KS3 Mathematics at Norbury

Overview

Mathematics has changed over time and continues to develop even now. We hope that our students might be part of further shaping the landscape of maths in the years to come. Aside from this, an understanding of basic numeracy is essential to navigating everyday life. The department is passionate about delivering an engaging and relevant curriculum that will create confident individuals both in the classroom and beyond.

Year 7 Mathematics

The department follows Oxford Smart Mosaic's Maths Curriculum in Year 7 and 8. This curriculum was written with Craig Barton, and is based on research and best practice from around the world. It is built from the ground up with the principles of maths mastery at its core. This approach ensures students master and acquire a solid enough understanding of the mathematics being taught to enable them to move on to more advanced material. Mastering mathematics means students acquiring a deep, long-term, secure and adaptable understanding of the subject. Below are the topics that will be studied throughout the year, in order of teaching.

UNIT 1: Place Value

The focus of the first unit is to understand and use place value for integers, measures, and decimals of any size as well as ordering positive integers. Students will also learn to convert measures and multiply and divide by powers of ten.

UNIT 2: Properties of numbers

The focus of the second unit is to explore and understand the properties of numbers, including factors, multiples, primes, and prime factors. Students will also learn to identify and apply the concepts of highest common factor (HCF) and lowest common multiple (LCM). This unit also includes working with roots and powers. For example, determining the prime factors of a number or calculating the square root and cube of a number.

UNIT 3: Arithmetic

The focus of the third unit is to master arithmetic skills, including ordering and comparing negative numbers, and performing addition, subtraction, multiplication, and division with them. Students will also learn and apply the associative, distributive, and commutative laws, as well as the order of operations. For example, solving complex calculations involving negative numbers or applying the order of operations in multi-step problems.

UNIT 4: Expressions and equations

The focus of the fourth unit is to cover the basics of algebra, including identifying terms, coefficients, expressions, formulae, and equations. Students will also learn to form and solve equations, perform substitution, expand, factorise, and simplify expressions by collecting like terms.

UNIT 5: Co-ordinates

The fifth unit focuses on describing and plotting graphs, solving coordinate problems, and working with equations of horizontal, vertical, and straight-line graphs. Students will learn to interpret and draw these graphs accurately, as well as solve related problems and equations. For example, finding the equation of a simple line given its graph or determining a missing coordinate of a shape on a coordinate grid.

UNIT 6: Perimeter and area

The sixth unit emphasises understanding the properties of quadrilaterals and triangles, calculating the perimeter of polygons, and finding the areas of rectilinear shapes, triangles, and quadrilaterals. Students will learn to identify and analyse different types of quadrilaterals and triangles, as well as compute their perimeters and areas. For example, calculating the area of a parallelogram or the perimeter of a complex polygon.

UNIT 7: Fractions

The seventh unit focuses on mastering all basic skills related to fractions. Students will learn to add, subtract, multiply, and divide fractions, as well as simplify them. This unit also covers converting between improper fractions and mixed numbers. For example, performing operations with fractions in various contexts or simplifying fractions to their lowest terms.

UNIT 8: Ratio and proportion

The eighth unit focuses on understanding and using ratios. Students will learn to create and interpret ratio diagrams, scale ratios up and down, and find original amounts given a fraction. This unit also includes expressing one number as a fraction of another, sharing quantities into a given ratio, and working with conversion rates. For example, scaling a recipe up or down based on the number of servings or converting between different imperial and metric units of measurement.

UNIT 9: Transformations

The ninth unit centres on transformations in geometry. Students will explore translations, rotations, reflections, and enlargements, learning to identify and apply these transformations to shapes. This unit also includes understanding the effects of transformations on the coordinates of points and the properties of shapes. For example, performing a reflection across a line or determining the coordinates of a shape after a rotation.

Year 8 Mathematics

Overview

Maths in year 8 builds on the students' knowledge from year 7 while bringing in some more applied maths such as statistics. Year 8 focuses on deeper understanding and building the basis on which we add in Year 9.

UNIT 1: Rounding and Estimation

The first unit focuses on estimation and rounding techniques. Students will learn to round numbers to the nearest whole number, decimal place, or significant figure, as well as to powers of ten. This unit also includes finding rounding error intervals and determining whether a calculation is an overestimate or underestimate. For example, rounding a number and analysing the error interval for calculations using the rounded number.

UNIT 2: Solving Linear Equations

The second unit focuses on solving linear equations. Students will learn to recognize linear equations and understand families of linear equations. This unit includes simplifying equations, and solving equations that include brackets, or fractions. For example, solving an equation like $2(x+3)=12$ or multiplying an equation by a denominator to remove a fraction and find the variable's value.

UNIT 3: Sequences

The third unit focuses on sequences, including term-to-term rules and the concept of the nth term. Students will learn to identify patterns in sequences and solve problems with sequences. This unit emphasises calculating the nth term of a sequence and applying term-to-term or position-to-term rules to generate terms. For example, determining the nth term for a linear sequence or finding a specific term based on the established rule.

UNIT 4: Linear Graphs

The fourth unit focuses on straight-line graphs, including understanding the gradient and y-intercept. Students will learn to read and interpret applied linear graphs, as well as find equations of graphs. This unit emphasises calculating the gradient from given points and using the y-intercept to formulate the equation of a line. For example, determining the equation of a line given its gradient and y-intercept or analysing a graph to extract information.

UNIT 5: Percentages and proportionality

The fifth unit focuses on percentages and proportionality. Students will learn to express one number as a percentage of another, calculate percentage change, and find percentages of amounts. This unit also covers percentages of percentages and comparing proportions, as well as understanding direct and inverse proportion. For

example, calculating the percentage increase in a value or determining the relationship between two quantities in direct proportion.

UNIT 6: Statistics

The sixth unit focuses on statistics, including creating and interpreting bar charts, pictograms, and scatter graphs. Students will learn to draw and measure angles to construct pie charts, as well as calculate averages and range. This unit also covers finding averages from a table and identifying outliers in data sets. For example, analysing data represented in a scatter graph or calculating the mean from a given set of tabulated values.

UNIT 7: Perimeter, area and volume

The seventh unit focuses on perimeter, area, and volume. Students will learn to calculate the circumference of circles in order to find the perimeter of sectors. They will also find the area of circles and sectors. This unit also covers the concepts of faces, edges, and vertices, along with understanding nets, surface area, and the volume of prisms. For example, finding the surface area of a cube or calculating the volume of a cylinder.

UNIT 8: Polygons and angles

The eighth unit focuses on polygons and angles. Students will learn to recognise different types of polygons and explore rotational and reflectional symmetry. This unit covers angles in parallel lines, as well as interior and exterior angles of polygons. Students will also learn to find missing angles using angle facts. For example, calculating the interior angle of a regular polygon or determining missing angles created by parallel lines.

UNIT 9: Constructions

The ninth unit focuses on constructions in geometry. Students will learn to draw circles and construct triangles and rhombuses. This unit also covers creating perpendicular bisectors, constructing perpendicular lines at a specific point, and drawing angle bisectors. For example, accurately bisecting an angle without a protractor or constructing a triangle given specific measurements.

Year 9 Mathematics

Overview

In Year 9, we begin to look at introducing concepts used at GCSE and use the three Year AQA GCSE route map. It is in Year 9 that we begin to split the girls into tiers, with the bottom set completing the foundation tier scheme of work.

The course covers the following attainment targets:

- Number
- Algebra
- Ratio Proportion and Rates of Change
- Geometry and measures
- Statistics and Probability

For details of the order in which we are teaching topics please see the course overview or scheme of work which is stuck into your daughter's exercise book. Below you will see what we cover for each of the attainment targets.

Year 9 AQA Mathematics

(Topics in brackets are taught to higher only).
Topics underlined are in foundation for year 9 but appear in the higher scheme of work later in the course in greater depth.

Number

- Integers and Place value – working with four operations, rounding and estimating
- Using inequality symbols
- Working with decimals and negative numbers– four operations and ordering
- Powers and Roots – square, cube numbers and their roots
- Factors and Multiples – prime factors, finding the Highest Common Factor and Lowest Common Multiple
- Fractions – four operations, fractions of an amount and comparing fractions
- (Standard Form - Reading, writing, ordering and four operations)

Algebra

- Simplifying expression – collecting like terms, multiplying and dividing
- Form expressions – area and perimeter and modelling problems with algebra
- Expanding over a single bracket
- Substitute positive and negative values into expressions and formulae
- Factorise expressions
- Solve simple formulae - Solve linear equations with unknowns on both sides

- Sequences – continue an arithmetic or geometric sequence, recognise square, cube, and triangular numbers, find the nth term of a sequence and use the nth term to generate a sequence
- Straight line graphs – plot and label linear graphs, find and interpret the gradient

- (Real life graphs - conversion graphs, matching graphs to situations, distance time)

Ratio, proportion and rates of change

- Percentages – of an amount, increase and decrease, compare two proportions using percentages, VAT, profit and loss

- Ratio - Express a multiplicative relationship between two quantities as a ratio or fraction, dividing into a ratio

- Ratio - applying ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing and concentrations) including better value or best buy problems

Geometry and Measure

- Shape and Angles – recognise different angle rules, angles at parallel lines and angles in polygons
- Polygons – interior and exterior angles of regular and irregular polygons
- Area and perimeter – find the area of 2D shapes by counting and formula
- Volume – of 3D shapes including cuboids and prisms

- Measurement - measure line segments and angles in geometric figures, interpreting maps and scale drawings and bearings

- (Loci and construction- perpendicular bisectors, constructing perpendicular lines at a specific point, and drawing angle bisectors)
- Pythagoras' theorem

Statistics and Probability

- Representing Data – bar charts, pictograms, line graphs, frequency polygons, two-way tables, stem and leaf diagrams, pie charts and scatter diagrams
- Averages – from a data set and from frequency tables (including grouped frequency tables)

KS4 Mathematics at Norbury

Overview

In 2024 we made the decision to move from the Edexcel to the AQA syllabus for GCSE Mathematics. In order to reach this decision, we did some blind comparisons with both students and teachers and found the newer AQA papers to be more accessible. They include sufficient challenge at the top end while being written in more straightforward English. There are two tiers of entry and students are entered for either the Higher Tier or the Foundation Tier.

The GCSE course covers the following attainment targets:

- Number
- Algebra
- Ratio Proportion and Rates of Change
- Geometry and measures
- Statistics and Probability

The two tiers of entry are assessed as follows: Higher (Grades 4-9) and Foundation (Grades 1-5). The course starts in Year 10 and continues through to Year 11. The tier of entry is based on the student's KS3 result and her progress subsequent to that. Most pupils will remain on the tier they are prepared for from the start of year 10. Some tier change decisions are made at the end of Year 10 midterms with an even smaller number of borderline pupils being given a final opportunity to demonstrate their ability in November.

During the course students take Unit Exams at the end of each unit taught. These are used to set predicted grades and may, in some cases, lead to set changes if the student would benefit from a move to a higher or lower set.

The course is assessed through three examination papers of equal weighting. Each paper is 1 hour 30 minutes long and contains 80 marks each. Paper 1 is a non-calculator exam. Calculators are allowed for paper 2 and 3.

A scientific calculator, ruler, protractor and compasses are all ESSENTIAL to the course. Students are encouraged to purchase textbooks or revision books to support study at home, and some of these are available on ParentPay.

The department also subscribes to two on-line software called "MathsWatch" and "Sparx". Both contain video lessons on all GCSE topics taught throughout the course, accompanying worksheets and online tasks that are set regularly by teachers as independent study.

Year 10 AQA GCSE Mathematics

Underlined topics are higher tier only.

Number

- Integers and Place value – working with four operations, rounding and estimating
- Working with decimals – four operations and ordering, terminating or recurring decimals and their fractional equivalents
- Error intervals and bounds
- Powers and Roots – square, cube numbers and their roots, recognise powers and real roots, calculate with integer, fractional and negative indices
- Factors and Multiples – finding the Highest Common Factor and Lowest Common Multiple, prime factors and the unique factorisation theorem
- Systematic listing and the product rule for counting
- Fractions – four operations, fractions of an amount and comparing fractions
- Interpret fractions and percentages as operators
- Calculate exactly with multiples of pi
- Apply and interpret limits of accuracy
- Standard form - Interpret and calculate with numbers in standard form
- Surds

Algebra

- Simplifying expressions – collecting like terms, multiplying and dividing, coefficients as fractions
- Form expressions – area and perimeter and modelling problems with algebra
- Expanding over a single, double, or triple bracket
- Substitute positive and negative values into expressions and formulae
- Factorise expressions with a common factor, quadratics, or quadratics with a coefficient of x squared
- Solve simple formulae - Solve linear equations with unknowns on both sides
- Solve inequalities on a number line or on a graph
- Solve quadratic simultaneous equations
- Rearrange simple and more complex equations or formulae
- Sequences – recognise and use arithmetic progressions, Fibonacci type sequences, quadratic sequences, geometric progressions. Find the nth term of a linear sequence.
- Working with coordinates in all four quadrants
- Straight line graphs – plot and label linear graphs, find and interpret the gradient, working with parallel and perpendicular lines.
- Equations of tangents

- Plot and interpret graphs including reciprocal graphs (and exponential graphs) or non-standard functions in context.

Ratio, proportion and rates of change

- Identify and work with fractions in ratio problems
- Use scale factors and scale diagrams
- Interpret gradient as a rate of change.
- Percentages – of an amount, increase and decrease, percentage change, percentages greater than 100%, original value problems, simple interest, comparing two quantities, profit and loss
- Express one quantity as a proportion of the other
- Ratio - Use ratio notation and simplify ratios, divide into ratios
- Express a multiplicative relationship between two quantities as a ratio or fraction

Geometry and Measure

- Using conventional terms and notations and identify the properties of 3D shapes including points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries
- Shape and Angles – recognise and apply different angle rules, angles at parallel lines and angles in polygons
- Plans, elevations and nets
- Interpreting maps and scale drawings and use of bearings
- Solve geometrical problems on coordinate axes
- Tessellations – continue the tessellation of regular shapes
- Trigonometry and Pythagoras' Theorem - using exact trigonometric values and finding the area of any triangle
- Polygons – interior and exterior angles of regular and irregular polygons
- Transformations - Identify, describe and construct congruent and similar shapes, on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors)
- Area and perimeter – find the perimeters and areas of 2D shapes by counting and formula
- Similar shapes - working with lengths, areas or volumes
- Use standard units of measure and related concepts
- Circles: Identify and apply circle definitions and properties, find their area, and circumference including for sectors
- Surface area of prisms, pyramids and composite solids
- Volume – of 3D shapes including cuboids and prisms

- Constructions: Use the standard 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)

Statistics and Probability

- Interpreting and Representing Data – bar charts, pictograms, line graphs, frequency polygons, two-way tables, stem and leaf diagrams, pie charts, time series, vertical line charts, and scatter diagrams
- Box and whisker plots, histograms and cumulative frequency diagrams
- Basic and conditional probability
- Averages – from a data set and from frequency tables (including grouped frequency tables)
- Apply statistics to describe a population
- Venn diagrams
- Interpret, analyse and compare the distributions of data sets

Year 11 AQA GCSE Foundation Mathematics

Number

- Multiplicative Reasoning – simple and compound interest, reverse percentages, growth and decay problems
- Standard Form – write numbers in and out of standard form

Algebra

- Quadratics – expand double brackets, factorise into double brackets, find the roots of an equation
- Graphs – plot quadratic graphs and estimate solutions
- Simultaneous Equations – solve both graphically and algebraically

Ratio, proportion and rates of change

- Proportion – best buy, direct and inverse proportion
- Ratio – simplest form, splitting a quantity in a ratio, exchange rates, recipe ratios, scale drawings and maps

Geometry and Measure

- Transformations – reflect, translate, rotate and enlarge shapes
- Circles – area and circumference and volume of cylinders
- Pythagoras Theorem – find the hypotenuse and short sides of a right-angled triangle
- Trigonometry – label right angled triangles appropriately and use Trigonometry to find a missing length or angle
- Construction and Loci – construct triangles and use simple laws of loci using perpendicular and angle bisectors
- Similarity and Congruence – identify similar and congruent shapes
- Plans and elevations
- Vectors – column notation, add/subtract vectors, vectors from a to b

Statistics and Probability

- Probability – probability scale, list outcomes of events, sample space diagrams, two-way tables and frequency trees

Year 11 AQA GCSE Higher Mathematics

Algebra

- Quadratics – expand double brackets, factorise into double brackets, find the roots of an equation
- Graphs – recognise and draw graphs of quadratics, cubic, graphs of circles and reciprocal graphs
- Solving quadratics – by factorising, quadratic formula and completing the square
- Simultaneous equations – solve graphically, linear and quadratic simultaneous equations
- Inequalities – solve linear and quadratic inequalities (on a number line and sketch a graph)
- Algebraic fractions – simplify and use four operations on algebraic fractions
- Functions – inverse and composite functions
- Graphs of trigonometric functions – transformation of graphs

Geometry and Measure

- Similarity and congruence – prove congruence using SSS, SAS, ASA and RHS, prove two shapes are similar, similarity in lengths, areas and volume
- Further Trigonometry – sine and cosine rule, area of triangles, further trigonometry in 3D shapes
- Circle geometry – equation of tangents, gradient of the radius, perpendicular lines
- Vectors – vector notation, problems using division of vectors, prove two vectors are parallel or collinear

Ratio, proportion and rates of change

- Proportion – best buy, direct and inverse proportion
- Ratio – simplest form, splitting a quantity in a ratio, exchange rates, recipe ratios, scale drawings and maps

Statistics and Probability

- Probability – probability scale, list outcomes of events, sample space diagrams, two-way tables, Venn diagrams and tree diagrams using independent and conditional probabilities
- Data – sampling, capture recapture
- Cumulative Frequency and Box plots – median and quartiles
- Histograms – drawing and interpreting