

Mathematics

Key Stage 3

"No employment can be managed without arithmetic, no mechanical invention without geometry."

Benjamin Franklin

At Futures College your son or daughter will be taught mathematics by well-qualified, caring, enthusiastic and dedicated staff, committed to helping all students to achieve their potential. The mathematics department has seven dedicated teaching rooms all with interactive whiteboards, an Apple based ICT suite, a wide range of text books and access to a number of Internet based teaching and assessing sites including MyMaths, MethodMaths and Maths Watch.

At Key Stage 3 teaching follows the National Curriculum and students' mathematical skills and knowledge are developed in preparation for transition to GCSE in Key Stage 4. The use of ICT plays a major part in the teaching and learning within the department along with practical mathematics activities. The mathematics department makes extensive use of www.mymaths.co.uk for homework, revision and independent learning. Homework and revision clubs are a regular feature of the week within the department.

Key learning objectives

Year 7

- Simplify fractions by cancelling all common factors; identify fractions.
- Recognise the equivalence of percentages, fractions and decimals.
- Extend mental methods of calculation to include decimals, fractions and percentages.
- Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.
- Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations and methods.
- Check a result by considering whether it is of the right order of magnitude.
- Use letter symbols to represent unknown numbers or variables.
- Know and use the order of operations and understand that algebraic operations follow the same conventions and order as arithmetic operations.
- Plot the graphs of simple linear functions.
- Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle.
- Convert one metric unit to another (e.g grams to kilograms); read and interpret scales on a range of measuring instruments.
- Compare two simple distributions using the range and one of the mode, median or mean.
- Understand and use the probability scale 0 to 1: find and justify probabilities based on equally likely outcomes in simple contexts
- Solve word problems and investigate in a range of contexts, explaining and justifying methods and conclusions.

Year 8

- Add, subtract, multiply and divide integers.
- Use the equivalence of fractions, decimals and percentages to compare proportions; calculate percentages and find the outcome of a given percentage increase or decrease.
- Divide a quantity into two or more parts in a given ratio; use the unitary method to solve simple word problems involving ratio and direct proportion.
- Use standard column procedures for multiplication and division of integers and decimals, including by decimals such as 0.6 or 0.06 understand where to position the decimal point by considering equivalent calculations.
- Simplify or transform linear expressions by collecting like terms; multiply a single term over a bracket.
- Substitute integers into simple formulae.
- Plot the graphs of linear functions, where y is given explicitly in terms of x ; recognise that equations of the form $y = mx + c$ corresponds to straight-line graphs.
- Identify alternate and corresponding angles; understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360° .
- Enlarge 2-D shapes, given a centre of enlargement and a positive whole-number scale factor.
- Use straight edge and compasses to do standard constructions.
- Deduce and use formulae for the area of a triangle and parallelogram, and the volume of a cuboid; calculate volumes and surface areas of cuboids.
- Construct, on paper and using ICT, a range of graphs and charts, identify which are most useful in the context of a program.
- Find and record all possible mutually exclusive outcomes for single events and two successive events in a systematic way.
- Identify the necessary information to solve a problem; represent problems and interpret solutions in algebraic, geometric or graphical form.
- Use logical argument to establish the truth of a statement.

Year 9

- Add, subtract, multiply and divide fractions.
- Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100% or as a whole
- Make and justify estimates and approximations of calculations.
- Construct and solve linear equations with integer coefficients, using an appropriate method.
- Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, on paper and using ICT; write an expression to describe the n th term of arithmetic sequence.
- Given values for m and c , find the gradient of lines given by equations of the form $y = mx + c$.
- Construct functions arising from real-life problems and plot their corresponding graphs; interpret graphs arising from real situations.
- Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons.
- Know that translations, rotations and reflections preserve length and angle and map objects on to congruent images.
- Know and use the formulae for the circumference and area of a circle.
- Design a survey or experiment to capture the necessary data from one or more sources; determine the sample size and degree of accuracy needed; design, trial and if necessary refine data collection sheets.
- Communicate interpretations and results of a statistical enquiry using selected tables, graphs and diagrams in support.
- Know that the sum of probabilities of all mutually outcomes is 1 and use this when solving problems.
- Solve substantial problems by breaking them into simpler tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy.
- Present a concise, reasoned argument, using symbols, diagrams, graphs and related explanatory text.

Key Stage 4

Year 10

Mathematics at GCSE is a compulsory subject. Teaching encourages students to develop confidence and a positive attitude towards Mathematics and recognise its importance in their own lives and society. The examination board is EDEXCEL. GCSE Mathematics is entirely assessed by written examination.

A new 1–9 grading scale with 9 being the highest grade. Grade 4 will be pegged to current C grade.

The specification

Content taken from the Department for Education's Mathematics GCSE subject content and assessment objectives document, published in November 2013. Content is indicated that is for all students (standard font), for the overlap between Foundation and Higher tier (underlined font) and for Higher tier only (bold font).

Six content areas: F/ H

Number	25%/15%
Algebra	20%/30%
Ratio, proportion, rates of change	25%/20%
Geometry	15%/20%
Probability & Statistics	15%/20%

- Coverage of broader and deeper mathematical content, delivered through a single extended GCSE
- Higher tier will include questions that will stretch the most able
- Foundation tier will focus on core mathematical understanding and skills for all students to master
- A greater focus on problem-solving
- Additional requirements to provide clear mathematical arguments
- Fewer formulae provided on formulae sheets

Year 11

There are two written papers; one non-calculator and one calculator; both worth 50% of the final grade. There are two tiers of entry Foundation which allows the award of grades G-C and higher which allows for the award of grades E – A*.

In order to study A level Mathematics students will need to achieve at least a B grade at GCSE and some sixth forms and colleges may require students that do not achieve an A or A* to take an algebra test to see if they are suitable for the course.

GCSE Mathematics builds on Key Stage 3 and covers the broad mathematical strands of:

- Number;
- Algebra;
- Geometry;
- Measures;
- Statistics; and
- Probability.

All Key Stage 4

In addition to these areas of skills the GCSE will also test the students' ability to apply their knowledge to fundamental elements of mathematics in everyday life. Throughout the course and in the examination there is an emphasis on problem-solving and mathematical thinking. The topics within each strand are taught in units which usually last for two weeks.

Each unit will include some consolidation work as well as learning new skills and their application. Students work as a whole class, individually and in groups on a variety of different activities.

Throughout Key Stage 4 students are expected to keep up to date revision notes. Students will be given homework on mymaths (www.mymaths.co.uk) to consolidate learning from the classroom.

Useful websites for revision and practise:

www.mymaths.co.uk

www.methodmaths.com

www.emaths.co.uk

www.bbc.co.uk/bitesize

www.mathswatchvle.com

British values and SMSC into the curriculum

In Mathematics, students get to work in groups; they discuss and plan tasks, dividing them up into smaller questions, and sharing these out amongst themselves according to each other's strengths. This develops team building and a sense of responsibility, which are important skills that will be used in everyday life. Students learn how to organise their work in a systematic way, so that it can be understood by others as well as themselves. They learn to distinguish between the right and wrong ways (methods) of successfully completing tasks. In addition they learn to develop a sense of purpose, through the ability to investigate a hypothesis; consider other view points and ethical issues; discuss their work logically and get their findings and opinions across sensibly.

All these skills prepare students for the real world.

Mathematics contributes to students' spiritual development in different ways; e.g. the feeling of excitement and delight that students experience when they are able to solve questions they once found difficult or even impossible to solve. Students are often inspired by the cross-curricular links with other subjects (Art, Design and Technology and Geography amongst others). They pride themselves in understanding and being able to use mathematical tools applied in the business world. Mathematics helps students to make informed decisions in life, based on the skills and confidence gained from choosing the most appropriate method in solving problems. These skills are transferrable to real-life situations, and therefore help the students become reflective, responsible and insightful individuals, respecting each other's cultural, spiritual and traditional practices. Students will demonstrate mutual respect by the way they work in the classroom; exhibiting good working relationships which promote effective learning.

Within mathematics there are opportunities to study areas where numerical data is part of the rule of law e.g. taxation or calculations which need to be made to make sure that industry complies with Health and Safety legislation. Statistics can also be used to identify the impact of legislative change. National statistics can be used to identify strong, weak and negative correlation and understand the dangers of assuming causation.

Mathematics and the use of data have a significant role in the democratic decision making and influencing change. Students hear statistics quoted to justify and argue for particular positions and use data to inform their own arguments. The development of critical thinking skills using mathematics will help develop student resilience to being exploited by extremists. Students can explore the extent of individual liberty bearing in mind numerical legal constraints e.g. speed limits; level of alcohol in the blood when driving and taxation levels. Mathematics can be used to challenge extremism in particular through the use of statistics. This could include the use of government migration figures to challenge inaccurate claims made about immigration levels in the UK.

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