Subject: Mathematics
Year 11 Overview – Higher

ST. MARY MAGDALENE C OF E SCHOOL
PENINSULA CAMPUS
Excellence through innovation, founded in faith since 1840.

Key content – knowledge and skills	National Curriculum focus
All include the national curriculum reference – full outline in the national curriculum focus. **<u>Autumn 1:</u>** **Unit 14 & 15:** Further statistics & Equations and graphs. **[S1, S3, S4 & N8, A4, A11, A12, A18 - A22]** **<u>Autumn 2:</u>** **Unit 16 & 17:** Circle theorems & more algebra. **[A16, G9, G10 & N8, A4 - A7, A18]** **<u>Spring 1:</u>** **Units 18 &19:** Vectors and Geometric proof & Proportion and graphs. **[G25 & A7, A12 - A15, R7, R10, R13 - R16]** **<u>Spring 2:</u>** Revision / Exam practice **<u>Summer 1:</u>** **GCSE exams.**	Subject content from the National Curriculum Framework Document: Pupils will be taught: - S1: To infer properties of populations or distributions from a sample, while knowing the limitations of sampling. - S3: To construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use. - S4: To interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: - ● appropriate graphical representation involving discrete, continuous and grouped data, including box plots - ● appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range). - N8: To calculate exactly with fractions, surds and multiples of π; simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{(4 \times 3)} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators. - A4: To simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by: - ● collecting like terms - ● multiplying a single term over a bracket - ● taking out common factors - ● expanding products of two or more binomials - ● factorising quadratic expressions of the form x2 + bx + c, including the difference of two squares;

	factorising quadratic expressions of the form ax2 + bx + c - ● simplifying expressions involving sums, products and powers, including the laws of indices. - A11: To identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square. - A12: To recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = 1/x$ with $x \neq 0$, exponential functions $y = kx$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size. - A18: To solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula; find approximate solutions using a graph. - A19: To solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically; find approximate solutions using a graph. - A20: To find approximate solutions to equations numerically using iteration. - A21: To translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution. - A22: To 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. - A16: To recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point.

	- G9: To identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment. - G10: To apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results. - N8: To calculate exactly with fractions, surds and multiples of π; simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{(4 \times 3)} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators. - A4: To simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by: ● collecting like terms ● multiplying a single term over a bracket ● taking out common factors ● expanding products of two or more binomials ● factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares; factorising quadratic expressions of the form $ax^2 + bx + c$ ● simplifying expressions involving sums, products and powers, including the laws of indices. - A5: To understand and use standard mathematical formulae; rearrange formulae to change the subject. - A6: To know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs. - A7: Where appropriate, interpret simple expressions as functions with inputs and outputs; ; interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function' (the use of formal function notation is expected).

	- A18: To solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula; find approximate solutions using a graph. - G25: To apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; use vectors to construct geometric arguments and proofs. - A7: Where appropriate, interpret simple expressions as functions with inputs and outputs; ; interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function' (the use of formal function notation is expected). - A12: To recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = 1/x$ with $x \neq 0$, exponential functions $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size. - A13: To sketch translations and reflections of a given function. - A14: To plot and interpret graphs (including reciprocal graphs and exponential graphs) 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. - A15: To calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts (this does not include calculus). - R7: To understand and use proportion as equality of ratios.

	- R10: To solve problems involving direct and inverse proportion, including graphical and algebraic representations. - R13: To understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y; construct and interpret equations that describe direct and inverse proportion. - R14: To interpret the gradient of a straight-line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion. - R15: To 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 (this does not include calculus). - R16: To set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes.

Key assessment points

Students will sit mock examinations in December of 2020 – they will begin their external GCSE examinations based on the 2 - year SOL in Summer 1 2021.

Formative assessments to be carried out throughout the academic year. All end of topic tests will be synoptic, including questions on all content covered up to that point. Assessment will focus on understanding of the content above – each assessment will cover progress steps as outlined by Pearson education of which can be directly translated to the 9-1 scale.

Christian ethos

A Christian ethos will be promoted in Maths lessons by encouraging a sense of wonder in the natural world and a respect for all of God's creation. Students will treat each other with mutual respect and learn to work together through group and practical activities, and consider Christian views on ethical issues discussed. The incorporation of real-life skills and a large emphasis on problem solving will also encourage a wider scope on the natural world and further develop students sense of wonder.

British values

- **Individual liberty** in the sense of being able to develop and express one's own views, **tolerance** and **mutual respect** for one another's views is taught through the topics in which different views and/or ethics are involved. Through students

- **The rule of law** is addressed in units of work covering the need to have speed limits, through students understanding the need for following classroom rules**.**
- **Democracy** is taught through student debates when reasoning mathematically and explaining proofs.
- Group activities in Maths require students to engage in **team work** and show **mutual respect** for each other.