# Mathematics

**Intent:**

In the mathematics department at BBG Academy, we instill critical thinking to solve a multitude of real-life problems and the ability to employ sound reasoning in order to become fluent in the fundamentals of mathematics. We engage students to appreciate the interlinked nature of mathematics and thus draw on prior successes in order to approach new concepts and scenarios with competence and confidence. We strive to make maths enjoyable for all our learners in a bid to develop lifelong independent learners.

We believe it is important for every student to reach their potential. Our goal is for students to engage in and enjoy their mathematics lessons, thus unlocking their potential and reach the highest grades they are capable of. We track the progress of each student extensively from the beginning of Year 7 right up to their GCSE examinations, allowing each member of staff to identify gaps in knowledge and intervene effectively. The department aims to develop confidence, interest and enjoyment in mathematics. We use a variety of up-to-date teaching methods and resources to engage students and relate their mathematical knowledge to everyday life around them and actively research new techniques and methods to support the students to progress as best we can.

We continue to develop an inclusive curriculum raise the achievement of our low attaining students, bolster the progress of middle attaining students and stretch our higher achievers.

Our KS3 curriculum is structured to initially bridge gaps in the transition from KS2. Curriculum is structured to systematically build upon prior learning year on year in order to allow students access to increasingly more complex concepts and content at GCSE level.

Interleaving starters and feed forward lessons are used in conjunction with online homework to reinforce prior learning, mastery and encourage independent advancement. Our assessment calendar is shared with the team at the beginning of the academic year together with the SOW, which explicitly spell out the objectives for students. Fixed half termly summative assessments are constructed and tracked to highlight gaps in prior knowledge so that teachers can promptly effectively intervene.

British values are emerging in the form of functional mathematics in which every good citizen needs to be proficient e.g., budgeting and household economics, personal finance matters, tax returns, interest rates, mortgages.

All students study the Edexcel GCSE course. This is a linear course which means that all the examinations are taken at the end of Year 11. The students will take three exams; one non-calculator and two calculator papers. All three examinations are one hour and 30 minutes long.

## Key Stage 3

**Implementation:**

| Term | Year 7 | | | Year 8 | | | Year 9 | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Topic** | **Knowledge** | **Skills/Assessment** | **Topic** | **Knowledge** | **Skills/Assessment** | **Topic** | **Knowledge** | **Skills/Assessment** |
| Term 1 | Transition | | | Proportional Reasoning | Ratio & Scale | Understanding and solving problems with ratio and scale | Reasoning with algebra | Straight line graphs | Finding equation of a straight line from a graph, interpret gradient and intercept of real-life graphs. Explore parallel and perpendicular lines |
| | Algebraic Thinking | Sequences | Make and test conjectures about patterns and relationships. Use a calculator accurately Generate sequences from term-to-term rule Recognise arithmetic and geometric sequences. | Proportional Reasoning | Multiplicative change | Applying reasoning and working with multiplicative change | | | |
| | | | | Proportional Reasoning | Multiplying and dividing fractions | Multiply and divide fractions and mixed numbers including simple algebraic fractions | | Forming and solving equations | Solving equations and inequalities with unknown on both sides. Rearrange one step, two step and complex formulae. Apply algebraic conventions and understanding of numbers to test conjectures |
| | Algebraic Thinking | Understanding and using algebraic notation | Use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships. Use relationships between operations including inverse operations. | Representations | Working in the Cartesian plane | Recognising equations of simple graphs, plotting y=mx+c and exploring gradient. | | | |
| | | | | Representations | Representing data | Reading and interpreting data representations; e.g., scatter graphs, frequency tables and two-way table | | Testing conjectures | Make and test conjectures about patterns and relationships; look for proofs or counterexamples. Simplify and manipulate algebraic expressions to maintain equivalence by expanding products of two or more binomials |
| | Algebraic Thinking | Equality & equivalence | Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms. Use approximation through rounding to estimate answers. Solve linear equations in one variable. | Representations | Tables & Probability | Working with tables, sample space diagrams, Venn diagrams, systematic listing and probability. | | | |
| | Place value & proportion | Place Value and Ordering | Understand and use place value for decimals, measures and integers of any size. Ordering positive and negative integers, decimals and fractions. Round numbers to an appropriate degree of | | | | Constructing in 2 & 3 dimensions | 3D shapes | Sketch nets of cuboids and other 3 D shapes, develop an understanding of plans and elevations. Calculate surface area of cubes, cuboids, triangular |

| Term | Year 7 | | | Year 8 | | | Year 9 | | |
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| | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment |
| | | | accuracy. Interpret and compare numbers in standard form | | | | | | prisms and cylinder. Explore volumes of cones, pyramids and spheres |
| | Algebraic Thinking | Fraction, decimal & percentages | Convert fluently between, fraction, decimals, and percentages. Compare quantities. Use and interpret pie charts | | | | | Constructions & congruency | Draw and measure angles. Construct perpendicular bisector from a point, to a point and explore loci. Construct triangles form given information and explore congruent triangles |
| Term 2 | Applications of Number | Addition & Subtraction | Addition & subtraction problem solving. Use formal and written methods, applied to positive integers and decimals. Solve problems involving perimeter, interpret appropriate tables, charts and diagrams. | Algebraic Techniques | Brackets, equations & inequalities | Simplifying and manipulating algebraic expressions with brackets. Solving equations and inequalities | Reasoning with numbers | Numbers | Work with directed numbers, HCF and LCM, numbers in standard form and fractions. Solve problems with fractions, decimals and integers. Understand and use surds |
| | | | | Algebraic Techniques | Sequences | Generating sequences given an algebraic rule and finding the nth term | | | |
| | | Multiplication & Division | Multiplication and division problem solving involving area of triangles, parallelograms and trapezia. Change freely between units (time, length, area, capacity and mass). Use the concepts and vocabulary of multiples, factors, lowest common multiple and highest common factor | Algebraic Techniques | Indices | Using laws of indices and applying the laws to algebraic expressions | Reasoning with numbers | Using percentages | Calculate percentage increase and decrease, express a change as a percentage, solve percentage problems (calculator and non-calculator). Solve reverse percentage and repeated percentage change problems. |
| | Directed Number | | | Algebraic Techniques | Fractions and percentages | Calculating fractions, decimals and percentages of an amount. Expressing one quantity as a fraction or percentage of another with and without a calculator | Reasoning with numbers | Maths & Money | Solve problems with bills, bank statements, simple |

| Term | Year 7 | | | Year 8 | | | Year 9 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment |
| | Fractional Thinking | Fractions & percentages of amounts | Calculate percentages and fractions of amounts (with and without a calculator) | | | Reverse percentages. Solve complex percentage problems | | | interest, compound interest, VAT, wages, taxes and exchange rates. Develop an understanding of financial maths |
| | | Equations with directed numbers | Use four operations with directed numbers | Algebraic Techniques | Standard form | Converting between standard form and ordinary numbers. | | | |
| | | | Evaluate algebraic expressions with directed numbers. | | | Applying four operations with standard form | Reasoning with geometry | Deduction | Solve angle problems using chain of reasoning, link constructions and geometrical reasoning |
| | | | Solve two step equations using order of operations with directed numbers, roots of positive numbers, exploring higher powers and roots | Algebraic Techniques | Number sense | Rounding, estimating and understanding error intervals. | | | |
| | | | | | | Converting units of length, mass, capacity, area and volume. Problem solving involving time and the calendar | Reasoning with geometry | Rotation & translation | Identify order of rotational symmetry and rotate a shape. Translate a shape. Compare rotation and reflection of shapes. Find a result of combined transformations |
| | | Addition & subtraction of fractions | Apply equivalence to add and subtract fractions and decimals. Add and subtract fractions with the same and different denominators. Add and subtract simple algebraic fractions | | | | Reasoning with proportion | Pythagoras theorem | Calculate and use Pythagoras theorem in 2D and 3D shapes |
| | | | | | | | | Enlargement and Similarity | Enlarge a shape by a positive, fractional and negative scale factor. Solve problems with similar triangles, explore ratios in right-angles triangles |

| Term | Year 7 | | | Year 8 | | | Year 9 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment |
| Term 3 | Lines and angles | Constructing, measuring & using geometric notation | Use a protractor to measure and draw angles, construct triangles, draw pie charts. Use geometric notation to label shapes accurately | Developing Geometry | Angles in Parallel lines & polygons | Developing geometric reasoning. Using angle facts for parallel lines and solving complex problems. Calculating missing angles in polygons, constructing angle and perpendicular bisectors | Reasoning with proportion | Ratio & proportion problems | Solve problems with direct and inverse proportion including algebra. Work out 'best buy' problems. Recognise graphs of inverse proportion |
| | Lines and angles | Developing Geometric reasoning | Calculate angles on a straight line, around a point, in a triangle and quadrilaterals | | | | | Rates | Solve problems involving speed, distance, time and use distance/time graphs. Solve problems with density, mass and volume. Solve flow problems and convert compound units. |
| | Reasoning with Numbers | Developing number sense | Develop strategies for mental addition and subtraction. Use estimation for checking mental calculations | Developing Geometry | Area of trapezia & circles | Calculating area of triangles, parallelograms, trapezium and a circle Calculating perimeter and area of compound shapes | | | |
| | Reasoning with Numbers | Sets & Probability | Identify and represent sets, create Venn diagrams and use the vocabulary of probability | Developing Geometry | Line Symmetry & reflection | Recognising symmetry and reflecting shapes in horizontal, vertical and diagonal lines. | | Probability | Work with relative frequency, expected outcomes and independent events. Use tree diagrams, work out probabilities without replacement. |
| | Reasoning with Numbers | Prime numbers & proof | Recognise number properties and apply them to make and test conjectures | Reasoning with data | The data handling cycle | Draw and interpret diagrams to represent data; e.g., pictograms, multiple bar charts, vertical line charts, pie charts and line graphs. Compare distribution and identify misleading graphs | Representation & Revision | | |
| | | | | Reasoning with data | Measures of location | Understand and use mean, median and mode. Find the mean from an ungrouped and a grouped frequency table. Compare distributions using averages. | | Algebraic representation | Draw and interpret quadratic graphs. Investigate graphs including reciprocal and simultaneous equations. Represent inequalities |

**Key Stage 4**

| Term | Year 10 | | | Year 11 | | |
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| | **Topic** | **Knowledge** | **Skills/Assessment** | **Topic** | **Knowledge** | **Skills/Assessment** |
| Term 1 | Similarity | Congruency, similarity and enlargement | Enlarge a shape by a negative scale factor. Explore areas and volumes of similar shapes Solve mixed problems involving similar shapes. Prove a pair of triangles are congruent | Similarity | Congruency, similarity and enlargement | Students are frequently assessed throughout year 11 and the assessment results identify gaps in knowledge. Students are then taught relevant topics to help each individual reach their full potential.<br><br>Ongoing, half termly, personalised schemes of work are tailored to the needs of the group of students in each class. |
| | Similarity | Trigonometry | Use trigonometry in 3-D shapes. Calculate missing lengths, angles and area in non-right angle triangles using sine and cosine rule | Similarity | Trigonometry | |
| | Developing algebra | Representing solutions of equations and inequalities | Represent solutions to single and multiple inequalities on a graph. Solve quadratic equations and inequalities by factorisation. | Developing algebra | Representing solutions of equations and inequalities | |
| | Developing algebra | Simultaneous equations | Solve a pair of simultaneous equations (one linear, one quadratic) using graphs and algebraically | Developing algebra | Simultaneous equations | |
| Term 2 | Geometry | Angles and bearing | Solve bearings problems using Pythagoras and trigonometry. Apply sine and cosine rules to bearing problems. | Geometry | Angles and bearing | Exam preparation |
| | Geometry | | | Geometry | Working with circles | |
| | | Working with circles | Calculate the length of an arc and area of a sector. Understand circle theorems and solve problems. Problem solving involving volume and surface area of a cylinder, cone and a sphere. Solve area and volume problems involving similar shapes | | Vectors | |
| | Geometry | | | Geometry | Ratio and Fractions | |
| | Proportions & proportional change | | | | Percentages Interest | |
| | | | | Proportions & proportional change | Probability | |
| | | Vectors | Explore collinear points using vectors Use vectors to | | | |

| Term | Year 10 | | | Year 11 | | |
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| | Topic | Knowledge | Skills/Assessment | Topic | Knowledge | Skills/Assessment |
| | | | construct geometric arguments and proofs | | | |
| | | Ratio and Fractions | Link ratio and algebra ratios in area problems. Use ratios in volume problems. Mixed ratio problems | | | |
| | | Percentages Interest | Calculate simple and compound interest. Repeated percentage change. Solve problems involving growth and decay. Understand iterative processes. Solve problems involving percentages, ratios and fractions | | | |
| | | Probability | Find probabilities from tables, Venn diagrams and frequency trees. Use tree diagrams for independent and dependent events. Construct and interpret conditional probabilities (tree diagrams, Venn diagrams and two-way tables) | | | |
| Term 3 | Delving into data<br>Using Number<br>Using Number<br>Using Number<br>Expressions | Collecting and representing data<br>Non calculator methods<br>Types of numbers and sequences | Construct a stratified sample, interpret frequency tables, frequency polygons. Construct and interpret histograms and cumulative frequency diagrams<br>Rational and irrational numbers (convert recurring decimals) Understand and use surds Calculate with surds. Understand and use limits of accuracy Upper and lower bounds Use number sense. Solve financial maths problems. Break down and solve multi-step problems | Delving into data<br>Using Number<br>Using Number<br>Using Number<br>Expressions | Collecting and representing data<br>Non calculator methods<br>Types of numbers and sequences<br>Indices, Roots and Surds<br>Manipulating Expressions | Final exam preparation |

| Term | Year 10 | | | Year 11 | | |
|---|---|---|---|---|---|---|
| | **Topic** | **Knowledge** | **Skills/Assessment** | **Topic** | **Knowledge** | **Skills/Assessment** |
| | | Indices, Roots and Surds | Describe and continue sequences involving surds. Find the rule for the $n^{th}$ term of a quadratic sequence | | | |
| | | Manipulating Expressions | Understand and use the power zero and negative indices. Work with powers of powers. Understand and use fractional indices. Calculate numbers in standard form<br><br>Add and subtract simple algebraic fractions. Add and subtract complex algebraic fractions. Multiply and divide simple algebraic fractions and complex algebraic fractions. Form and solve equations and inequalities with fractions. Solve equations with algebraic fractions | | | |