

## Programme of study for Year 11 Higher Maths

Autumn (1 <sup>st</sup> term)	Autumn (2 <sup>nd</sup> term)	Spring (1 <sup>st</sup> term)	Spring (2 <sup>nd</sup> Term)	Summer (1 <sup>st</sup> term)	Summer (2 <sup>nd</sup> term)
Other timing: From: September To: October	Other timing: From: November To: December	Other timing: From:            To:	Other timing: From:            To:	Other timing: From:            To:	Other timing: From:            To:
<b>Topic / Key Question:</b> - Quadratics, expanding more than 2 brackets, sketching graphs, graphs of circles, cubes and factorising. - Circle Theorems - Circle Geometry - Changing the subject of a complex formulae, algebraic fractions, and equations of algebraic fractions, rationalising surds and proof.	<b>Topic / Key Question:</b> - Vectors and geometric proof - Reciprocal and exponential graphs; gradient and area under a graph. - Direct and inverse proportion -	Topic / Key Question: -Any topics remaining to be completed from half term 2 will be completed in this half-term.	Topic / Key Question: Revision will be focused around topics the class have generally underperformed in their final mocks	Topic / Key Question: Revision will be focused around topics the class have generally underperformed in their final mocks	Topic / Key Question:  Examination period: Yr 11 are on study leave
<b>Skills:</b> A01: Use, recall and apply standard techniques  A02: From given mathematical information: Reason, interpret & communicate mathematically  A03: Solve problems or evaluate methods and solutions within mathematics and in other contexts	<b>Skills:</b> A01: Use, recall and apply standard techniques  A02: From given mathematical information: Reason, interpret & communicate mathematically  A03: Solve problems or evaluate methods and solutions within mathematics and in other contexts	<b>Skills:</b> A01: Use, recall and apply standard techniques  A02: From given mathematical information: Reason, interpret & communicate mathematically  A03: Solve problems or evaluate methods and solutions within mathematics and in other contexts	<b>Skills:</b> A01: Use, recall and apply standard techniques  A02: From given mathematical information: Reason, interpret & communicate mathematically  A03: Solve problems or evaluate methods and solutions within mathematics and in other contexts	<b>Skills:</b> A01: Use, recall and apply standard techniques  A02: From given mathematical information: Reason, interpret & communicate mathematically  A03: Solve problems or evaluate methods and solutions within mathematics and in other contexts	

<p><b>Key Learning Outcomes:</b></p> <p>Sketch a graph of a quadratic function, by factorising or by using the quadratic formula. Also identify roots, y-intercept and turning points.</p> <p>Identify from a graph if a quadratic equation has any real roots.</p> <p>Find approximate solutions to quadratic equations using a graph.</p> <p>Expand the product of 2 binomials.</p> <p>Sketch graph of simple cubic functions, given as 3 linear functions.</p> <p>Solve simultaneous equations graphically.</p>	<p><b>Key Learning Outcomes:</b></p> <p>Understand and use vector notation, including column notation.</p> <p>Understand and interpret vectors as displacement in the plane with an associated direction.</p> <p>Understand that <math>2\mathbf{a}</math> is parallel to <math>\mathbf{a}</math> and twice its length, and that <math>\mathbf{a}</math> is parallel to <math>-\mathbf{a}</math> in the opposite direction.</p> <p>Represent vectors, combination of vectors and scalar multiples in the plane pictorially.</p> <p>Calculate the sum or difference of 2 vectors and a scalar multiple of</p>	Key Learning Outcomes:	Key Learning Outcomes:	Key Learning Outcomes:	Key Learning Outcomes:

<p>Find approximate solutions of simultaneous equations formed from 1 linear and 1 quadratic function graphically.</p> <p>Find graphically the intersection points of a given straight line with a circle.</p> <p>Solve simultaneous equations representing real life situations graphically.</p> <p>Solve quadratic inequalities in 1 variable, by factorising and sketching the graph to find critical values.</p> <p>Represent the solution set for inequalities using set notation.</p> <p>Identifying the solutions to 2 different inequalities, show this as the intersection of the 2 solution sets.</p> <p>Solve linear inequalities in 2 variables graphically.</p>	<p>a vector using column vectors.</p> <p>Find the length of a vector using Pythagoras Theorem.</p> <p>Calculate the resultant of 2 vectors.</p> <p>Solve problems where vectors are divided in a given ratio with the use of scalar identity properties.</p> <p>Produce geometrical proofs to prove points are collinear and vectors/lines are parallel.</p> <p>Recognise + sketch &amp; interpret graphs of the reciprocal function, where <math>x \neq 0</math>. State value of <math>x</math> for which the eqn. is not defined.</p> <p>Recognise, sketch and interpret graphs of exponential functions <math>y = k^x</math></p> <p>Set up, solve and interpret the answers in growth and decay</p>				
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<p>Show solution set of several inequalities in 2 variables on a graph.</p> <p>Use iteration with simple converging sequences.</p> <p>Recall, draw and identify parts of a circle including: sector, tangent, segment, and chord.</p> <p>Prove and use the 7 circle theorem facts.</p> <p>Find and give reasons for missing angles by using:</p> <ul style="list-style-type: none"> <li>- Circle theorems</li> <li>- Isosceles triangles in a circle</li> <li>- Angles between tangent and radius is 90 degrees.</li> <li>- Tangents from an external point are equal in length.</li> </ul> <p>Select and apply construction techniques and understanding of</p>	<p>problems-Interpret &amp; analyse transformations of graphs of functions and write functions algebraically: <math>f(x \pm a)</math></p> <p>Apply to the graph of <math>y = f(x)</math> the transformations <math>y = -f(x)</math>, <math>y = f(-x)</math>, <math>y = f(x) + a</math>, <math>y = f(x+a)</math> for linear, quadratic, cubic functions.</p> <p>Estimate area under a quadratic or other graphs by dividing it into trapezium.</p> <p>Interpret gradient (<math>m</math>) of linear or non-linear graphs, &amp; estimate <math>m</math> of non-linear graph at a given point by sketching the tangent and findings its <math>m</math>.</p> <p>Interpret <math>m</math> of non-linear graph in curved distance/time and velocity/time graphs For non-linear distance/time graph, estimate speed at one point in time, from the tangent, and average speed acceleration over</p>				
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<p>loci to draw graphs based on circles and perpendicular lines.</p> <p>Find an equation of a tangent to a circle at a given point by:</p> <ul style="list-style-type: none"> <li>- Finding the gradient of the radius that meets the circle at that point. (Circles all centre the origin.)</li> <li>- Finding the gradient of the tangent perpendicular to it using the given point.</li> </ul> <p>Recognise and construct the graph of a circle using:  <math>x^2 + y^2 = r^2</math>  For radius centred at the origin of coordinates.</p> <p>Rationalise the denominator involving surds.</p> <p>Simplify algebraic fractions.</p> <p>Multiply and divide</p>	<p>several seconds by finding the <b><i>m</i></b> of the chord.</p> <p>Interpret <b><i>m/area under</i></b> of linear or non-linear graphs in financial context or real-life contexts.</p> <p>Interpret rate of change of: graphs of containers filling &amp; emptying or unit price in price graphs.</p> <p>Recognise &amp; interpret graphs showing direct and indirect proportion. Identify direct proportion from table of values, by comparing ratio of values, for <b><i>x</i><sup>2</sup></b> and <b><i>x</i><sup>3</sup></b> relationships.</p> <p>Write statements of proportionality for quantities proportional to the square, cube or <b><i>x</i><sup>n</sup></b> of another quantity.</p> <p>Set up &amp; use equations to solve word and other problems involving direct proportion or</p>				
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<p>algebraic fractions.</p> <p>Solve quadratic equations arising from algebraic fraction equations.</p> <p>Change the subject of a formula, including cases where the subject occurs on both sides, and where a power of a subject appears.</p> <p>Change the subject of a formula, where all the variables appear in the denominator.</p> <p>'Show that' and prove questions using consecutive integers (<math>n</math>, <math>n+1</math>) squares <math>a^2, b^2</math> even numbers (<math>2n</math>) and odd numbers (<math>2n+1</math>)</p> <p>Use function notation to find:  <math>f(x) + g(x)</math> and <math>f(x) - g(x)</math>.  <math>2f(x)</math>, <math>f(3x)</math> etc algebraically.</p> <p>Find the inverse of a linear function.</p> <p>Know that <math>f^{-1}(x)</math> refers to the inverse function.</p>	<p>inverse proportion.</p> <p>Use <math>y=kx</math> to solve direct proportion problems, including questions where students find <math>k</math>.</p> <p>Solve problems involving inverse proportion using graphs by plotting and reading values from graphs.</p>				
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<p>Find composite functions for 2 functions <math>f(x)</math> and <math>g(x)</math> find <math>fg(x)</math> or <math>gf(x)</math> etc.</p>					
<p>End of term 1 assessment to cover: Students will be assessed on the entire SoW from Yr 9 to Yr 11 for internal exam series 1.</p>		<p>End of term 2 assessment to cover: Students will be assessed on the entire SoW from Yr 9 to Yr 11 for internal exam series 2.</p>		<p>End of year assessment to cover: Students will be assessed on the entire SoW from Yr 9 to Yr 11 for their summer GCSE public exam.</p>	
<p><b>Rationale for sequence:</b> Students will apply previous knowledge of Algebra skills from year 10 by sketching quadratic graphs and marking coordinates of roots, y-intercept, maximum and minimum points/solving quadratic equation when the solution is <math>y=n</math>.</p> <p>Students will then stretch their knowledge on expanding double brackets to expand triple brackets and form cubic expressions. Students will then be expected to factorise cubic equations to sketch cubic graphs by</p>	<p><b>Rationale for sequence:</b> Students will apply previous skill and cross over knowledge from physics to draw vectors on scaled grids and represent vectors in vector notation. Students will use HCF skills to find the scalar multiple of a vector. Student will use Pythagoras skills to find the given length of the vector.</p> <p>Students will be introduced to reciprocal and exponential graphs. Student will understand how to interpret the graphs against the given variables. The</p>	<p><b>Rationale for sequence:</b></p>	<p><b>Rationale for sequence:</b></p>	<p><b>Rationale for sequence:</b></p>	<p><b>Rationale for sequence:</b></p>

<p>identifying roots and the y-intercept.</p> <p>Students use knowledge from Yr 9 on Pythagoras and relate/understand how this links on forming the equation of the circle. The students will then use the substitution method demonstrated and practiced in Yr 10 to solve simultaneous equations involving a quadratic and linear equation algebraically/completing the square/quadratic formula. This skills and knowledge acquired here during this term will allow a smooth transition for iteration.</p> <p>In addition to the above, students will be introduced to Circle Theorems'. Students will use their algebra skills to run through and understand the proofs related to Circle Theorems.</p> <p>During the final few weeks of half-term 1,</p>	<p>knowledge gained during this time is a cross over with biology when variables are looked at focusing on growth or decay.</p> <p>Students will further develop their knowledge on <math>f(x)</math> functions by applying the given transformations to them.</p> <p>Student will focus on real-life graphs where tangents will have to be drawn and the gradient formula will need applied to find the required measure – for example average speed, acceleration. In addition, students will also use the trapezium rule to estimate the area under the graph to find the distance covered.</p> <p>Finally, student will complete the GCSE course by working on Direct &amp; indirect proportion graphs and scenarios in relation to</p>				
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<p>student will use their basic knowledge of equivalent fractions and apply this to rationalising the denominator. Students will then focus on simplifying (factorising &amp; recognising the HCF in algebraic form) and solving algebraic fractions using all four operations and powers.</p> <p>The students will then use the above skills to change the subject for more complex equations using more than 1 method to achieve the answer. As a result of this students will be able to find the inverse of given functions and use substitution skills from solving quadratic and linear simultaneous equations to show compound functions in their simplest form.</p>	<p><math>x^n</math>, where <math>n \neq 1</math>. They will use prior algebra skills of substitution and rearranging the equation to find the value of the constant to form directly or indirectly proportion equations.</p> <p>Through the above, students develop an appreciation of maths associated with mechanics, calculus and engineering. Learners will develop an understanding of how various mathematical models can be applied to real life graphs and their implications. Eg rate of birth, mortality, as well as investigating the relationship between variables.</p>				
<p>Reading / literacy: Elements of literacy will be incorporated through key</p>	<p>Reading / literacy: Elements of literacy will be incorporated through</p>	<p>Reading / literacy: Elements of literacy will be incorporated through</p>	<p>Reading / literacy: Elements of literacy will be incorporated through</p>	<p>Reading / literacy: Elements of literacy will be incorporated through</p>	<p>Reading / literacy: Elements of literacy will be incorporated through</p>

words and worded questions	key words and worded questions	key words and worded questions	key words and worded questions	key words and worded questions	key words and worded questions
Numeracy: Throughout the lessons students will be engaged with numeracy.	Numeracy: Throughout the lessons students will be engaged with numeracy.	Numeracy: Throughout the lessons students will be engaged with numeracy.	Numeracy: Throughout the lessons students will be engaged with numeracy.	Numeracy: Throughout the lessons students will be engaged with numeracy.	Numeracy: Throughout the lessons students will be engaged with numeracy.
<p>Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC):</p> <p>During the lesson a discussion will take place on the real-life scenarios the topic at hand students have come across or will face later in life when making decisions. These regular discussions allows teachers into an insight into the knowledge students have about life and how we can inform them further.</p>					