

**Curriculum Area: Maths Year: 11  
2015/2016**

Topics	Year Curriculum	How you can support learning at home, eg. Books, websites, family learning through visits.
Module 1 Algebra	<p><b>Equations, formulae, expressions and identities</b></p> <ul style="list-style-type: none"> <li>●● factorise quadratic expressions, including the difference of two squares, e.g. <math>x^2 - 9 = (x+3)(x-3)</math></li> <li>cancel common factors in rational expressions,</li> <li>●● simplify simple algebraic fractions to produce linear expressions; use factorisation to simplify compound algebraic fractions</li> <li>●● solve equations involving algebraic fractions with compound expressions as the numerators and/or denominators</li> <li>●● solve linear inequalities in one and two variables; find and represent the solution set</li> <li>●● explore 'optimum' methods of solving simultaneous equations in different forms</li> <li>●● solve quadratic equations by factorisation</li> <li>●● solve quadratic equations by factorisation, completing the square and using the quadratic formula, including those in which the coefficient of the quadratic term is greater than 1</li> <li>●● solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns, where one is linear in each unknown and the other is linear in one unknown and quadratic in the other or of the form <math>x^2 + y^2 = r^2</math></li> <li>●● derive and use more complex formulae; change the subject of a formula, including cases where the subject occurs twice</li> <li>●● derive relationships between different formulae that produce equal or related results</li> </ul> <p><b>Sequences, functions and graphs</b></p> <ul style="list-style-type: none"> <li>●● identify the equations of straight-line graphs that are parallel; find the gradient and equation of a straight-line graph that is perpendicular to a given line</li> <li>●● plot graphs of more complex quadratic and cubic functions; estimate values at specific points, including maxima and minima</li> <li>●● know and understand that the intersection points of the graphs of a linear and quadratic function are the approximate solutions to the corresponding simultaneous equations</li> </ul>	BBC Bitesize website Mathswatch personal tutor CD <a href="http://www.mathswatch.co.uk/#/gcse/4554948524">http://www.mathswatch.co.uk/#/gcse/4554948524</a> Edexcel Foundation/Higher Revision guides & workbooks available from Edexcel <a href="http://www.mymaths.co.uk">www.mymaths.co.uk</a>



	<ul style="list-style-type: none"> <li>●● construct the graphs of simple loci, including the circle <math>x^2+y^2= r^2</math> ; find graphically the intersection points of a given straight line with this circle and know this represents the solution to the corresponding two simultaneous equations</li> <li>●● find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function</li> <li>●● identify and sketch graphs of linear and simple quadratic and cubic functions; understand the effect on the graph of addition of (or multiplication by) a constant</li> <li>●● plot and recognise the characteristic shapes of graphs of simple cubic functions (e.g. <math>y=x^3</math> ), reciprocal functions exponential functions ( <math>y = kx</math> = for integer values of <math>x</math> and simple positive values of <math>k</math>) and trigonometric functions, on paper and using ICT</li> <li>●● apply to the graph <math>y= f(x)</math> the transformations  <math>y=f(x)+a</math>,  <math>y= f(ax)</math>,  <math>y= f(x+a)</math> and  <math>y=af(x)</math> for linear, quadratic, sine and cosine function</li> </ul>	
Module 2 Number	<p><b>Place value, ordering and rounding</b></p> <ul style="list-style-type: none"> <li>●● use standard index form to make sensible estimates for calculations involving multiplication and/or division</li> <li>●● understand how errors can be compounded in calculations</li> <li>●● understand upper and lower bounds</li> </ul> <p><b>Integers, powers and roots</b></p> <ul style="list-style-type: none"> <li>●● use inverse operations, understanding that the inverse operation of raising a positive number to power <math>n</math> is raising the result of this operation to power <math>\frac{1}{N}</math></li> <li>●● understand and use rational and irrational numbers</li> </ul> <p><b>Fractions, decimals, percentages, ratio and proportion</b></p> <ul style="list-style-type: none"> <li>●● use an algebraic method to convert a recurring decimal to a fraction</li> <li>●● calculate an unknown quantity from quantities that vary in direct proportion using algebraic methods where appropriate</li> <li>●● understand and use direct and inverse proportion; solve problems involving inverse proportion (including inverse squares) using algebraic methods</li> </ul> <p><b>Number operations</b></p> <ul style="list-style-type: none"> <li>●● use a multiplier raised to a power to represent and solve problems involving repeated proportional change, e.g. compound interest</li> <li>●● use surds in exact calculations, without calculator; rationalise a denominator</li> </ul>	Edexcel Past Papers Mobile Phone App Springs VLE Nrich Maths: <a href="http://nrich.maths.org/teacher-secondary">http://nrich.maths.org/teacher-secondary</a>



	<p><b>Calculator methods</b></p> <ul style="list-style-type: none"> <li>●● use calculators to explore exponential growth and decay, using a multiplier and the power key</li> <li>●● calculate with standard index form, using a calculator as appropriate</li> <li>●● use calculators, or written methods, to calculate the upper and lower bounds of calculations in a range of contexts, particularly when working with measurements</li> </ul> <p><b>Checking results</b></p> <ul style="list-style-type: none"> <li>●● check results using appropriate methods</li> </ul>	
<p>Module 3 Shape and Space</p>	<p><b>Geometrical reasoning</b></p> <ul style="list-style-type: none"> <li>●● show step-by-step deduction in solving more complex geometrical problems</li> <li>●● understand the necessary and sufficient conditions under which generalisations, inferences and solutions to geometrical problems remain valid</li> <li>●● prove and use the facts that: <ul style="list-style-type: none"> <li>– the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference</li> <li>– the angle subtended at the circumference by a semicircle is a right angle</li> <li>– angles in the same segment are equal</li> <li>– opposite angles in a cyclic quadrilateral sum to <math>180^\circ</math></li> </ul> </li> <li>●● prove and use the alternate segment theorem</li> <li>●● prove the congruence of triangles and verify standard ruler and compass constructions using formal arguments</li> <li>●● understand and use Pythagoras' theorem to solve 3-D Problems</li> <li>●● use trigonometric relationships in right-angled triangles to solve 3-D problems, including finding the angles between a line and a plane</li> <li>●● calculate the area of a triangle using the formula <math>\frac{1}{2} ab \sin C</math></li> <li>●● draw, sketch and describe the graphs of trigonometric functions for angles of any size, including transformations involving scalings in either or both of the x and y directions</li> <li>●● use the sine and cosine rules to solve 2-D and 3-D problems</li> </ul> <p><b>Transformations and coordinates</b></p> <ul style="list-style-type: none"> <li>●● understand and use the effects of enlargement on areas and volumes of shapes and solids</li> <li>●● understand and use vector notation to describe transformation of 2-D shapes by combinations of translations; calculate and represent graphically the sum of two</li> </ul>	



	<p>vectors</p> <ul style="list-style-type: none"> <li>●● calculate and represent graphically the sum of two vectors, the difference of two vectors and a scalar multiple of a vector; calculate the resultant of two vectors</li> <li>●● understand and use the commutative and associative properties of vector addition</li> <li>●● solve simple geometrical problems in 2-D using vectors</li> </ul> <p><b>Measures and mensuration</b></p> <ul style="list-style-type: none"> <li>●● apply knowledge that measurements given to the nearest whole unit may be inaccurate by up to one half of the unit in either direction and use this to understand how errors can be compounded in calculations</li> <li>●● recognise limitations in the accuracy of measurements and judge the proportional effect on solutions</li> <li>●● solve problems involving surface areas and volumes of cylinders, pyramids, cones and spheres</li> <li>●● understand and use the formulae for the length of a circular arc and area and perimeter of a sector</li> <li>●● consider the dimensions of a formula and begin to recognise the difference between formulae for perimeter, area and volume in simple contexts</li> <li>●● solve problems involving more complex shapes and solids, including segments of circles and frustums of cones</li> <li>●● understand the difference between formulae for perimeter, area and volume by considering dimensions</li> </ul>	
<p>Module 4 Handling Data &amp; Probability</p>	<p><b>Specifying a problem, planning and collecting data</b></p> <ul style="list-style-type: none"> <li>●● consider possible difficulties with planned approaches, including practical problems; adjust the project plan accordingly</li> <li>●● deal with practical problems such as non-response or missing data</li> <li>●● identify what extra information may be required to pursue a further line of enquiry</li> <li>●● select and justify a sampling scheme and a method to investigate a population, including random and stratified sampling</li> <li>●● understand how different methods of sampling and different sample sizes may affect the reliability of conclusions drawn</li> </ul> <p><b>Processing and representing data</b></p> <ul style="list-style-type: none"> <li>●● use an appropriate range of statistical methods to explore and summarise data; including calculating an appropriate moving average for a time series</li> </ul>	



	<ul style="list-style-type: none"> <li>●● use a moving average to identify seasonality and trends in time series data, using them to make predictions</li> <li>●● select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including histograms for grouped continuous data with equal class intervals</li> <li>●● construct histograms, including those with unequal class intervals</li> </ul> <p><b>Interpreting and discussing results</b></p> <ul style="list-style-type: none"> <li>●● interpret and use cumulative frequency diagrams to solve problems</li> <li>●● recognise the limitations of any assumptions and the effects that varying the assumptions could have on the conclusions drawn from data analysis</li> <li>●● compare two or more distributions and make inferences, using the shape of the distributions and measures of average and spread, including median and quartiles</li> <li>●● use, interpret and compare histograms, including those with unequal class intervals</li> </ul> <p><b>Probability</b></p> <ul style="list-style-type: none"> <li>●● use tree diagrams to represent outcomes of compound events, recognising when events are independent and distinguishing between contexts involving selection both with and without replacement</li> <li>●● recognise when and how to work with probabilities associated with independent and mutually exclusive events when interpreting data</li> <li>●● understand that if an experiment is repeated, the outcome may – and usually will – be different, and that increasing the sample size generally leads to better estimates of probability and population parameters</li> </ul>	
<p>Module 5 Functionality</p>	<p><b>Representing</b></p> <ul style="list-style-type: none"> <li>●● choose and combine representations from a range of perspectives; introduce and use a range of mathematical techniques, the most efficient for analysis and most effective for communication</li> </ul> <p><b>Analysing – use mathematical reasoning</b></p> <ul style="list-style-type: none"> <li>●● make progress by exploring mathematical tasks, developing and following alternative approaches; examine and extend generalisations; support assumptions by clear argument and follow through a sustained chain of reasoning, including proof</li> </ul> <p><b>Interpreting and evaluating</b></p> <ul style="list-style-type: none"> <li>●● show insight into the mathematical connections in the context or problem; critically examine strategies adopted and arguments presented; consider the</li> </ul>	



assumptions in the model and recognise limitations in the accuracy of results and conclusions

**Communicating and reflecting**

- routinely review and refine findings and approaches; identify how other contexts were different from, or similar to, the current situation and explain how and why the same or different strategies were used

