THE BRITISH SCHOOL OF NANJING
A NORD ANGLIA EDUCATION SCHOOL

16 Han Fu Lu, Jiangning,
Nanjing 211106, China
T +86 25 5210 8987
E info@bsn.org.cn

Mathematics Curriculum Overview

Key Stage 3-Year 9

Students continue their journey of discovery in mathematics. This is done through an accompaniment of teacher-led learning, project-based learning and student-led discovery. Students use a mixture of mathematical software where possible and gain experience using a calculator in mathematics. They get taught problem-solving techniques and apply computational thinking to problems where possible in the form of algorithmic approaches. This is all accompanied by a focus on mathematical rigor, alongside an emphasis on appropriate use of mathematical vocabulary and associated spellings. Students are also exposed to mental strategies throughout the year, as well as frequent exposure to mental mathematics – to aid in not only mathematical vocabulary but listening to mathematics in English.

During Year 9, students are revisiting a multitude of areas and building their confidence in this pre-IGCSE preparation year.

Number

Students begin with a review of fractions, decimals and percentages. They particularly focus on percentages and finding percentage increase and decrease via a multiplier, alongside solving simple and compound interest problems. Students then revisit the idea of rounding to significant figures, which then ties in with them looking at upper and lower bounds of calculations and estimations. Moving forward students delve deeper into reciprocals of numbers and fractions and the relationship between index laws. Students also cover recurring decimals and how to find the rational representation of recurring decimals, they also learn why decimals recur due to the nature of the decimal base. Students explore the concepts of direct and inverse proportion from a numerical standpoint, and revisit this during algebra to derive formulae.

Sets: some students are also introduced to the fundamental idea of sets and begin to use set building notation alongside visual representations of sets via Venn diagrams.

Shape & Space

Students review Pythagoras' Theorem in two-dimensions and extend this to three-dimensions to more sophisticated problems. Alongside this, students also review angles in polygons and parallel sides, now building rigorous mathematical arguments to support their reasoning. A sound understanding of how to find missing angles in polygons lays the foundation for trigonometry. Students now start their learning of trigonometry. Students begin by being introduced to the sine, cosine and tangent ratios, and use this to solve missing side and missing angle problems. Some students will go on to look at the sine and cosine rules and applying these in non-right-angled triangles and using them in applied problems such as bearings.

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Additionally, some students will look at vectors in 2-dimensions and representing these in both column form and using i-j notation and completing basic arithmetic with vectors. Students will also review plotting straight lines in standard form (y=mx+c) and learn new forms of representing straight lines. Some students will move on to plotting quadratic graphs and be expected to know how to plot them given a quadratic equation, alongside being able to identify the roots of a quadratic graph and find the minima/maxima of a quadratic graph given its equation. Alongside students again review transformations of shapes and are introduced to negative and fractional enlargement of shapes. Students will be introduced to basic circle theorems.

Algebra

Students build upon their knowledge of algebra. Students revisit algebraic manipulation, in both expanding and factorising single brackets, and then moving onto expanding and factorising double brackets and quadratic expressions. Students revisit solving equations, starting with a review in solving linear equations, whilst some students will move on to solving quadratic equations of the form $ax^2 + bx + c = 0$ with $a = \pm 1$. Students then apply their knowledge of equations to inequalities, finding solution regions and being able to represent this information both on a number line and being able to shade solution regions on a Cartesian plane. All students are expected to cover linear inequalities on the Cartesian plane, with some advancing to quadratic inequalities. Alongside, students will revisit proportion in algebra and look at expressing direct and inverse proportion using algebra as opposed to explicit numerical values. Students will become comfortable using formulae throughout not only algebra but the three other areas as well, and therefore they learn how to rearrange and change the subject of a formula as well. All students will revisit arithmetic sequences and be expected to use the formula for finding the nth term of a sequence and problem solve using this, with some students being introduced to formula for the sum of an arithmetic sequence – some students will advance to geometric sequences and finding the nth term of geometric sequence.

Data

Students review concepts that they have previously visited in senior school such as looking at the three different averages and the range of sets of data. They then move on to looking at the interquartile ranges of sets of data. Continuing, they then look at representing data in different ways, via stem-and-leaf diagrams and finding the averages from this. They then look at representing data in tables, in both grouped and ungrouped forms, and are expected to be able to find averages or estimates of averages for data in this form. Students are then expected to learn about frequency and cumulative frequency and understand the shape of cumulative frequency distribution and how to read it appropriately. Students revisit single-event probability and then move on to multiple-event probability and representing this in Venn diagrams, some students will use set notation and be expected to find probabilities represented using set notation. They will be expected to apply probability in problem-solving questions and use probability to approximate.

Technology

Students will learn through a myriad of digital mediums. Students will become proficient in their use of Microsoft Teams, OneNote, Outlook and the Office packages including Excel. Students will explore and investigate mathematics using mathematics specific software such Geogebra and Desmos where possible. Alongside this, students will continue to gain confidence in the use of a scientific calculator and improved dexterity and speed in calculating. We also use MyiMaths and Dr Frost Maths for students to practice fluency problems and so that students can receive instantaneous feedback alongside additional teacher feedback when appropriate.

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Recommended resources for Deeper Understanding

MyiMaths, a service we often use to assign homework. All students have a log in and can access any task from KS3 to KS5. We suggest students review classwork on here. https://www.myimaths.com/

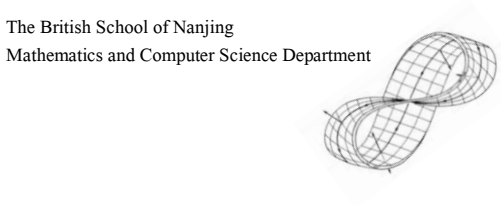
Dr Frost Maths is an additional service that focuses on exam-style questions. Students can also access this and will be given a log in if they desire. https://www.drfrostmaths.com/

Mathtrainer is a website for students to practise their basic understanding of four operations, the website acts like an app and saves their scores. We recommend this for frequent practise. https://www.mathtrainer.org/

Complete Mathematics Timestables are fantastic for students to practise their timetables. They include different tasks as opposed to classic calculations such as arrays and recognising division facts.

https://completemaths.com/teaching-tools/digital-manipulatives/timestables

Applications for Students



Sumaze! is a series of educational puzzle apps developed by MEI (Mathematics Education Innovation). A phone/tablet app available in four different versions depending on students' age. https://sumaze.mei.org.uk/

Geogebra applications. A collection of Geogebra features are available for download on a mixture of devices. A personal favourite of ours is the 3D calculator – students can use AR (augmented reality) to plot 3D objects around them. https://www.geogebra.org/download?lang=en

Desmos. A beautiful and simple graphing calculator for students to explore functions and more, its often updated with new features and extends to some unusual, weird and funky functions. https://www.desmos.com/

Euclidea is an elegantly designed app for students to explore constructions using a straight-edge and pairs of compasses, all performed on their device. https://www.euclidea.xyz/