



Scheme of Work		SUBJECT: Mathematics		YEAR: 11 Higher (set 2) ~ Autumn term 1	
	Surds and indices	Circle theorems	Probability		
Key concepts	<p><b>1) Calculate exactly with surds</b></p> <p><b>2) Simplify surd expressions involving squares eg</b></p> $\sqrt{12} = \sqrt{4 \times 3}$ $\sqrt{12} = \sqrt{4} \times \sqrt{3}$ $\sqrt{12} = 2\sqrt{3}$ <p><b>3) Rationalise denominators</b></p> <p>4) Recognise and use <u>simple geometric progressions</u> (<math>r^n</math> where <math>n</math> is an integer and <math>r</math> is a surd)</p>	<p><b>1. Apply and prove the standard circle theorems concerning angles, radii, tangents and chords and use them to prove related results</b>, including</p> <p>a. angle at centre is equal to twice angle at circumference;</p> <p>b. angle in a semi-circle is <math>90^\circ</math>;</p> <p>c. angles in the same segment are equal;</p> <p>d. opposite angles in a cyclic quadrilateral sum to <math>180^\circ</math>;</p> <p>e. tangent at any point on a circle is perpendicular to the radius at that point</p> <p>f. tangents from an external point are equal in length;</p>	<p>1. Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments</p> <p>2. Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale</p> <p>3. <u>Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size</u></p> <p>4. Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams <u>and tree diagrams</u></p>		



		<p>g. the perpendicular from the centre to a chord bisects the chord;</p> <p>h. alternate segment theorem</p>	<p>5. <u>Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</u></p> <p>6. <b>Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams</b></p>
Themes	<b>Surds</b>	<b>Circle theorems</b>	<b>Probability</b>
Challenge	<p>1) Perform the four operations with surds in the following format <math>a\sqrt{b} + c\sqrt{d}</math></p> <p>2) Focus on larger numbers which may take several steps to simplify</p> <p>3) Rationalise denominators including brackets</p>	<p>1) Recap using SSS, SAS and ASA to prove two triangles are congruent</p> <p>1) Use circle theorems to complete proof questions</p>	<p>4) Notation for Venn diagrams <math>P(A \cap B)</math>, <math>P(A \cup B)</math>, <math>P(A')</math></p> <p>4) Venn diagrams using three events</p> <p>5) Tree diagrams using more than 2 outcomes</p>



	3) Solve multi-step problems involving surds and linking to other areas of mathematics		
Support	<p>1) Recap square numbers</p> <p>1) Focus on the methods for performing the four operations with surds, but leaving answers in un-simplified form</p> <p>2) Focus on smaller numbers, i.e. multiples of 4, 9, 25, 100 etc</p> <p>4) Can Identify arithmetic and geometric sequences</p> <p>4) Create geometric sequences from rules</p>	<p>1) Recap parts of a circle</p> <p>1) Recap basic angle properties and practice solving problems using more than 1 property</p>	<p>2) Recap language of probability and probability scales</p> <p>3) Carry out experiments to investigate the connection between experimental and theoretical probability</p> <p>4) Complete two way tables</p> <p>5) Frequency trees to record information</p>
Literacy focus	Key words: Surds, rationalise, sequences, geometric, square numbers, multiples, denominators, multiply, divide	Key words: Subtended, alternative theorem, radius, circumference, segment	Key words: Probability, dependent, independent, Tree diagrams, Venn diagrams, two way tables, experimental probability, Theoretical probability, relative frequency
Cross-curricular links			
SMSC & MBV			
ASSESSMENTS	Assessment 1 ~ October	Assessment 1 ~ October	Assessment 1 ~ October

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Out of school learning	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week
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Scheme of Work		SUBJECT: Mathematics		YEAR: 11 Higher (set 2) ~ Autumn term 2	
	Direct and inverse proportion	Statistics recap and review	Vectors		
Key concepts	<p>1) Solve problems involving direct and inverse proportion, including graphical and algebraic representations</p> <p><u>2) Understand that <math>X</math> is inversely proportional to <math>Y</math> is equivalent to <math>X</math> is proportional to <math>\frac{1}{y}</math></u></p> <p>3) <b>Construct and interpret equations that describe direct and inverse proportion</b></p> <p><u>4) Recognise and interpret graphs that illustrate direct and inverse proportion</u></p>	<p>1. <b>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</b></p> <p>2. Interpret, analyse and compare distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data, <b>including box plots</b></p> <p>3. interpret, analyse and compare the distributions of data sets from univariate empirical distributions</p>	<p><b>1) <u>Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors</u></b></p> <p><b>2) Use vectors to construct geometric arguments and proofs</b></p>		



		<p>through consideration of outliers, <b>quartiles and inter-quartile range</b></p> <ol style="list-style-type: none"> <li>4. <u>Draw estimated lines of best fit</u></li> <li>5. <u>Make predictions</u></li> <li>6. <u>Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so</u></li> <li>7. <u>Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling</u></li> </ol>	
Themes	<b>Direct and inverse proportion</b>	<b>Representing data</b>	<b>Vectors</b>
Challenge	<ol style="list-style-type: none"> <li>1) Sketch graphs of direct and inverse proportion involving squares and cubes</li> <li>3) Use algebraic notation for creating equations to represent direct and inverse proportion.</li> </ol>	<ol style="list-style-type: none"> <li>1) Calculating frequencies from histogram</li> <li>1) Estimating frequencies above or below a given value, both on a histogram and a cumulative frequency diagram</li> <li>1) Estimating key statistics from a cumulative frequency diagram</li> <li>2) Compare two data sets from box plot by comparing the medians, IQR and spread of the data, include values in answer</li> </ol>	<ol style="list-style-type: none"> <li>1) Four operations with vectors involving negatives</li> <li>2) Diagrams involving fractions of vector, i.e. using midpoints</li> <li>2) Mixing vectors and ratios to solve more complex geometric arguments and proofs</li> </ol>



		Describing the relationship between the two variables as well as stating its correlation, understand the difference between these	
Support	<p>1) Basic wordy problems using direct and inverse proportion, by calculating unitary proportion</p> <p>1) Sketch graphs of simple direct and inverse proportion, i.e. not squares or cubes</p>	<p>1) Recap the meaning of frequency tables and interpretation of inequalities for intervals</p> <p>1) Recap constructing and interpreting frequency diagrams and polygons</p> <p>2) Compare two data sets using an average and the range</p> <p>2) Calculate interquartile range from a set of raw data</p> <p>4) Recap constructing scatter diagrams</p> <p>4) Recap correlation</p>	<p>1) Link vectors to translations</p> <p>1) Four operations with simple vectors</p> <p>2) Simple basic diagrams involving addition and subtraction of whole vector</p>
Literacy focus	Key words Direct, inverse, proportion,	Key words: Frequency, frequency density, histogram, interval, cumulative frequency, interquartile range, quartiles, scatter diagrams, correlation, box plot	Key words Vectors
Cross-curricular links			
SMSC & MBV			
ASSESSMENTS	Assessment 2 ~ Mocks #1	Assessment 2 ~ Mocks #1	Assessment 2 ~ Mocks #1
Out of school learning	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week



Scheme of Work		SUBJECT: Mathematics		YEAR: 11 Higher (set 2) ~ Spring term 1	
	Growth and decay	Geometry and measures	Algebraic fractions	Further equations and graphs	
Key concepts	1. <u>Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes</u>	1) Solve geometrical problems on co-ordinate axes 2) Identify, describe and construct congruent and similar shapes, including on co-ordinate axes, by considering rotation, reflection, translation and enlargement ( <u>including fractional and negative scale factors</u> ) 3) <b>Describe the changes and invariance achieved by combinations of rotations, reflections and</b>	1. <b>Simplify and manipulate algebraic expressions involving algebraic fractions</b>	1) Solve linear equations in one unknown algebraically <u>including those with the unknown on both sides of the equation</u> 2) Find approximate solutions using a graph 3) <u>Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square</u>	





		<p><b>translations</b> including using column vector notation for translations</p> <p>4) <u>Find the surface area of pyramids and composite solids</u></p> <p>5) <u>Calculate surface area of spheres, cones and composite solids</u></p> <p>6) <u>Calculate the volume of spheres, pyramids, cones and composite solids</u></p> <p>7) including frustums</p> <p>8) <u>Calculate arc lengths, angles and areas of sectors of circles</u></p>		<p><b>and by using the quadratic formula</b></p> <p>4) <u>Find approximate solutions using a graph</u></p> <p>5) Recognise, sketch and interpret graphs of linear and quadratic functions</p> <p>6) <u>Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square</u></p> <p>7) <u>Translate simple situations or procedures into algebraic expressions or formulae</u></p> <p>8) <u>derive an equation, solve the equation and interpret the solution</u></p>
Themes	<b>Iteration</b>	<b>Geometry and measures recap and review</b>	<b>Algebraic fractions</b>	<b>Solving linear and quadratic equations</b>



Challenge	<ul style="list-style-type: none"> <li>1. More complex iterative problems</li> <li>1. Rearranging formulae to give the iterative formula</li> </ul>	<ul style="list-style-type: none"> <li>6) Calculating volume and surface area of frustums</li> <li>1 – 8) Link into other areas of maths to solve more complex multi-step questions</li> </ul>	<ul style="list-style-type: none"> <li>1) Solve equations involving algebraic fractions</li> <li>4) Create and solve equations involving algebraic fractions</li> <li>1) Link into other areas of mathematics to solve more complex problems</li> </ul>	<ul style="list-style-type: none"> <li>2) Solve quadratics with a coefficient of 'a' using factorising and completing the square</li> <li>7) Make the link between the turning point and completing the square</li> <li>8) Derive and solve quadratic equation to solve problems</li> <li>8) Derive and solve simultaneous equations, where one is linear and the other quadratic</li> </ul>
Support	<ul style="list-style-type: none"> <li>1) Recap methods of substitution</li> <li>1) Remind students that BIDMAS applies to algebraic expressions</li> </ul>	<ul style="list-style-type: none"> <li>1) Recap basic methods for simple transformations</li> <li>2) Describing a transformation which has taken place</li> <li>4) Recap formulas for area of 2D shape</li> <li>6) Recap methods of substitution and remind students that BIDMAS apply to algebraic expressions</li> <li>8) Calculate area and perimeter of semi-circles and quarter circles</li> </ul>	<ul style="list-style-type: none"> <li>1) Recap factorising quadratics</li> <li>1) Four operations involving fractions</li> </ul>	<ul style="list-style-type: none"> <li>2) Solving a range of linear equations</li> <li>3) Solve quadratics by factorising</li> <li>8) Derive and solve linear equations to solve problems</li> <li>8) Derive and solve simultaneous equations, where both are linear</li> </ul>
Literacy focus	Key words: Compound measures, iteration, iterative formula	Key words: Reflection, rotation, translation, enlargement,	Key words: Algebraic fractions, factorise	Key words:



		scale factor, vector, surface area, volume, cone, cylinder, sphere, pyramid, composite shapes, frustum, arcs, sectors		Linear, quadratic, simultaneous, factorise, completing the square
Cross-curricular links				
SMSC & MBV				
ASSESSMENTS	Assessment 3 ~ Formal in class assessments	Assessment 3 ~ Formal in class assessments	Assessment 3 ~ Formal in class assessments	Assessment 3 ~ Formal in class assessments
Out of school learning	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week



Scheme of Work		SUBJECT: Mathematics	YEAR: 11 Higher (set 2) ~ Spring term 2
	<b>Algebra: Further quadratics, rearranging formulae and identities</b>	<b>Equation of a circle</b>	
Key concepts	<ol style="list-style-type: none"> <li>1. Simplify and manipulate algebraic expressions (<u>including those involving surds</u>) by:               <ol style="list-style-type: none"> <li>a. <u>expanding products of two or more binomials</u></li> <li>b. <u>factorising quadratic expressions of the form <math>ax^2 + bx + c</math> including the difference of two squares</u></li> <li>c. <b>factorising quadratic expressions of the form <math>ax^2 + bx + c</math></b></li> <li>d. simplifying expressions involving sums, products and powers, including the laws of indices</li> </ol> </li> <li>2. Understand and use standard mathematical formulae</li> <li>3. Rearrange formulae to change the subject</li> <li>4. <u>Know the difference between an equation and an identity</u></li> <li>5. <u>Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs</u></li> <li>6. Where appropriate, interpret simple expressions as functions with inputs and outputs</li> </ol>	<ol style="list-style-type: none"> <li>1) <b>Recognise and use the equation of a circle with centre at the origin</b></li> <li>2) <b>Find the equation of a tangent to a circle at a given point.</b></li> </ol>	



	<p><b>7. Interpret the reverse process as the 'inverse function'</b></p> <p><b>Interpret the succession of two functions as a 'composite function'</b></p>	
Themes	<b>Algebraic manipulation</b>	<b>Equation of a circle</b>
Challenge	<p>1. Perform each of the skills on expressions involving surds</p> <p>1. Expanding three brackets</p> <p>1. Factorising expressions with a coefficient of 'a'</p> <p>3. Rearrange formulae where the subject appears more than once</p> <p>5. More complex proof problems</p> <p>7. Calculate composite functions of algebraic expressions using algebra only</p> <p>Calculate inverse functions of more complex functions (i.e. subject appears twice)</p>	<p>2) Gradient of perpendicular lines</p> <p>2) Link into trigonometry to calculate area of sectors and segments</p> <p>2) Link into other areas of mathematics to solve more complex problems</p>
Support	<p>1) Recap FOIL method, or other methods covered for expanding two brackets</p> <p>1) Recap the meaning of 'Factorising' Factorise into a single bracket</p> <p>1) Recap rules of indices</p> <p>3) Rearranging formulae using flow charts for those struggling</p> <p>Understand the difference between 'show' and 'Prove'</p>	<p>2) Find equation of a straight line</p>
Literacy focus	Key words:	Key words:

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	Factorise, completing the square, formulae, functions, composite, inverse	Radius, tangent, gradient, y-intercept, $y=mx+c$ , sectors, segments
Cross-curricular links		
SMSC & MBV		
ASSESSMENTS	Assessment 4 ~ Mocks #2	Assessment 4 ~ Mocks #2
Out of school learning	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week	Exam questions ~ ½ Churchill exam paper ~ to be marked in class next week

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