Mathematics Year 11	Working towards expected outcomes Your child is not yet making the expected progress within this course.	Working at expected outcomes Your child is achieving the expected progress for this point within the course.	Working beyond expected outcomes Your child is exceeding the expected progress.
Autumn Term	Students working **towards** expected outcomes in Y11 can: • Evaluate most positive integer inputs and some negative or fractional inputs. • Find and evaluate basic composite functions and find inverse functions involving minimal steps. • Perform basic reflections and translations on a graph. Eg. $y = f(-x)$ or $y = f(x) - 7$ • Understand column vector notation and convert between diagrams and column vector forms. • Given the vectors ***a*** and ***b*** find further vectors such as ***3a+b*** • Solve basic geometric problems involving adding and subtracting vectors. • Understand the process of trial and improvement is a way of gaining an approximate solution to a complex problem. • Understand that iteration is a process repeated many times.	Students working **at** expected in Y11 can: • Find inputs and outputs of a range of functions and can work with algebraic inputs to form expressions and/or further equations. • Find a range of composite and inverse functions requiring more advanced rearrangement or manipulation skills. • Form and solve equations between different functions. Eg. Solve $h(x) = g(x)$ • Understand the link between function notation and graph transformations to sketch new graphs or track points (including for trigonometric graphs). • Add and subtract vectors fluently, including with fractional scalars. • Use vectors on more complex diagrams involving ratios. • Prove geometric facts such as that vectors are parallel or lie on the same straight line. • Rearrange a variety of equations into given iterative forms including those where factorising might be required.	Students working **beyond** expected in Y11 can: **In addition to the skills listed under 'Working At' for this topic, students working beyond expected outcomes can:** • Solve complex composite/inverse function problems including forming and solving equations. Eg. Solve $gf(x) = fg^{-1}(x)$. • Carry out compound graph transformations. Eg. $-f(x-2)+10$ • Understand the relationship between functions and their inverses including their graphical representations. • Find unknown ratios or proportions in a diagram using the fact that all vectors $\overrightarrow{AB}$ are the same and equating co-efficients. • Identify a solution lying in a given range by demonstrating a change in sign. • Use iteration in real-world modelling problems including those where part of the formula is unknown, but some iterations are given. • Understand the connection between the algebraic iterative process and the graphical representation (converging and diverging). • Fluently convert a wide range of recurring decimals to fractions and understand how

	• Substitute into iterative formulae and use them to generate further solutions. • Recall some fraction, decimal and percentage conversions and convert simple recurring decimals into fractions. • Continue a range of sequences including arithmetic, geometric, Fibonacci and quadratic. • Find specific terms from an nth term formula and identify an nth term for an arithmetic or simple quadratic sequence. • Find the mean and range from lists or frequency tables; draw and interpret simple charts like bar charts and pie charts. • Recall some features of cumulative frequency graphs, • Calculate frequencies and frequency densities from tables or histograms. • Use the capture-recapture method to estimate population sizes. • Explain how to take a random sample.	• Understand that successive iterations generate more accurate results and select the best answer. • Convert a wide range of recurring decimals to fractions including 0.14444... and use them in some further calculations. Eg. 0.11111... x 0.45454545... • Find the nth term for a wide range of sequences including more challenging quadratic sequences met in Y11. • Understand how to use term-to-term rules and write them for arithmetic or geometric sequence. • Construct and interpret boxplots, cumulative frequency graphs, scatter graphs and histograms. • Use proportional approaches to estimate (eg. The median) from a histogram. • Use the capture-recapture method and comment on any assumptions that affect the estimate. • Make inferences on straight line graphs related to a real-world context. Eg. The cost of a bill based on the number of units consumed. • Explain how to take a variety of sample types.	these can be used to simplify other calculations. • Create equations from algebraic terms of a sequence given that the sequence is arithmetic or geometric. • Use their sequences skills to be able to identify a sequence formula from a diagram, looking at patterns in growth rather than just numbers. • Draw and interpret a wide variety of statistical diagrams and be able to work with histograms where no total frequency is known, or frequency-density scale is not given. • Further interpret histograms to be able to answer questions related to percentages or probability. Eg. A person who took 11-15 seconds to complete the puzzle is selected. What is the probability that they took longer than 12 seconds to complete the puzzle? • Make perceptive comments about data and understand the advantages and draw-backs of a variety of statistical diagrams and sampling types.

Spring Term	Students working **towards** expected outcomes in Y11 can: • Recall the basics of algebraic proof • Make a start on some 'show that' questions to form equations for area or perimeter. • Link to some rules of angles within a geometric proof such as congruence. • Use figures rounded to 1sf to make estimations where most values become integers. • Understand basic travel graphs involving straight lines. • Draw and measure tangents to a curve and use trapezia to estimate the area under a curve. • Convert between metric units and apply approach speed, distance, time problems by formula. • Plot a variety of graphs. • Recall that the point of intersection between two graphs is the solution to their simultaneous equations. • Construct triangles with a protractor or compass and understand simple loci (e.g. 3 cm from a point).	Students working **at** expected in Y11 can: • Recall most algebraic proof techniques and represent odd, even and consecutive numbers correctly. • Attempt a wide variety of 'show that' problems to form equations where two quantities might be proportionally related. Eg. The area of the triangle is twice the area of the rectangle. • Apply and justify circle theorems in solving angle problems. • Establish congruent triangles by following a three-step process linking to angle rules and shape properties eg. lines of symmetry. • Estimate values involving decimals and fractions and understand how the estimate differs from the true value. • Understand that sometimes other rounding accuracies can be more efficient eg. Estimate $\sqrt{2{,}478}$ • Understand the link between the gradient and area under a curve to speed, distance and acceleration. • Understand and apply speed, density and pressure problems using formulae and	Students working **beyond** expected in Y11 can: **In addition to the skills listed under 'Working At' for this topic, students working beyond expected outcomes can:** • Confidently answer most 'show that' questions, including those where they may need to form their own expressions. • Prove all required circle theorems. • Readily link a wide variety of geometrical properties to establish formal proofs. • Make effective decisions about rounding styles to estimate calculations involving powers and roots. • Understand how adjusting the place values in a calculation affects the original answer. • Understand how changes to a situation may affect estimations and justify these choices. • Apply the skill of measuring gradients and areas under curves to comment on other real-life situations such as a rate of flow. • Handle compound measure problems involving multiple conversions. • Comment on the changes to a compound measure following a proportional change. Eg. The area reduces by 1/3, what is the effect on the force? • Use graphs to solve equations in one variable where the equation may have to rearranged to

	• Use a diagram with 2 loci to identify a required region. Eg. A radio mast must be within 3km of town A and no more than 8km from town B. Indicate the region where the mast can be placed.	ensuring units agree before performing calculations. • Plot and sketch a variety of graphs, predicting the number of solutions their simultaneous equations might have. • Plot graphs to solve equations in one variable. Eg. $x^2 - 3x + 5 = x$ • Construct a range of loci including perpendicular lines and bisectors. • Solve loci problems with multiple conditions including perpendicular lines, loci around point or around the outside of a line or rectilinear shape.	match the given graph. Eg. Use the graph of $y = x^2 - 5x + 4$ to solve the equation $x^2 - 3x + 5 = x$ • Know the shape of all key loci and understand their real-life meanings. Eg. That the path of all points equidistant between two point is the perpendicular bisector. • Use their understanding of loci to solve a variety of multi-condition problems. Eg. A radio mast must be within 3km of town A and no more than 4km from town B. The mast must be closer to town B than town A. Indicate the region where the mast can be placed.