GCSE Mathematics (Set 3)
Curriculum Intent 2021-2022

Core aims of the subject at Key Stage 4

"Mathematics expresses values that reflect the cosmos, including orderliness, balance, harmony, logic, and abstract beauty." **Deepak Chopra**

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Our curriculum in mathematics aims to develop fluency in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that students develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. We are also striving to allow students to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, develop mathematical arguments and proofs and make conclusions based on logical inferences. Our intention is also for students to solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions; as such resilience is a crucial skill that we will be cultivating in students. Students also need to be able to utilise technology effectively, such as scientific calculators, to perform increasingly complex problems (as well having strong written and mental mathematical skills, not instead of). As the repertoire of mathematical skills that a student possesses grows increasingly more complex, so should the ability of students to use their mathematics to model real life situations.

At key stage 3, we promote equality by working through the breadth of the curriculum at the same pace for all students so that all students can achieve regardless of their starting point. There are a number of lunchtime clubs in mathematics that are currently under review (Countdown club, 24 club, TT Rockstars club). We extend our highest attaining students through depth and more challenging problem solving, rather than an acceleration of content. At key stage 4, all students continue their mathematical studies on an appropriate GCSE pathway determined by their prior attainment and performance across key stages 2 and 3 to give them the best chance of achieving well in the subject. In all key stages we enter our most able students into the annual UKMT maths challenge competition. We intend for a high proportion of our students to go on and study or use mathematics in some form post-16; this means that our key stage 4 curriculum needs to be broad enough to cater for students who will go on to study maths at the highest level in our Further Mathematics and STEP preparation classes to those who will study Core Mathematics to complement their A Level choices.

In addition to the obvious intention of preparing students for more advanced mathematical studies, mathematics also prepares students for future learning in other disciplines and improves the cognitive ability in general of students and, as such, is essential for their personal development. The study of mathematics conditions the brain to see connections and builds neural pathways that make the brain stronger for all other things. Mathematical study enhances students' general intelligence and supports the life-long learning of students by: creating a framework in the brain for systematic thinking, developing the ability to solve and analyse problems, stretching the mind to work on unfamiliar tasks with confidence, developing the sequencing skills critical to arriving at accurate results or logical conclusions, promoting caution and care in thinking and deciphering complex mathematical problems to arrive at an accurate answer and learning through trial and error to integrate different principles to arrive at a logical conclusion.

In addition to these disciplinary aspects of the mathematics curriculum, the actual mathematical knowledge and skills that students learn are also vitally important in allowing students to achieve elsewhere in school. Topics studied in mathematics are prerequisite for several disciplines across key stages 3, 4 and 5 such as geography, psychology and economics (to name only a few). Mathematics also provides a theoretical springboard for the ever-evolving STEM sector. Nationally, there are huge shortfalls in job applicants with strong STEM skills and reports estimate that the cost of this shortfall is £1.5 billion each year. Furthermore, occupations in the STEM sector are growing at a rate that nearly is nearly double other sectors which could see this shortfall exacerbated. Our intention is to develop students' abilities sufficiently so that they are able to rise to the challenging opportunities this sector has to offer. In the 21st century science, technology and engineering are constantly changing and have become increasingly important for society. The mathematical principles that govern these areas, however, have not changed and consequently the breadth and depth of our curriculum aims to future-proof our students in this field. This is all in addition to the inspirational and motivating research that claims that candidates with strong maths skills earn on average 11% more in their lifetime.

Mathematics is a discipline which is universal; transcending language and cultural differences. Throughout its rich history, mathematics has adopted elements from around the world and gives students the opportunity to appreciate fundamental truths and create water-tight arguments based on logic and reasoning; as such it helps contribute to the student's spiritual, moral, spiritual and cultural development.

Ultimately, the intention of the maths curriculum is to provide students with the necessary thinking skills and content to be successful in their next stage of life or education.

Response to COVID

We have adapted our schemes of work in order to minimise 'lost learning', changing the order and repeating key aspects where needed. We have provided students with question analysis feedback following assessments, which directs them to the relevant Hegarty Maths video tutorials and quizzes. In addition to this, we have provided students with walkthrough videos/PowerPoints to help them understand questions they struggled with. Students have also received Knowledge Organisers, Hegarty Topic Lists and very detailed Revision Lists.

Assessment

The key principles of feedback in the mathematics department are that feedback should:

1. Be specific, accurate and crystal-clear to students.

2. Look forwards not backwards
3. Inform teachers' planning to secure and further students' learning
4. Place the responsibility on the student to forge their next steps
5. Allow students to feel pride

In addition, the maths department assessment and feedback policy should be manageable in terms of staff workload and allow for the prioritisation of planning ahead of marking.

During mathematics lessons

During a student's mathematics lesson is where they will receive the most feedback about their performance in the subject. Feedback will be given each lesson to students by the teacher, who has the expert knowledge to do so. This may happen in a variety of ways, which include (but are not restricted to):

- Questioning by the class teacher as part of whole class teaching
- Questioning by the class teacher as part of a conversation with individuals or small groups
- Use of mini whiteboards
- Use of Plickers
- Low stakes quizzes
- Teacher circulating the classroom and correcting mathematical and spelling errors
- Use of exit tickets

In addition, feedback is given to students automatically by several online platforms: Hegarty Maths and Method Maths.
Information gathered by these forms of assessment should always be used by the class teacher to help decide how best to ensure that students move forward mathematically.

Due to the right/ wrong nature of mathematics, classwork should be self-assessed (or peer-assessed if the teacher deems appropriate). The quality and quantity of student work should be monitored by teachers; this may take place during the lesson or the class teacher may choose to collect student books and monitor this outside of the lesson. In either case, there is no expectation to see written comments from teachers in student books.

Testing is a key component of assessment in mathematics. Each unit of work has a test that accompanies it. Wherever possible, there will be a delay between finishing the unit of work and taking the relevant test. This is to give teachers further insight into what students have *learnt* rather than what they were able to *perform* in lesson. Tests are marked by class teachers and written feedback provided. This may be simply be in the form of ticks, crosses and an overall score or if a key error or misconception has been identified then more detailed feedback would be given (if enough students have made the same error or misconception then this may be addressed with the whole class in lesson time rather than giving written feedback to each student). Records of student scores are stored by class teachers and progress is tracked internally using Edexcel steps. Additional feedback is provided for mock exams in key stage 4 to make these assessments as meaningful as possible

for the students. Students are provided with individualised question level analysis from their mock exams which is cross-referenced against Hegarty Maths clips to allow students to work independently to address their targets.

Homework

Hegarty Maths homework – a Hegarty maths task is set for students to complete as homework each week. The Hegarty maths task will be set on something that students have learnt previously. The reason for this is twofold: to allow students the opportunity to practice retrieving the subject content and to allow staff the opportunity to see what students have *learnt* rather than *performed* in a previous lesson. Hegarty Maths homework tasks are to be completed in a designated Hegarty Maths book. The homework is a written homework that is marked online (there is an option for students to complete their homework during a Monday lunchtime if they found the task too challenging or if there are internet issues or similar). Students should self-assess their homework and it should be clear to their subject teacher which questions were answered correctly and which were not. The quality of homework is monitored each week in the first lesson after the homework deadline; this will typically be done during lesson time while students are working independently (there is also time here for teachers to offer feedback to individual students if needed). Students are encouraged to leave comments for staff to read when they have answered a question incorrectly. Students should expect a response from their class teacher with some additional help in this case.

Clubs and/or intervention

The following clubs are offered at lunchtimes for Key Stage 4 Mathematics:

- Drop-in clinic for homework help
- UKMT Mentoring

Parental/Carer support

Parents/ carer are able to support their child by monitoring the standard of homework tasks as mentioned above. Parents can also promote use of Method Maths as a useful tool to practise past exam papers.

Helpful sources of information

https://hegartymaths.com/
https://corbettmaths.com/
https://www.mathsgenie.co.uk/gcse.html
https://www.ukmt.org.uk/
https://www.drfrostmaths.com/
https://www.mathscareers.org.uk/
https://www.methodmaths.info/
https://www.ocr.org.uk/Images/168982-specification-gcse-mathematics.pdf

Connections to Learning

Mathematics is a highly inter-connected discipline. From years 7 to 11 the mathematics curriculum focuses on four strands: number (at GCSE we split this into number and ratio and proportion as two separate strands), algebra, geometry and statistics. These strands can be thought of

as symbiotic; advances in one strand allow for further development of the others. Consequently, the connections between the various strands of the mathematics curriculum are myriad and one of the most enjoyable aspects of mathematics is studying seemingly separate areas of study and then making links between them and seeing how these areas interact. In mathematics lessons, depth of understanding is prioritised. This involves taking the time to see how a particular topic links to the other topics that have already been studied. As a consequence of the need to understand all of these various connections within mathematics, students should expect to be given regular opportunity to review prior learning as students will struggle with new concepts if they have not developed fluency with previous concepts.

Below shows the progression of the different strands of key stages 3 and 4. While these topic areas have been presented as four separate strands they should definitely not be viewed as mutually exclusive. As mentioned above each topic area in a given strand links to topics in the other strands. In key stage four, there is an increased emphasis on problem solving and students need to be prepared to link topic areas together in unusual and interesting ways.

Number:

Number 1: Place Value for integers and decimals, ordering, rounding, upper and lower bounds, use estimation to replace values in calculation, powers of ten, multiplying and dividing by powers of ten

Number 2: Special Numbers: Squares, cubes, roots primes, multiples, factors, prime factor decomposition, LCM, HCF, Venn diagrams, standard form, higher powers, index rules,

Number 3: Calculations,(3a) addition, subtraction (including time differences, perimeter) (3b) multiplication and division, problem solving, product rule for counting(3c) calculating with negatives, order of operations

Number 4: Fractions and Decimals, (use bar diagrams) equivalencies (fractions to decimals), equivalent fractions and cancelling, adding and subtraction, mixed numbers and improper fractions. Multiplication and fractions of amounts.

Number 5: Revise fractions, addition, subtraction, multiplication and revision, percentages (equivalence and percentage

Algebra:

Algebra 1: Notation, expressions, simplifying, substituting, expanding and factorising

Algebra 2: Solving equations linear, brackets, unknowns both sides

Algebra 3: Sequences: continuing, term to term, nth term, recognition of arithmetic, geometric, Fibonacci

Algebra 4: Algebraic manipulation including index laws, expanding and factorising quadratics, solving quadratics by factorisation.

Algebra 5: Coordinate geometry, linear graphs, real life graphs including rates of change and compound measures. Quadratic graphs.

Algebra 6: Consolidate solving linear and quadratic

Geometry:

Geometry 1: Properties of 2D shapes, lines and angles including parallel lines, angle sums and polygons, geometric reasoning (proof)

Geometry 2: Units of measurement, perimeter of compound shapes, area of any 2D shape, names and properties of 3D shapes, volume prisms and cylinders.

Geometry 3: Axes and Coordinates, basic lines (y=a, x = a). Symmetry and rotation, transformations: reflection, rotation, translation, enlargement including fractional and negative, congruency and tessellations including why some shapes don't tessellate.

Geometry 4: Constructions and Loci Constructing line and angle bisectors, triangles including equilateral triangles,

Statistics:

Statistics 1: Types of data, averages and range: Mean, median, mode and range, mean from frequency tables, estimated mean, extend into geometric mean

Statistics 2: Probability including and/or laws, sample spaces, frequency trees, probability trees, two way tables and Venn diagrams, conditional probability, probability using algebraic terms.

Statistics 3: Recap averages and range, Collecting and representing data, sampling, pie charts, line graphs, stem and

change) and decimals including x and ÷ by 0.1, 0.01, multiplicative reasoning.
Number 6: Ratio and Proportion know and use notation, simplify, share in given ratio, include bar model and problem solving including combining ratios.
Number 7: Consolidate powers and roots if required. Indices including fractional indices and simple surds. Estimating powers and roots of any given number.
Number 8: Consolidate percentages, ratio and proportion compound measures. Direct and indirect proportion, percentage change, reverse percentages and growth and decay.

GCSE Unit 4: Fractions, Decimals and Percentages
GCSE Unit 14: Multiplicative Reasoning
GCSE Unit 11: Ratio and Proportion
GCSE Unit 18: Fractions, Indices and Standard Form

This strand is particularly important for subsequent study in Core Mathematics.

equations if required; simultaneous equations and inequalities including inequations, number lines and graphical representations, rearranging formulae

GCSE Unit 2: Algebra Basics
GCSE Unit 4: Equations and Inequalities
GCSE Unit 16: Quadratic Equations and Graphs
GCSE Unit 20: Further Algebra

This strand is particularly important for subsequent study in A Level Mathematics and A Level Further Mathematics.

perpendicular from and to a point, angles of 60º, 45º, loci and scale drawing problems
Geometry 5: Consolidate angles including those in triangles if required. Pythagoras and trig in right angled triangles. Area of any triangle using sine.

GCSE Unit 6: Angles
GCSE Unit 8: Perimeter, Area and Volume
GCSE Unit 10: Transformations
GCSE Unit 12: Right-angled Triangles
GCSE Unit 17: Further Perimeter, Area and Volume
GCSE Unit 19: Congruence, Similarity and Vectors
GCSE Unit 15: Constructions, loci and bearings

This strand is particularly important for subsequent study in A Level Mathematics and A Level Further Mathematics.

leaf, dual and composite bar charts extending into reverse mean, cumulative frequency, box plots, quartiles and IQR

GCSE Unit 3: Graphs, Tables and Charts
GCSE Unit 7: Averages and Range
GCSE Unit 13: Probability

This strand is particularly important for subsequent study in Core Mathematics.

Connections to Future Pathways

Studying maths helps to develop skills in logical thinking, analysis, problem-solving, decision-making and communication, which are valued by employers across many job sectors. Furthermore, mathematical careers are in every business and industry throughout every sector of the economy. Mathematics may not be the central focus of all professions, but it can serve as critical building blocks of a larger and more meaningful whole. Mechanical engineers, for example, work with numbers for the design and production of all types of simple and complex machines. Actuaries use numbers to calculate and assess the consequences of financial risk. And economists analyse and interpret quantitative data to discern macro- and micro-economic patterns. Banking is a world of numbers and mathematics is used in the way accounts are handled, for calculating interest rates and for determining credit scores.

Data - Again, big data plays a major role in the increased demand for skilled data scientists. It is the job of data scientists to immerse themselves in the ocean of big data, bringing structure to it that, in turn, allows for effective analysis of that data. Many employers rate the ability to handle data very highly.
Number – Banking, Accountancy and Finance. For example, Accountants examine financial records and prepare financial documents for businesses, nonprofits, firms and individuals. They are responsible for the accuracy of the documents they create and for making sure that taxes are paid on time.
Geometry – Architecture, Civil Engineering and Astronomers. Geometry is used in astronomy in many, many ways. One of the most common uses, however, is the use of geometry to find the distance between celestial objects, such as stars and planets. ... But other uses of geometry include measuring the speed and velocity of planets orbiting other stars.
Algebra – Air Traffic Controllers, Video Game Designers and Economists. Air traffic controller uses math in order to be able to understand distances and measurements at a moment's notice. They also must be able to do mental math quickly and accurately. Part of their job is directing aircraft at what altitude and speed to fly. For example, air traffic controllers frequently need to calculate the minimum safe level for planes to fly at. To do this they use the equation:

Minimum safe level (measured in feet) = 30 × (1013 - pa)
(*pa* is the atmospheric pressure. This value can change daily, depending on weather systems.)

Other Careers:
• Logistics specialist • Control statistician • Systems operation analyst • Robotics analyst • Actuary • Insurance underwriter • Operations research analyst • Technical mathematical modeller • Financial analyst • Business metrics analyst • Big data analyst • Marketing consultant • Claims adjuster • Database administrator • Cryptographer

Year 10 Overview

Term	Knowledge	Assessment
	Unit 2: Algebra Basics In this unit, we ensure that students have a good grasp of the basic concepts of algebra as this is an area where it can be easy for a student to have misconceptions. It's important that any misconceptions are addressed at the start of the GCSE before they affect any subsequent learning. Unit 3: Graphs, Tables and Charts This unit develops students' abilities to draw, and make inferences from, a variety of different statistical diagrams. The students options for GCSE likely involves some subjects where statistical analysis is required and so studying this in the first half term allows students to make use of these skills elsewhere during the remainder of years 10 and 11. Unit 4: Fractions, Decimals and Percentages	

	Students will consolidate their understanding of fractions, decimals and percentages from key stage 3, including their equivalences, before looking at more sophisticated techniques such as understanding percentages as multipliers.	
Autumn 1	➢ Use correct algebraic notation. ➢ Write and simplify expressions. ➢ Use the index laws. ➢ Multiply and divide expressions. ➢ Substitute numbers into expressions. ➢ Recognise the difference between a formula and an expression. ➢ Substitute numbers into a simple formula. ➢ Expand brackets. ➢ Simplify expressions with brackets. ➢ Substitute numbers into expressions with brackets and powers. ➢ Recognise factors of algebraic terms. ➢ Factorise algebraic expressions. ➢ Use the identity symbol ≡ and the not equals symbol ≠ ➢ Write expressions and simple formulae to solve problems. ➢ Use maths and science formulae. ➢ Designing tables and data collection sheets. ➢ Reading data from tables. ➢ Use data from tables. ➢ Design and use two-way tables. ➢ Draw and interpret comparative and composite bar charts. ➢ Interpret and compare data shown in bar charts, line graphs and histograms. ➢ Plot and interpret time series graphs. ➢ Use trends to predict what might happen in the future. ➢ Construct and interpret stem and leaf and back-to-back stem and leaf diagrams. ➢ Draw and interpret pie charts. ➢ Plot and interpret scatter graphs. ➢ Determine whether or not there is a relationship between sets of data. ➢ Draw a line of best fit on a scatter graph. ➢ Use the line of best fit to predict values. ➢ Compare fractions. ➢ Add and subtract fractions. ➢ Use fractions to solve problems. ➢ Find a fraction of a quantity or measurement. ➢ Use fractions to solve problems.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of these units between 1 and 2 weeks after finishing the unit

	➢ Multiply whole numbers, fractions and mixed numbers. ➢ Simplify calculations by cancelling. ➢ Divide a whole number by a fraction. ➢ Divide a fraction by a whole number or a fraction. ➢ Convert fractions to decimals and vice versa. ➢ Use decimals to find quantities. ➢ Write one number as a fraction of another. ➢ Convert percentages to fractions and vice versa. ➢ Write one number as a percentage of another. ➢ Convert percentages to decimals and vice versa. ➢ Find a percentage of a quantity. ➢ Use percentages to solve problems. ➢ Calculate simple interest. ➢ Calculate percentage increases and decreases. ➢ Use percentages in real-life situations. ➢ Calculate VAT (value added tax).	
	Unit 5: Equations and inequalities This unit builds on the algebra unit covered in the first half term and allows students to develop their repertoire of algebraic manipulation skills. The purpose here is to get students to understand that algebra is an effective problem solving tool and allow them to solve increasingly difficult problems as they progress through the GCSE. Unit 6: Angles Students will build on their knowledge of angles from KS3 with increasing formality and increased emphasis on use of the correct mathematical vocabulary as well as calculating unknown angles in more challenging shapes such as octagons and decagons. This topic also lends itself to some algebraic problem solving to allow students opportunity to recap these key skills. Unit 7: Averages and Range Developing statistical analysis skills further, this unit students how to calculate and interpret measures of spread and dispersion. Students should expect some familiarity in content from key stage 3 but with more problem solving, especially when using the mean, and greater use of frequency tables.	
Autumn 2	➢ Understand and use inverse equations. ➢ Rearrange simple linear equations. ➢ Solve simple linear equations. ➢ Solve two-step equations. ➢ Solve linear equations with brackets. ➢ Solve equations with unknowns on both sides. ➢ Use correct notation to show inclusive and exclusive inequalities.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1

	➢ Solve simple linear inequalities. ➢ Write down whole numbers which satisfy an inequality. ➢ Represent inequalities on a number line. ➢ Solve two-sided inequalities. ➢ Substitute values into formulae and solve equations. ➢ Change the subject of a formula. ➢ Know the difference between an expression, an equation, a formula and an identity. ➢ Recognise and extend sequences. ➢ Use the nth term to generate terms of a sequence. ➢ Find the nth term of an arithmetic sequence. ➢ Solve geometric problems using side and angle properties of quadrilaterals. ➢ Identify congruent shapes. ➢ Understand and use the angle properties of parallel lines. ➢ Find missing angles using corresponding and alternate angles. ➢ Solve angle problems in triangles. ➢ Understand angle proofs about triangles. ➢ Calculate the interior and exterior angles of regular polygons. ➢ Calculate the interior and exterior angles of polygons. ➢ Explain why some polygons fit together and some others do not ➢ Solve angle problems using equations. ➢ Solve geometrical problems showing reasoning. ➢ Calculate the mean from a list and from a frequency table. ➢ Compare sets of data using the mean and range. ➢ Find the mode, median and range from a stem and leaf diagram. ➢ Identify outliers. ➢ Estimate the range from a grouped frequency table. ➢ Recognise the advantages and disadvantages of each type of average. ➢ Find the modal class. ➢ Find the median from a frequency table. ➢ Estimate the mean of grouped data. ➢ Understand the need for sampling. ➢ Understand how to avoid bias.	and 2 weeks after finishing the unit
	Unit 13: Probability This unit builds on the concept of likelihood developed at key stage 3 but introduces students to more formal ways of working with probability such as Venn diagrams and tree diagrams. Unit 8: Perimeter, Area and Volume	

	Students here will develop their mensuration skills to allow them to calculate with increasingly challenging 2D and 3D compound shapes. This area is likely to involve some algebraic manipulation as a way to make connections between topics and to deepen understanding.	
Spring 1	➢ Calculate simple probabilities from equally likely events. ➢ Understand mutually exclusive and exhaustive outcomes. ➢ Use two-way tables to record the outcomes from two events. ➢ Work out probabilities from sample space diagrams. ➢ Find and interpret probabilities based on experimental data. ➢ Make predictions from experimental data. ➢ Use Venn diagrams to work out probabilities. ➢ Understand the language of sets and Venn diagrams. ➢ Use frequency trees and tree diagrams. ➢ Work out probabilities using tree diagrams. ➢ Understand independent events. ➢ Understand when events are not independent. ➢ Solve probability problems involving events that are not independent. ➢ Calculate the perimeter and area of rectangles, parallelograms and triangles. ➢ Estimate lengths, areas and costs. ➢ Calculate a missing length, given the area. ➢ Calculate the area and perimeter of trapezia. ➢ Find the height of a trapezium given its area. ➢ Convert between area measures. ➢ Calculate the perimeter and area of shapes made from triangles and rectangles. ➢ Calculate areas in hectares, and convert between ha and m2. ➢ Calculate the surface area of a cuboid. ➢ Calculate the surface area of a prism. ➢ Calculate the volume of a cuboid. ➢ Calculate the volume of a prism. ➢ Solve problems involving surface area and volume. ➢ Convert between measures of volume.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit
	Unit 14: Multiplicative Reasoning This is an important unit for students ‘number sense’ and their ability to use mathematics and numeracy outside of the classroom. Here students develop their understanding of proportion and apply it to several areas such as finance and science.	
Spring 2	➢ Calculate a percentage profit or loss. ➢ Express a given number as a percentage of another in more complex situations.	Assessment in this half term follows the marking and feedback

	➢ Find the original amount given the final amount after a percentage increase or decrease ➢ Find an amount after repeated percentage change. ➢ Solve growth and decay problems. ➢ Solve problems involving compound measures. ➢ Convert between metric speed measures. ➢ Calculate average speed, distance and time. ➢ Use formulae to calculate speed and acceleration. ➢ Use ratio and proportion in measures and conversions. ➢ Use inverse proportion	policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit
	Unit 10: Transformations This area builds on work covered in key stage 3 on reflection, rotation, translation and enlargement but stretches students understanding to incorporate ideas such as vectors and negative scale factors. Unit 11: Ratio and proportion Unit 14 (Multiplicative Reasoning) is extended here but with less of a focus on utilising proportion in real life and with more of a view to developing the underlying mathematical principles behind it.	
Summer 1	➢ Translate a shape on a coordinate grid. ➢ Use a column vector to describe a translation. ➢ Draw a reflection of a shape in a mirror line. ➢ Draw reflections on a coordinate grid. ➢ Describe reflections on a coordinate grid. ➢ Rotate a shape on a coordinate grid. ➢ Describe a rotation. ➢ Enlarge a shape by a scale factor. ➢ Enlarge a shape using a centre of enlargement. ➢ Identify the scale factor of an enlargement. ➢ Find the centre of enlargement. ➢ Describe an enlargement. ➢ Transform shapes using more than one transformation. ➢ Describe combined transformations of shapes on a grid. ➢ Use ratio notation. ➢ Write a ratio in its simplest form. ➢ Solve problems using ratios. ➢ Solve simple problems using ratios. ➢ Use ratios to convert between units. ➢ Write and use ratios for shapes and their enlargements. ➢ Divide a quantity into 2 or 3 parts in a given ratio.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit

	➢ Solve word problems using ratios. ➢ Use ratios involving decimals. ➢ Compare ratios. ➢ Solve ratio and proportion problems. ➢ Use the unitary method to solve proportion problems. ➢ Solve proportion problems in words. ➢ Work out which product is better value for money. ➢ Recognise and use direct proportion on a graph. ➢ Understand the link between the unit ratio and the gradient. ➢ Recognise different types of proportion. ➢ Solve word problems involving direct and inverse proportion.	
	Unit 12: Right-angled Triangles This unit introduces students to Pythagoras' theorem and trigonometry which are two important mathematical skills. Students should expect these skills to be interleaved with questions linked to Unit 8 (Perimeter, Area and Volume) to deepen their knowledge. Unit 14: Multiplicative Reasoning This unit was looked at earlier in the academic year but is revisited here as it is such an important area for students to understand for their later lives.	
Summer 2	➢ Understand Pythagoras' theorem. ➢ Calculate the length of the hypotenuse in a right-angled triangle. ➢ Solve problems using Pythagoras' theorem. ➢ Calculate the length of a line segment AB. ➢ Calculate the length of a shorter side in a right-angled triangle. ➢ Understand and recall the sine ratio in right-angled triangles. ➢ Use the sine ratio to calculate the length of a side in a right-angled triangle. ➢ Use the sine ratio to solve problems. ➢ Use the sine ratio to calculate an angle in a right-angled triangle. ➢ Use the sine ratio to solve problems. ➢ Understand and recall the cosine ratio in right-angled triangles. ➢ Use the cosine ratio to calculate the length of a side in a right-angled triangle. ➢ Use the cosine ratio to calculate an angle in a right-angled triangle. ➢ Use the cosine ratio to solve problems. ➢ Understand and recall the tangent ratio in right-angled triangles. ➢ Use the tangent ratio to calculate the length of a side in a right-angled triangle. ➢ Use the tangent ratio to calculate an angle in a right-angled triangle.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit

	➢ Solve problems using an angle of elevation or depression. ➢ Understand and recall trigonometric ratios in right-angled triangles. ➢ Use trigonometric ratios to solve problems. ➢ Know the exact values of the sine, cosine and tangent of some angles. ➢ Calculate a percentage profit or loss. ➢ Express a given number as a percentage of another in more complex situations. ➢ Find the original amount given the final amount after a percentage increase or decrease ➢ Find an amount after repeated percentage change. ➢ Solve growth and decay problems. ➢ Solve problems involving compound measures. ➢ Convert between metric speed measures. ➢ Calculate average speed, distance and time. ➢ Use formulae to calculate speed and acceleration. ➢ Use ratio and proportion in measures and conversions. ➢ Use inverse proportions.	

Year 11 Overview

Term	Knowledge	Assessment
	Unit 17: Further Perimeter, Area and Volume This unit extends the previous work on perimeter, area and volume to include circles and use of pi. Often manipulation using pi utilises algebraic skills from the start of year 10. Unit 16: Quadratic Equations and Graphs Students' skills in solving equations are strengthened here to include solving quadratic equations by factorising and understanding how the solutions to a quadratic equation are linked to the graph of the quadratic function.	
Autumn 1	➢ Calculate the circumference of a circle. ➢ Solve problems involving the circumference of a circle. ➢ Calculate the circumference and radius of a circle. ➢ Work out percentage error intervals. ➢ Work out the area of a circle. ➢ Work out the radius or diameter of a circle. ➢ Solve problems involving the area of a circle. ➢ Give answers in terms of π.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit

	➢ Understand and use maths language for circles and perimeters. ➢ Work out areas of semicircles and quarter circle and perimeters. ➢ Solve problems involving sectors of circles. ➢ Solve problems involving areas and perimeters of 2D shapes. ➢ Work out the volume and surface area of cylinders. ➢ Work out the volume of a pyramid. ➢ Work out the surface area of a pyramid. ➢ Work out the volume of a cone. ➢ Work out the surface area of a cone. ➢ Work out the volume of a sphere. ➢ Work out the surface area of a sphere. ➢ Work out the volume and surface area of composite solids. ➢ Multiply double brackets. ➢ Recognise quadratic expressions. ➢ Square single brackets. ➢ Plot graphs of quadratic functions. ➢ Recognise a quadratic function. ➢ Use quadratic graphs to solve problems. ➢ Solve quadratic equations ax2 + bx + c = 0 using a graph. ➢ Solve quadratic equations ax2 + bx + c = k ➢ Using a graph. ➢ Factorise quadratic expressions. ➢ Solve quadratic functions algebraically.	

	Unit 18: Fractions, Indices and Standard form A 'finishing off' unit to cover the remaining number skills on the GCSE. Here students practise their fractional arithmetic with mixed numbers as well as learn how to perform arithmetic with numbers written in standard form. Unit 19: Congruence, Similarity and Vectors This unit allows students to utilise their multiplicative reasoning skills in the context of similar shapes. In this unit students are also required to form logical, coherent arguments to decide whether two shapes are congruent or not. This unit also introduces students to the concept of vectors as mathematical objects that can be manipulated (rather than just to describe a translation). Here students will add, subtract and multiply vectors and interpret these calculations geometrically.	
Autumn 2	➢ Multiply and divide mixed numbers and fractions. ➢ To know and use the laws of indices. ➢ Write large numbers in standard form. ➢ Convert large numbers from standard form into ordinary numbers. ➢ Write small numbers in standard form. ➢ Convert numbers from standard form with negative powers of ordinary numbers ➢ To multiply and divide numbers in standard form. ➢ To add and subtract numbers in standard form. ➢ Recognise 3D shapes and their properties. ➢ Describe 3D shapes using the correct mathematical words. ➢ Understand the 2D shapes that make up 3D objects." ➢ Identify and sketch planes of symmetry of 3D shapes. ➢ Understand and draw plans and elevations of 3D shapes. ➢ Sketch 3D shapes based on their plans and elevations. ➢ Make accurate drawings of triangles using a ruler, protractor and compasses. ➢ Identify SSS, ASA, SAS and RHS triangles as unique from a given description.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit

	➢ Identify congruent triangles ➢ Understand similarity. ➢ Use similarity to solve angle problems. ➢ Find the scale factor of an enlargement. ➢ Use similarity to solve problems. ➢ Understand the similarity of regular polygons. ➢ Calculate perimeters of similar shapes. ➢ Recognise congruent shapes. ➢ Use congruence to work out unknown angles. ➢ Use congruence to work out unknown sides. ➢ Add and subtract vectors. ➢ Find the resultant of two vectors. ➢ Subtract vectors. ➢ Find multiples of a vector.	
	Unit 20: Further Algebra This unit stretches the students' algebra skills further to include topics such as rearranging formulae, sketching non-linear graphs and solving simultaneous equations.	
Spring 1	➢ Solve simultaneous equations by drawing a graph. ➢ Write and solve simultaneous equations. ➢ Solve simultaneous equations algebraically. ➢ Draw and interpret graphs of cubic functions. ➢ Draw and interpret graphs of y = 1/x. ➢ Draw and interpret non-linear graphs to solve problems. ➢ Change the subject of a formula. ➢ Identify expressions, equations, formulae and identities. ➢ Prove results using algebra.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document. Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit
	Unit 15: Constructions, Loci and Bearings In this unit, students gain an appreciation for the methods used by ancient Greek mathematicians who developed methods for bisecting angles, and lines without the use of rulers and protractors. Also covered is bearings which allows students to make use of their angles skills in a real-life context.	
Spring 2	➢ Draw diagrams to scale. ➢ Correctly interpret scales in real-life contexts.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document.

	➢ Use scales on maps and diagrams to work out lengths and distances. ➢ Know when to use exact measurements and estimations on scale drawings and maps. ➢ Draw lengths and distances correctly on given scale drawings. ➢ Accurately draw angles and 2D shapes using a ruler, protractor and compasses. ➢ Construct a polygon inside a circle. ➢ Recognise nets and make accurate drawings of nets of common 3D objects. ➢ Draw accurately using rulers and compasses. ➢ Bisect angles and lines using rulers and compasses. ➢ Draw loci for the path of points that follow a given rule. ➢ Identify regions bounded by loci to solve practical problems. ➢ Find and use three-figure bearings. ➢ Use angles at parallel lines to work out bearings. ➢ Solve problems involving bearings and scale diagrams.	Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit