

# **Goldwyn Plus - Mathematics**

## **Subject Statement and Long Term Plan**



## **Mathematics – Statement of Intent**

*“Every problem has a solution”*

### **Intent**

Our intent is to encourage all students to build on their knowledge and explore all areas of mathematics. Students are encouraged to physically represent mathematical concepts. Objects and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols. Mathematical concepts are explored in a variety of representations and problem-solving contexts to give pupils a richer and deeper learning experience. This has three stages fluency, reasoning and leads to problem solving. Becoming fluent in the fundamentals of mathematics, including through varied and frequent practice, so that pupils develop conceptual understanding and recall and apply knowledge. Reasoning mathematically by following a line of enquiry, conjecturing relationships and generalisations, and using mathematical language. Problem solving is applying their mathematics to a variety of routine and non-routine problems

Students are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without grasping the principles. All learners benefit from deepening their conceptual understanding of mathematics, regardless of whether they've previously struggled or excelled. We believe students must be given time to fully understand, explore and apply ideas - rather than accelerate through new topics. This approach enables learners to truly grasp a concept, and the challenge comes from investigating it in new, alternative and more complex ways.

### **Implementation**

The curriculum is sequenced by topics which build, link and expand on previous knowledge. Each student starts the topic at a suitable point for them anywhere from the Key stage 1, Key stage 2, Key stage 3 and GCSE learning objective regardless of their year group. Each topic follows a rubric where students can identify the aspect they are working on and what they are working towards. Students can start anywhere on the rubric based on their strengths spending as long as needed to make sure they have embedded the skills and concepts needed before moving on. We start each lesson focusing on timetables or number skills to ensure these are fluent. Lessons are taught as a range of 1:1 and mixed age and ability groups. These group vary each lesson and the amount of lessons is dependent on the student bespoke learning programme.

### **Impact**

Students will be curious and resilient learners. Students will be able to take functional skills Edexcel awards in number and measure, statistics Algebra and a GCSE in mathematics. As well as formal examinations students will have the skills and knowledge to be able to know when and how to use maths in their everyday lives. Students will use their mathematical knowledge across the curriculum.

## Mathematics Department: Long Term Plan

The Mathematics Long Term Plan reflects a key focus upon fluency, reasoning and problem-solving skills across the curriculum. It is anticipated that all pupils will have the opportunity to study for a formal qualification in Mathematics which addresses their needs, including AQA Awards, Entry level Certificates and GCSE examinations. The Curriculum Plan has a clear sequence centred upon both prior learning and expectations for future learning. Students work based on a key stage to suit them anywhere from KS1, KS2 KS3 upwards. It is hoped that this work provides the foundation for further progress through Key Stage 4.

Term	1	2	3	4	5	6
KS3	<p><b>Number and place value</b>  <b>Addition and subtraction</b>  <b>Multiplication and division</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>Understand and use place value</li> <li>Order positive integers</li> <li>Apply the four operations, including formal written methods, to integers</li> <li>Recognise and use relationships between operations</li> <li>Use the concepts and</li> </ul>	<p><b>Fractions decimals and percentages</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>To order and compare fractions, decimals and percentages using the correct symbol</li> <li>To recognize fractions or shapes, objects or quantities</li> <li>To recognise equivalent fractions</li> <li>To simplify fractions</li> <li>To recognise and convert improper fractions and mixed number</li> <li>To use the four operations with</li> </ul>	<p><b>Measurements</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</li> <li>measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml) tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks</li> </ul>	<p><b>Shapes – 2D and 3D</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them</li> <li>recognise angles as a property of shape or a description of a turn</li> <li>compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes</li> <li>identify acute and obtuse</li> </ul>	<p><b>Geometry – positions, directions, transformations</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>Describing positions and movements such as clock wise and anti-clock wise including degrees</li> <li>To recognise lines of symmetry, rotational symmetry</li> <li>to reflect, translate and rotate a shape in four quadrants</li> <li>Use co-ordinates</li> </ul>	<p><b>Statistics</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>interpret, construct and compare tally charts, pictograms, bar charts, line graphs, pie chart, timetables and tables.</li> </ul> <p>To calculate the mean, median mode and range in set of data</p>

	<p>vocabulary of prime numbers, factors (divisors) and multiples</p>	<p>fractions</p> <ul style="list-style-type: none"> <li>• read and write fraction, decimals and percentages as each other</li> <li>• recognise and use 3 DP</li> <li>• round decimals</li> <li>• read, write, order and compare numbers with up to three decimal places</li> <li>• To recognise per cent is out of 100.</li> <li>• To find a percentage of a number.</li> </ul>		<p>angles and compare and order angles up to two right angles by size</p> <ul style="list-style-type: none"> <li>• identify lines of symmetry in 2-D shapes presented in different orientations</li> <li>• Be able to measure and calculate the area and perimeter of regular and irregular shapes</li> </ul>		
<b>Year 10</b>	<p><b>Number properties</b>  <b>Decimals</b>  <b>Negative numbers</b>  <b>Units</b>  <b>Accuracy and rounding</b>  <b>BIDMAS</b>  <b>Indices and standard form</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• As KS3</li> <li>• order positive and negative integers</li> <li>• apply the four operations, including formal</li> </ul>	<p><b>Fractions, decimas</b>  <b>Percentages</b>  <b>Ratio and proportion</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• As KS3</li> <li>• Four operations with fractions</li> <li>• To calculate increase and decreases</li> <li>• Work with percentage larger than 100%</li> <li>• To calculate original value, simple and compound interest</li> </ul>	<p><b>2D shape properties</b>  <b>Perimeter and area</b>  <b>Circles</b>  <b>3D Shapes</b>  <b>Volume and surface area</b>  <b>Plans and elevations</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular</li> </ul>	<p><b>Angles</b>  <b>Pythagoras</b>  <b>Transformations and vectors</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with</li> </ul>	<p><b>Algebraic expressions, equation, formula and sequences</b>  <b>Inequalities</b>  <b>Simultaneous equations</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• use and interpret algebraic notation, including: <ul style="list-style-type: none"> <li>• <math>ab</math> in place of <math>a + b</math></li> <li>• <math>3y</math> in place of <math>3 \times y</math></li> <li>• <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>, <math>a^2b</math> in place of <math>a \times a \times b</math></li> <li>• <math>\frac{a}{b}</math> in place of <math>a \div b</math></li> </ul> </li> </ul>	<p><b>Statistical representation</b>  <b>Collecting data</b>  <b>Averages</b>  <b>Graphs and Scatter graphs</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>• interpret and construct <ul style="list-style-type: none"> <li>○ frequency tables</li> <li>○ bar charts</li> <li>○ pie charts</li> <li>○ pictograms</li> <li>○ pie charts</li> </ul> </li> <li>• interpret and</li> </ul>

	<p>written methods, to integers, both positive and negative</p> <ul style="list-style-type: none"> <li>• Use BIDMAS</li> <li>• use the concepts and vocabulary of highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem</li> <li>• calculate with roots, and with integer indices</li> <li>• calculate with and interpret standard form <math>A \times 10^n</math>, where <math>1 \leq A &lt; 10</math> and <math>n</math> is an integer.</li> </ul>	<ul style="list-style-type: none"> <li>• order positive and negative decimals</li> <li>• use the symbols =, <math>\neq</math>, <math>&lt;</math>, <math>&gt;</math>, <math>\leq</math>, <math>\geq</math></li> <li>• apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative;</li> <li>• understand and use place value</li> <li>• recognise and use relationships between operations</li> <li>• use ratio notation, including reduction to simplest form</li> <li>• express a multiplicative relationship between two quantities as a ratio</li> <li>• understand and use proportion as equality of ratios</li> <li>• relate ratios to</li> </ul>	<p>lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description</p> <p>derive and apply the properties and definitions of special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language</p> <p>use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)</p> <p>identify and apply circle definitions and properties, including: centre, radius, chord, diameter,</p>	<p>reflection and/or rotation symmetries;</p> <ul style="list-style-type: none"> <li>• use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description</li> <li>• apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles;</li> <li>• understand and use alternate and corresponding angles on parallel lines;</li> <li>• derive and use the sum of angles in a triangle (e.g. to deduce use the angle sum in any polygon, and to derive properties of regular polygons)</li> <li>• know the formulae for: Pythagoras' theorem, <math>a^2 + b^2 = c^2</math></li> </ul>	<ul style="list-style-type: none"> <li>• coefficients written as fractions rather than decimals</li> <li>• brackets</li> <li>• Simplify and manipulate algebraic expressions by: <ul style="list-style-type: none"> <li>• Collecting like terms</li> <li>• Multiplying a single term over a bracket</li> <li>• Taking out common factors</li> <li>• Expanding products of two or more binomials</li> <li>• Factorising quadratic expressions of the form <math>x^2 + bx + c</math>, including the difference of two squares</li> </ul> </li> <li>• Simplifying expressions involving sums, products and powers, including the laws of indices</li> </ul>	<p>construct vertical line charts and tables and line graphs for time series data</p> <ul style="list-style-type: none"> <li>• Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling.</li> <li>• apply statistics to describe a population</li> <li>• Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data.</li> <li>• interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:</li> </ul>
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	<ul style="list-style-type: none"> <li>simplify and manipulate algebraic expressions</li> <li>simplifying expressions involving sums, products and powers, including the laws of indices</li> </ul>	<ul style="list-style-type: none"> <li>fractions</li> <li>express the division of a quantity into two parts as a ratio</li> <li>apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentration s)</li> <li>understand and use proportion as equality of ratios</li> <li>solve problems involving direct and inverse proportion, including graphical and algebraic representations</li> <li>understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y</li> </ul>	<p>circumference, tangent, arc, sector and segment identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres</p> <p>know and apply formulae to calculate the volume of cuboids and other right prisms (including cylinders) know the formulae to calculate the surface area and volume of spheres, pyramids, cones and composite solids</p> <p>Construct and interpret plans an elevation</p>	<ul style="list-style-type: none"> <li>apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs</li> <li>identify an order of rotational and reflective symmetry for two dimensional shapes</li> <li>use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description</li> <li>Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering</li> </ul>	<ul style="list-style-type: none"> <li>Substitute numerical values into formulae and expressions, including scientific formulae</li> <li>Understand and use the concepts and vocabulary of expressions, equations, formulae, identities inequalities, terms and factors</li> <li>Understand and use standard mathematical formulae; rearrange formulae to change the subject</li> <li>Use relevant formulae to find solutions to problems such as simple kinematic problems involving distance, speed and acceleration</li> <li>Know the difference between an</li> </ul>	<p>appropriate graphical representation involving discrete, continuous and grouped data</p> <ul style="list-style-type: none"> <li>appropriate measures of central tendency (median, mean, mode and modal class) and spread</li> <li>apply statistics to describe a population</li> <li>use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation;</li> <li>Interpret simple expressions as functions with inputs and outputs;</li> <li>Work with coordinates in all four quadrants</li> <li>Plot graphs of equations that correspond to straight-line graphs in the coordinate</li> </ul>
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		<ul style="list-style-type: none"> <li>construct and interpret equations that describe direct and inverse proportion</li> </ul>		<p>rotation, reflection, translation and enlargement (including fractional scale factors)</p>	<p>equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments</p> <ul style="list-style-type: none"> <li>Solve linear inequalities in one variable;</li> <li>Represent the solution set on a number line;</li> <li>Understand and use the concepts and vocabulary of expressions, equations, formulae, identities and inequalities</li> <li>Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)</li> <li>Solve quadratic equations algebraically by factorising</li> <li>Find approximate</li> </ul>	<p>plane;</p> <ul style="list-style-type: none"> <li>Use the form <math>y = mx + c</math> to identify parallel lines</li> <li>Find the equation of the line through two given points, or through one point with a given gradient</li> </ul>
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					<p>solutions to quadratic equations using a graph</p> <ul style="list-style-type: none"><li>• solve two simultaneous equations in two variables algebraically;</li><li>• find approximate solutions to simultaneous equations in two variables using a graph</li><li>• translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution.</li><li>• solve linear inequalities in one variable</li><li>• represent the solution set on a number line,</li><li>• generate terms</li></ul>	
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					<p>of a sequence from either a term-to-term or a position-to-term rule</p> <ul style="list-style-type: none"> <li>recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (<math>r^n</math> where <math>n</math> is an integer, and <math>r</math> is a rational number <math>&gt; 0</math> or a surd) and other sequences</li> </ul>	
<b>Year 11</b>	<p><b>Recap year 10 Probability</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</li> <li>apply ideas</li> </ul>	<p><b>Recap year 10 Compound measures</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>use standard units of mass, length, time, money and other measures (including standard compound measures) using</li> </ul>	<p><b>Recap year 10 Trigonometry</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>know the trigonometric ratios</li> <li>apply them to find angles and lengths in right-angled triangles</li> <li>Know the exact values of <math>\sin\theta</math>, <math>\cos\theta</math> and <math>\tan\theta</math></li> </ul>	<p><b>Recap year 10 Constructions</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description</li> <li>use the standard</li> </ul>	<p><b>Revision, gap filling, Examinations</b></p>	<p><b>Recap year 10 Probability</b></p> <p><b>Key learning:</b></p> <ul style="list-style-type: none"> <li>record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</li> <li>apply ideas</li> </ul>

	<p>of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</p> <ul style="list-style-type: none"> <li>relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale</li> <li>apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the</li> </ul>	<p>decimal quantities where appropriate</p> <ul style="list-style-type: none"> <li>round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)</li> <li>change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts</li> <li>use compound units such as speed, rates of pay, unit pricing, density and pressure</li> </ul>		<p>ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle);</p> <ul style="list-style-type: none"> <li>use these to construct given figures and solve loci problems;</li> <li>know that the perpendicular distance from a point to a line is the shortest distance to the line</li> </ul>		<p>of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</p> <ul style="list-style-type: none"> <li>relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale</li> <li>apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of</li> </ul>
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	<p>property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p> <ul style="list-style-type: none"> <li>• understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</li> <li>• enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams</li> <li>• construct theoretical possibility spaces for single and combined</li> </ul>					<p>an exhaustive set of mutually exclusive events sum to one</p> <ul style="list-style-type: none"> <li>• understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</li> <li>• enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams</li> <li>• construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate</li> </ul>
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	<p>experiments with equally likely outcomes and use these to calculate theoretical probabilities</p> <ul style="list-style-type: none"> <li>calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</li> </ul>					<p>theoretical probabilities</p> <ul style="list-style-type: none"> <li>calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</li> </ul>
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**HIGHER CONTENT will be included for individual students if required.**

A student may start on this long term plan at a stage which does not match their current year group due to their needs.