret and communicate mathematically** • **AO3: Solve problems within mathematics and in other contexts**

	• Quadratic sequence	• Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment • Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results • Find the nth term of a nonlinear sequence.		
Autumn 2	• Direct and Inverse Proportion • Graphs of cubic, quadratic- identify turning points • Linear Inequality, solving and Regions • Pythagoras and Trigonometry • Area and Arc length of sectors.	**Students will be able to:** • Interpret mathematical relationships both algebraically and graphically e.g. direct and inverse proportion and real-life graphs. • **Sketch quadratic and cubic functions. Know where a graph will cross the x-axis** • **Understand maximum and minimum points.** • Express solutions to inequalities using set notation • Solve several inequalities in two variables, representing the solution set on a graph • Understand, recall and use Pythagoras theorem in 2D and **3D shapes.** • Understand, use and recall the trigonometric ratios sine, cosine and tan and apply them to find angles and lengths. • **Know the exact values of Sin, Cos and tan 0, 30, 45, 60 and 90.** • **Know and apply the sine rule and cosine rule to find unknown lengths and angles and trigonometric area to calculate the sides and angles of any triangle given the areas.** • Calculate arc lengths, angles and areas of sectors of circles	• Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems. • Make and use connections between different parts of mathematics to solve problems. • Model situations mathematically and express the results using a range of formal mathematical representations, reflecting on how their solutions may have been affected by any modelling assumptions. • Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem. • Apply Pythagoras' theorem to problems in three dimensions, including repeated use of the theorem e.g. in finding the length of the diagonal of a cuboid • Identify right-angled triangles in three-dimensional shapes and use trigonometry to find missing sides and angles. • A sector is a fraction of 360° of the entire circle. • Understand and use standard mathematical formulae; rearrange formulae to change the subject	• Pixi Maths RAG • Maths Takeaway • Mathswatch homework • **AO1: Use and apply standard techniques** • **AO2: Reason, interpret and communicate mathematically** • **AO3: Solve problems within mathematics and in other contexts**

	• Equation of straight lines • Revisit Handling data and Probability	• To be able to find equation of straight line- Gradient and y intercept **Parallel and perpendicular lines** **Equation of a tangent to the circle.** **Averages including Histograms, Tree diagrams and Venn diagrams to find probability.** • To be able to find the measures of location and measures of spread including CF graphs, Boxplots, Scatter graphs and to use tree diagrams to solve Probability questions including Capture-Recapture method.	,	
Spring 1	• Functions and transformation of functions • Transformations • Compound Measures • Iteration • Similar Shapes	**Students will be able to:** • **Develop an understanding of functions.** Use function notation and find composite function **and inverses.** • **Interpret and analyse transformations of graphs of cubic, quadratic and trigonometric functions and write the functions algebraically** • Understanding the notation for transformation of functions is critical to accessing this topic. ○ f(x) ±a = Vertical Translation ○ f(x ± a) = Horizontal Translation ○ af(x) = Horizontal stretch ○ f(ax) = Vertical stretch • Use and apply compound units such as density and pressure and Speed/distance/time • Know and apply: • Speed = Distance ÷ Time • Density = Mass ÷ Volume • Pressure = Force ÷ Area • Approximate solution using Iteration. To be able to find missing length, Area and volume of similar shapes using Linear scale factor, **Area scale factor and Volume scale factors.** • Express one quantity as a percentage of another • Compare two quantities using percentages	• Understand and use function notation • Find the inverse of a function • Interpret the succession of two functions as a composite function • Identify and sketch the graphs of translations and reflections of a given graph • Identify and sketch the graphs of translations and reflections of the graph of a given equation • Use quadratic graphs to find the approximate solution to quadratic equations • Identify intercepts, and using symmetry, the turning points of graphs of quadratic functions • Apply the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures • Compare lengths, areas and volumes using ratio notation; make links to similarity and scale factors	• Pixi Maths RAG • Maths Takeaway • Mathswatch homework • **AO1: Use and apply standard techniques** • **AO3: Solve problems within mathematics and in other contexts**

	**Revise additional topics as per needs of class Percentages including Simple and Compound interest, Growth and Decay	• Work with percentages greater than 100%; • Solve problems involving percentage change • Solve problems involving percentage increase/decrease • Solve problems involving original value problems • Solve problems involving simple interest including in financial mathematics • Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes	• Students to have a secure understanding of the difference between simple and compound interest.	
Spring 2	• Vectors and geometric proof • Graphs • Gradient of a curve at a point. • Acceleration • 3d Pythagoras and Trigonometry. • Product rule of counting	**Students will be able to:** • Add and subtract vectors algebraically and use column vectors. • **Solve geometric problems involving vectors and produce proofs.** • Plot and interpret graphs (**including exponential graphs, reciprocal Graphs and trigonometric function**) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration ➢ **Interpret the gradient at a point on a curve** ➢ Calculate or estimate gradients of graphs • Extend Pythagoras and Trigonometry to 3d to find missing sides and angles. • To work out the total number of ways of performing a series of task	➢ Use tables of values to plot polynomial graphs ➢ **Use tables of values to plot reciprocal graphs** ➢ **Reinforce their knowledge of the shapes of graphs covered earlier in the course e.g. exponential, trigonometric.** ➢ Construct and interpret graphs of real-life contexts such as: ➢ Currency conversion ➢ Temperature conversion ➢ Distance-time graphs ➢ Recognise and sketch graphs of $y = x^2$, $y = x^3$ and $y = 1/x$ ➢ Distance – **Time graphs can be extended to Speed-Time/Acceleration-Time graphs**. • **interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts**	• Pixi Maths RAG • Maths Takeaway • Mathswatch homework • **AO1: Use and apply standard techniques** • **AO2: Reason, interpret and communicate mathematically** • **AO3: Solve problems within mathematics and in other contexts**

Summer 1	Revision of all topic content			