

## Curriculum Overview for Mathematics

### Year 11 (Higher)

<u>NP15: Surds and Indices</u> <p><b>Declarative Knowledge</b></p> <ul style="list-style-type: none"> <li>• Recognise roots</li> <li>• Recognise exponents and simple index laws</li> </ul> <p><b>Procedural Knowledge</b></p> <ul style="list-style-type: none"> <li>• Calculating with surds</li> <li>• Simplifying surds</li> <li>• Rationalising the denominator of a fraction</li> <li>• Calculate the powers</li> <li>• Calculate with negative and fractional indices</li> </ul> <p><b>Contextual Knowledge</b></p> <ul style="list-style-type: none"> <li>• Solve problems with powers</li> <li>• Solve problems with surds</li> </ul>	   	<p>Reading like a Mathematician  Subject specific vocabulary definitions and choral response  Reading reasoning and problem-solving questions</p> <p>Index (Exponent), Base, Power, Index Laws, Zero Index, Negative Index, Surd, Simplifying Surds, Rational Number, Irrational Number, Conjugate.</p> <p>End of unit (NP15-16) assessment with feedback lesson to address misconceptions  Content from this unit may be included in the formal mock assessment</p> <p>1 hour of Sparx Maths homework needs to be completed every week  Revision for formal assessment using provided revision booklet</p>
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<u>NP16: Numerical and Algebraic Representations of Proportion and Change</u> <p><b>Disciplinary knowledge</b></p> <ul style="list-style-type: none"> <li>• Recall representing direct proportion algebraically</li> <li>• Recall representing inverse proportion algebraically</li> </ul> <p><b>Procedural knowledge</b></p> <ul style="list-style-type: none"> <li>• Work with compound interest</li> <li>• Work with repeated percentage change</li> <li>• Represent exponential growth</li> <li>• Work with exponential growth and decay</li> </ul>	  	<p>Reading like a Mathematician  Subject specific vocabulary definitions and choral response  Reading reasoning and problem-solving questions</p> <p>Direct Proportion  Inverse Proportion  Compound Interest  Repeated Percentage Change  Multiplier  Exponential Growth  Exponential Decay  Squares, Cubes, Roots  Ratio and Proportion  Rates of Flow  Density/Pressure Problems  Graphical Representation  Algebraic Representation</p> <p>End of unit (NP15-16) assessment with feedback lesson to address misconceptions  Content from this unit may be included in the formal mock assessment</p>
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<b>Contextual knowledge</b> <ul style="list-style-type: none"> <li>Solve problems using direct proportion (H)</li> <li>Solve problems using direct proportion with squares, cubes and roots (H)</li> <li>Solve problems using inverse proportion (H)</li> <li>Solve problems using inverse proportion with square, cubes and roots (H)</li> <li>Work with exponential growth and decay graphically (H)</li> <li>Work with exponential growth and decay algebraically (H)</li> <li>Solve ratio and proportion problems, including combining ratio and quantities with different densities/pressures (H)</li> <li>Solve ratio and proportion problems with algebra (H)</li> <li>Solve ratio and proportion problems with rates of flow (H)</li> </ul>		1 hour of Sparx Maths homework needs to be completed every week  Revision for formal assessment using provided revision booklet
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<b>GM10: Advanced Vectors</b>  <b>Disciplinary knowledge</b> <ul style="list-style-type: none"> <li>Algebraic notation</li> <li>How to write a column vector</li> <li>Write a column vector to represent a translation</li> </ul> <b>Procedural knowledge</b> <ul style="list-style-type: none"> <li>Represent a path as a vector</li> <li>Add vectors</li> <li>Subtract vectors</li> <li>Multiply a vector by a scalar (H)</li> <li>Find the magnitude of a vector (H)</li> </ul> <b>Contextual knowledge</b> <ul style="list-style-type: none"> <li>Interpret vector addition geometrically</li> <li>Identify parallel vectors (H)</li> <li>Make geometric arguments and proofs using vectors (H)</li> </ul>		Reading like a Mathematician Subject specific vocabulary definitions and choral response Reading reasoning and problem-solving questions
		Column Vector, Translation Vector, Vector Addition, Vector Subtraction, Scalar Multiplication (H), Magnitude of a Vector (H), Parallel Vectors (H), Geometric Interpretation, Vector Proofs (H)
		End of unit assessment to address misconceptions Content from this unit may be included in the formal mock assessment
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**SP7: Advanced Probability**
**Disciplinary knowledge**

- Calculate simple probabilities
- Know that experiments and samples are theoretical
- Know the impact of sample size



Reading like a Mathematician  
 Subject specific vocabulary definitions and choral response  
 Reading reasoning and problem-solving questions

**Procedural knowledge**

- Predict expected outcomes
- Construct tree diagrams
- Interpret tree diagrams
- Construct tree diagrams for conditional probability (H)



Probability, experiment, sample space, outcome, event, relative frequency, expected outcome, tree diagram, conditional probability (H), independent event, 'and' rule, 'or' rule, Venn diagram, two-way table, sample size, sample, mutually exclusive,



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**Contextual knowledge**

- Use tree diagrams to calculate probability of independent events
- Calculate probability using tree diagrams
- Calculate probability using Venn diagrams
- Calculate probability using two-way tables
- Apply the 'and' and 'or' rules of probability calculations
- Solve complex probability problems, including 'given that' problems (H)
- Solve complex probability problems, including forming and solving equations (H)



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**A15: Functions and Advanced Graphs**
**Disciplinary knowledge**

- Recognise function notation
- Recognise and define composite functions
- Recognise and define inverse functions
- Identify cubic graphs
- Identify exponential graphs
- Identify trigonometric graphs



Reading like a Mathematician  
 Subject specific vocabulary definitions and choral response  
 Reading reasoning and problem-solving questions



Function notation, composite function, inverse function, cubic graph, exponential graph, inverse graph, trigonometric graph, sketch, iteration, iterative, equation of a circle, trial and improvement



End of unit assessment to address misconceptions  
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**Procedural knowledge**

- Evaluate functions
- Solve equations with functions
- Work with inverse graphs and functions
- Work with exponential functions and graphs
- Work with composite functions and graphs
- Complete an iterative process to solve an equation
- Sketch trigonometric graphs
- Estimate values using a trigonometric graph
- Translate and reflect graphs
- Use the equation of a circle

**Contextual knowledge**

- Work with and calculate with mixed problems using functions and graphs
- Use a graph to solve equations
- Calculate the roots of graphs
- Use trial and improvement as a strategy for solving equations
- Complete transformations of graphs, including combinations
- Reason and problem solve with functions, graphs, trigonometric graph transformation and equation of a circle



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## Curriculum Overview for Mathematics

### Year 11 (Crossover)

<b>A11-13: Advanced Manipulating and Simplifying Expressions, Quadratic Graphs and Equations, Advanced Sequences</b>		Reading like a Mathematician Subject specific vocabulary definitions and choral response Reading reasoning and problem-solving questions
<b>Disciplinary knowledge</b> <ul style="list-style-type: none"> <li>• Expand single brackets</li> <li>• Factorise into single brackets</li> <li>• Working with visual representations of arithmetic, quadratic and geometric sequences</li> <li>• Completing the number line - knowing about the different sets of numbers (natural, integers, rational, real (incl. irrational))</li> <li>• Power of 0, negative and fractional indices</li> </ul>		A11: expand, factorise, highest common factor, index law, exponents A12: parabola, roots, turning point/ vertex, y-intercept, quadratic formula, completing the square, factorised, equation, substitution A13: $U_n$ , linear sequence, quadratic sequence, geometric sequence, Fibonacci sequence, recurrence relation, square numbers, cube numbers, triangular numbers, position
<b>Procedural knowledge</b> <ul style="list-style-type: none"> <li>• Addition and subtraction of indices, power of a power, power of 0</li> <li>• Expand two and three binomials, including adding expressions which need first expanding</li> <li>• Factorising a quadratic where <math>a = 1</math></li> <li>• Factorising the difference of two squares</li> <li>• Factorising a quadratic where <math>a &gt; 1</math></li> <li>• Simplifying algebraic fractions, including numerical factors, single letter factors and bracket factors</li> <li>• Rearranging more complex formulae (including non-linear, subject in denominator, and subject appearing twice)</li> <li>• Plotting quadratics and reading values from a graph; solving quadratics graphically and simple <math>ax^2=b</math> by rearrangement</li> <li>• Solving quadratic equations <math>= 0</math> by factorising, identifying the solutions on a graph</li> <li>• Solving quadratic equations <math>= 0</math> using the quadratic formula, identifying the solutions on a graph</li> <li>• Completing the square to find roots. Simple examples where <math>b</math> is even and <math>a = 1</math>.</li> <li>• Producing a sketch graph of a quadratic by finding roots, y-intercept and turning points (by symmetry only)</li> <li>• Fibonacci sequences - numerical and algebraic</li> <li>• Quadratic sequences, including finding the nth term</li> <li>• Recurrence relations</li> </ul>		End of unit assessment to address misconceptions Content from this unit may be included in the formal mock assessment
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<b>Contextual knowledge</b> <ul style="list-style-type: none"> <li>• Simplifying an expression by factorising out a bracket</li> <li>• Solving quadratics presented not equal to 0, selecting the best method for solving</li> </ul>		
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<b>GM8: Surface Area and Volume</b> <p><b>Declarative Knowledge</b></p> <ul style="list-style-type: none"> <li>• Identify cubes, cuboids, prisms, cylinders, spheres, pyramids, cones and frustums</li> <li>• Define prisms</li> <li>• Define pyramids</li> </ul> <p><b>Procedural Knowledge</b></p> <ul style="list-style-type: none"> <li>• Calculate the surface area of cubes, cuboids, prisms, cylinders, spheres, pyramids and cones</li> <li>• Calculate the volume of cubes, cuboids, prisms, cylinders, spheres, pyramids and cones</li> <li>• Convert between square units of measurement (surface area)</li> <li>• Convert between cube units of measurement (volume)</li> </ul> <p><b>Contextual Knowledge</b></p> <ul style="list-style-type: none"> <li>• Calculate the surface area of frustums</li> <li>• Calculate the volume of frustums</li> <li>• Calculate the surface area of similar solids</li> <li>• Calculate the volume of similar solids</li> </ul>	   	<p>Reading like a Mathematician    Subject specific vocabulary definitions and choral response    Reading reasoning and problem-solving questions</p> <p>Cube, Cuboid, Prism, Cylinder, Sphere, Pyramid, Cone, Frustum, Similar, Surface area, Volume, Unit squared, Unit cubed</p> <p>End of unit assessment to address misconceptions    Content from this unit may be included in the formal mock assessment</p> <p>1 hour of Sparx Maths homework needs to be completed every week    Revision for formal assessment using provided revision booklet</p>
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### GM9: Advanced Right-Angled Triangles

#### Declarative Knowledge

- Recall Pythagoras' theorem
- Recall the trigonometric ratios



Reading like a Mathematician  
 Subject specific vocabulary definitions and choral response  
 Reading reasoning and problem-solving questions

#### Procedural Knowledge

- Calculate unknown lengths in 2D right-angled, equilateral and isosceles triangles
- Calculate unknown angles in 2D right-angled, equilateral and isosceles triangles
- Calculate unknown lengths in 3D cuboids (diagonals inside the cuboid)
- Calculate unknown angles in 3D cuboids (diagonals inside the cuboid)
- Calculate unknown angles in triangles using the sine rule
- Calculate unknown sides in triangles using the sine rule
- Calculate unknown angles in triangles using the cosine rule
- Calculate unknown sides in triangles using the cosine rule
- Calculate the area of triangle using the area of a triangle with sin formula



Hypotenuse  
 Opposite  
 Adjacent  
 Trigonometry  
 Right-angled triangle  
 Equilateral triangle  
 Isosceles triangle



End of unit assessment to address misconceptions  
 Content from this unit may be included in the formal mock assessment

#### Contextual Knowledge

- Reason and problem solve with 3D Pythagoras – using it in different contexts
- Reason and problem solve with 3D Trigonometry – using it in different contexts
- Reason and problem solve, including proof, with the sine rule
- Reason and problem solve, including proof, with the cosine rule
- Reason and problem solve, including proof, with the area of a triangle using sine



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## Curriculum Overview for Mathematics

### Year 11 (Foundation)

<b>A8: Linear Inequalities</b> <p><b>Declarative knowledge:</b></p> <ul style="list-style-type: none"> <li>• Know the inequality symbols</li> <li>• Know how to read a number line</li> </ul> <p><b>Procedural knowledge:</b></p> <ul style="list-style-type: none"> <li>• Represent a single inequality on a number line</li> <li>• Read an inequality from a number line</li> <li>• Represent a restrictive inequality on a number line</li> <li>• Read a restrictive inequality from a number line</li> <li>• Solve a linear inequality</li> <li>• State integer solutions to a linear inequality</li> <li>• Solve a restricted inequality</li> </ul> <p><b>Contextual knowledge:</b></p> <ul style="list-style-type: none"> <li>• Solve an inequality where division/multiplication of a negative is required</li> <li>• Solve a system of linear inequalities</li> <li>• Form an inequality from a description</li> </ul>		Reading like a Mathematician Subject specific vocabulary definitions and choral response Reading reasoning and problem-solving questions
		Inequality $<$ - less than $>$ - greater than $\leq$ - less than or equal to $\geq$ - greater than or equal to $=$ - equal to $\neq$ - not equal to Number Line Linear Inequality Solution Set Integer Solutions System of Inequalities Cartesian Grid Shading Open Circle Closed Circle Forming an Inequality Graphical Representation
		End of unit assessment to address misconceptions Content from this unit may be included in the formal mock assessment
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<b>GM4: Congruence and Similarity</b> <p><b>Declarative knowledge:</b></p> <ul style="list-style-type: none"> <li>• Read a column vector</li> <li>• Read a directed line vector</li> </ul>		Reading like a Mathematician Subject specific vocabulary definitions and choral response Reading reasoning and problem-solving questions
		Congruent, transformation, image, vector, similar, translation, enlargement, negative enlargement, fractional enlargement, rotation, reflection, mirror line, axis (pl. axes)
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<b>SP3: Introduction to Probability</b> <p><b>Disciplinary knowledge</b></p> <ul style="list-style-type: none"> <li>• Know the language of probability</li> <li>• Know the notation of probability</li> <li>• Know the probabilities of mutually exclusive events sum to 1</li> </ul> <p><b>Procedural knowledge</b></p> <ul style="list-style-type: none"> <li>• Use systematic listing</li> <li>• Record, describe and analyse the frequency of outcomes of simple probability experiments</li> <li>• Calculate theoretical probability</li> <li>• Construct theoretical sample spaces</li> <li>• Calculate the probability of 'and' events</li> <li>• Calculate the probability of 'or' events</li> </ul> <p><b>Contextual knowledge</b></p> <ul style="list-style-type: none"> <li>• Represent possible outcomes on a frequency tree</li> <li>• Represent possible outcomes on a tree diagram</li> <li>• Represent possible outcomes on a two-way table</li> <li>• Represent possible outcomes on a simple Venn diagram</li> <li>• Use sample space diagrams to calculate probability</li> </ul>		Systematic, relative frequency, outcome, event, fair, biased, mutually exclusive, independent, set, universal set, intersection, elements
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<b>NP11: Ratio</b> <p><b>Disciplinary knowledge</b></p> <ul style="list-style-type: none"> <li>• Know and use ratio notation</li> <li>• Identify uses for ratio</li> </ul>		Reading like a Mathematician Subject specific vocabulary definitions and choral response Reading reasoning and problem-solving questions
<p><b>Procedural knowledge</b></p> <ul style="list-style-type: none"> <li>• Simplify ratios</li> <li>• Simplify ratios into <math>1:n</math> / <math>n:1</math></li> <li>• Convert between ratio and fractions to represent proportional value</li> <li>• Share into ratios</li> </ul>		simplify (fully), ratio, part, whole, fraction, numerator, denominator, exchange, currency, ingredient
<p><b>Contextual knowledge</b></p> <ul style="list-style-type: none"> <li>• Calculate parts with given the difference between ratio part values</li> <li>• Use ratio in context, such as currency exchange and recipes.</li> </ul>		End of unit assessment to address misconceptions Content from this unit may be included in the formal mock assessment
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