GCSE Mathematics (Set 1)
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. 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. In Year 11, Method Maths or other forms of exam revision may be used as homework in place of Hegarty Maths.

Clubs and/or intervention

The following clubs are under review 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://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

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 change) and decimals including x and ÷ by 0.1, 0.01, multiplicative reasoning.

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 equations if required; simultaneous equations and

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, perpendicular from and to a point,

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 leaf, dual and composite bar charts

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 11: Multiplicative Reasoning

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

inequalities including inequations, number lines and graphical representations, rearranging formulae

GCSE Unit 9: Equations and inequalities
GCSE Unit 15: Equations and Graphs
GCSE Unit 6: Further Graphs
GCSE Unit 17: Further Algebra
GCSE Unit 19: Proportions and Graphs

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

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 16: Circle Theorems
GCSE Unit 18: Vectors
GCSE Unit 13: Further Trigonometry
GCSE Unit 7: Area and Volume
GCSE Unit 16: Similarity and Congruence

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

extending into reverse mean, cumulative frequency, box plots, quartiles and IQR

GCSE Unit 10: Probability
GCSE Unit 14: Further Statistics

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 16 Circle Theorems: Circle theorems develops students' ability to construct reasoned, logical arguments and also encourages students to justify their logic which is not asked of much elsewhere in the curriculum. This unit also provides a good opportunity to work on their angle facts from key stage 3. Unit 9 Equations and Inequalities: This unit ensures that a secure foundation of algebraic skills is in place from key stage 3 study by building on crucial topics such as solving linear, quadratic and simultaneous equations. These topics are often used to extend other areas of the curriculum and so strengthening these skills early on allows for more thorough exam preparation throughout the course.	
Autumn 1	➢ Solve problems involving angles, triangles and circles. ➢ Understand and use facts about chords and their distance from the centre of a circle. ➢ Solve problems involving chords and radii. ➢ Understand and use facts about tangents at a point and from a point. ➢ Give reasons for angle and length calculations involving tangents.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document.

	➢ Understand, prove and use facts about angles subtended at the centre and the circumference of circles. ➢ Understand, prove and use facts about the angle in a semicircle being a right angle. ➢ Find missing angles using these theorems and give reasons for answers. ➢ Understand, prove and use facts about angles subtended at the circumference of a circle. ➢ Understand, prove and use facts about cyclic quadrilaterals. ➢ Prove the alternate segment theorem. ➢ Solve angle problems using circle theorems. ➢ Give reasons for angle sizes using mathematical language. ➢ Find the equation of the tangent to a circle at a given point. ➢ Understand the difference between rational and irrational numbers. ➢ Simplify a surd. ➢ Rationalise a denominator. ➢ Find the roots of quadratic functions. Rearrange and solve simple quadratic equations. ➢ Solve more complex quadratic equations. Use the quadratic formula to solve a quadratic equation. ➢ Complete the square for a quadratic expression. ➢ Solve quadratic equations by completing the square. ➢ Solve simple simultaneous equations. ➢ Solve simultaneous equations for real-life situations. ➢ Use simultaneous equations to find the equation of a straight line. ➢ Solve linear simultaneous equations where both equations are multiplied. ➢ Interpret real-life situations involving two unknowns and solve them. ➢ Solve simultaneous equations with one quadratic equation. ➢ Use real-life situations to construct quadratic and linear equations and solve them. ➢ Solve inequalities and show the solution on a number line and using set notation.	Students will be assessed on the content of these units between 1 and 2 weeks after finishing the unit
	Unit 9 Equations and Graphs Continuing the content from before half term, this unit allows students to see the links between their algebraic skills and Cartesian geometry. Unit 18: Vectors This unit allows students to grow more familiarity with vectors that they have met briefly during translation at key stage 3. This is an important unit to prime students for key stage 5 study, especially with mechanics. This is also a unit that stretches students' problem solving abilities.	

Autumn 2	➢ Solve simultaneous equations graphically. ➢ Represent inequalities on graphs. ➢ Interpret graphs of inequalities. ➢ Recognise and draw quadratic functions. ➢ Find approximate solutions to quadratic equations graphically. ➢ Solve quadratic equations using an iterative process. ➢ Find the roots of cubic equations. ➢ Sketch graphs of cubic functions. ➢ Solve cubic equations using an iterative process. ➢ Solve problems using geometric sequences. ➢ Work out terms in Fibonnaci-like sequences. ➢ Find the nth term of a quadratic sequence. ➢ Understand and use vector notation. ➢ Work out the magnitude of a vector. ➢ Calculate using vectors and represent the solutions graphically. ➢ Calculate the resultant of two vectors. ➢ Solve problems using vectors. ➢ Use the resultant of two vectors to solve vector problems. ➢ Express points as position vectors. ➢ Prove lines are parallel. ➢ Prove points are collinear. ➢ Solve geometric problems in two dimensions using vector methods. ➢ Apply vector methods for simple geometric proofs.	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 4: Fractions, Decimals and Percentages This unit allows students the opportunity to recap the basics of fractions, decimals and percentages from key stage 3 before exploring more complicated concepts such as percentage increase/ decrease and compound interest. While these are important skills for the GCSE, they will also allow students to have a better understanding of bank accounts, loans and mortgages later in their adult life. Unit 13: Trigonometry The basics of SOHCAHTOA are recapped here before progressing onto non-right angled trigonometry with the sine and cosine rule. In this unit students also meet the graphs of the sin, cos and tan functions which are crucial for accessing key stage 5 mathematics in addition to supporting the topic of waves in physics.	
Spring 1	➢ Add, subtract, multiply and divide fractions and mixed numbers. ➢ Find the reciprocal of an integer, decimal or fraction. ➢ Write ratios in the form 1 : n or n : 1. ➢ Compare ratios.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document.

	➢ Find quantities using ratios. ➢ Solve problems involving ratios. ➢ Convert between currencies and measures. ➢ Recognise and use direct proportion. ➢ Solve problems involving ratios and proportion. ➢ Work out percentage increases and decreases. ➢ Solve real-life problems involving percentages. ➢ Calculate using fractions, decimals and percentages. ➢ Convert a recurring decimal to a fraction. ➢ Understand and use upper and lower bounds in calculations involving trigonometry. ➢ Understand how to find the sine of any angle. ➢ Know the graph of the sine function and use it to solve equations. ➢ Understand how to find the cosine of any angle. ➢ Know the graph of the cosine function and use it to solve equations." ➢ Understand how to find the tangent of any angle. ➢ Know the graph of the tangent function and use it to solve equations. ➢ Find the area of a triangle and a segment of a circle. ➢ Use the sine rule to solve 2D problems. ➢ Use the cosine rule to solve 2D problems. ➢ Solve bearings problems using trigonometry." ➢ Use Pythagoras' theorem in 3D. ➢ Use trigonometry in 3D." ➢ Recognise how changes in a function affect trigonometric graphs. ➢ Recognise how changes in a function affect trigonometric graphs.	Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit
	Unit 6: Graphs This unit builds on the graphs of the trigonometric functions met last half term and introduces students to more graphs such as the parabola and hyperbola. A lot of work here also strengthens coordinate geometry of linear graphs which is crucial for both A Level Mathematics and Core Maths in Key Stage 5.	
Spring 2	➢ Find the gradient and y-intercept from a linear equation. ➢ Rearrange an equation into the form y = mx + c. ➢ Compare two graphs from their equations. ➢ Plot graphs with equations ax + by = c. ➢ Sketch graphs using the gradient and intercepts. ➢ Find the equation of a line, given its gradient and one point on the line. ➢ Find the gradient of a line through two points. ➢ Draw and interpret distance–time graphs.	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

	➢ Calculate average speed from a distance–time graph. ➢ Understand velocity–time graphs. ➢ Find acceleration and distance from velocity–time graphs. ➢ Draw and interpret real-life linear graphs. ➢ Recognise direct proportion. ➢ Draw and use a line of best fit. ➢ Find the coordinates of the midpoint of a line segment. ➢ Find the gradient and length of a line segment. ➢ Find the equations of lines parallel or perpendicular to a given line. ➢ Draw quadratic graphs. ➢ Solve quadratic equations using graphs. ➢ Identify the line of symmetry of a quadratic graph. ➢ Interpret quadratic graphs relating to real-life situations. ➢ Draw graphs of cubic functions. ➢ Solve cubic equations using graphs. ➢ Draw graphs of reciprocal functions. ➢ Recognise a graph from its shape. ➢ Interpret linear and non-linear real-life graphs. ➢ Draw the graph of a circle.	and 2 weeks after finishing the unit
	Unit 7 Area and Volume: This unit consolidates the mensuration covered in key stage 3 and builds to more complex shapes such as cones, spheres and hemispheres while making use of the increasingly sophisticated algebra skills that are constantly being developed in students. For instance, in having students equate expressions for the volumes of two different solids and rearrange to give one unknown in terms of the other. Unit 8 Constructions: 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. While this unit appears quite disjointed from the rest of the curriculum it is needed for the study of loci with complex numbers in A Level Further Maths.	
Summer 1	➢ Find the perimeter and area of compound shapes. ➢ Recall and use the formula for the area of a trapezium. ➢ Convert between metric units of area. ➢ Calculate the maximum and minimum possible values of a measurement. ➢ Convert between metric units of volume. ➢ Calculate volumes and surface areas of prisms.	Assessment in this half term follows the marking and feedback policy in the assessment section at the top of this document.

	➢ Calculate the area and circumference of a circle. ➢ Calculate area and circumference in terms of π. ➢ Calculate the perimeter and area of semicircles and quarter circles. ➢ Calculate arc lengths, angles and areas of sectors of circles. ➢ Calculate volume and surface area of a cylinder and a sphere. ➢ Solve problems involving volumes and surface areas. ➢ Calculate volume and surface area of pyramids and cones. ➢ Solve problems involving pyramids and cones. ➢ Draw plans and elevations of 3D solids. ➢ Reflect a 2D shape in a mirror line. ➢ Rotate a 2D shape about a centre of rotation. ➢ Describe reflections and rotations. ➢ Enlarge shapes by fractional and negative scale factors about a centre of enlargement. ➢ Translate a shape using a vector. ➢ Carry out and describe combinations of transformations. ➢ Draw and use scales on maps and scale drawings. ➢ Solve problems involving bearings. ➢ Construct triangles using a ruler and compasses. ➢ Construct the perpendicular bisector of a line. ➢ Construct the shortest distance from a point to a line using a ruler and compasses. ➢ Bisect an angle using a ruler and compasses. ➢ Construct angles using a ruler and compasses. ➢ Construct shapes made from triangles using a ruler and compasses. ➢ Draw a locus. ➢ Use loci to solve problems.	Students will be assessed on the content of this unit between 1 and 2 weeks after finishing the unit
	Unit 11 Multiplicative Reasoning: A crucial unit for developing ‘number sense’ in students and definitely a unit that students will utilise outside of their maths lessons. Concepts such as growth and decay, rates of change (specifically speed, density and pressure) will be used by students in science in addition to other subjects. Unit 12 Similarity and Congruence: This unit extends students’ understanding of similarity from key stage 3 to include 2D and 3D similarity (by use of area and volume scale factors). This unit also offers a good opportunity to link several earlier skills from the year together through problem solving. Unit 14 Further Statistics: This unit covers more sophisticated data analysis skills from those covered at key stage 3. Invariably these skills will be used in any other GCSE subject (and beyond) which has an element of data handling. Crucially, these skills are vital for success in Core Mathematics and A Level Mathematics at KS5.	

Summer 2	➢ Find an amount after repeated percentage changes. ➢ Solve growth and decay problems. ➢ Calculate rates. ➢ Convert between metric speed measures. ➢ Use a formula to calculate speed and acceleration. ➢ Solve problems involving compound measures. ➢ Use relationships involving ratio. ➢ Use direct and indirect proportion. ➢ Show that two triangles are congruent. ➢ Know the conditions of congruence. ➢ Prove shapes are congruent. ➢ Solve problems involving congruence. ➢ Use the ratio of corresponding sides to work out scale factors. ➢ Find missing lengths on similar shapes. ➢ Use similar triangles to work out lengths in real life. ➢ Use the link between linear scale factor and area scale factor to solve problems. ➢ Use the link between scale factors for length, area and volume to solve problems. ➢ Construct and use back-to-back stem and leaf diagrams. ➢ Construct and use frequency polygons and pie charts. ➢ Plot and interpret time series graphs. ➢ Use trends to predict what might happen in the future. ➢ Plot and interpret scatter graphs. ➢ Determine whether or not there is a linear relationship between two variables. ➢ Draw a line of best fit on a scatter graph. ➢ Use the line of best fit to predict values. ➢ Decide which average is best for a set of data. ➢ Estimate the mean and range from a grouped frequency table. ➢ Find the modal class and the group containing the median. ➢ Construct and use two-way tables. ➢ Choose appropriate diagrams to display data. ➢ Recognise misleading graphs. ➢ Understand how to take a simple random sample. ➢ Understand how to take a stratified sample." ➢ Draw and interpret cumulative frequency tables and diagrams. ➢ Work out the median, quartiles and interquartile range from a cumulative frequency diagram. ➢ Find the quartiles and the interquartile range from stem-and-leaf diagrams.	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

	➢ Draw and interpret box plots. ➢ Understand frequency density. ➢ Draw histograms. ➢ Interpret histograms. ➢ Compare two sets of data. ➢ Use the product rule for finding the number of outcomes for two or more events. ➢ List all the possible outcomes of two events in a sample space diagram. ➢ Identify mutually exclusive outcomes and events. ➢ Find the probabilities of mutually exclusive outcomes and events. ➢ Find the probability of an event not happening. ➢ Work out the expected results for experimental and theoretical probabilities. ➢ Compare real results with theoretical expected values to see if a game is fair. ➢ Draw and use frequency trees. ➢ Calculate probabilities of repeated events. ➢ Draw and use probability tree diagrams. ➢ Decide if two events are independent. ➢ Draw and use tree diagrams to calculate conditional probability. ➢ Draw and use tree diagrams without replacement. ➢ Use two-way tables to calculate conditional probability. ➢ Use Venn diagrams to calculate conditional probability. ➢ Use set notation.	

Year 11 Overview

Term	Knowledge	Assessment
	Unit 17 Further Algebra: This unit is the culmination of most algebraic techniques covered from years 7 to 11. Here the algebra students have covered is made even more abstract by the introduction of function notation as a precursor for further study in A Level Mathematics. This unit also covers proof which is a significant mathematical concept which sets maths apart from the other sciences. Unit 19 Proportions and Graphs: This unit builds on unit 17 but focuses on the graphical aspects of the algebraic skills covered; utilising, for instance, function notation to formalise the transformation work covered in key stage 3 as well as formalising students' understanding of proportion.	

Autumn 1	➢ Change the subject of a formula where the power of the subject appears. ➢ Change the subject of a formula where the subject appears twice. ➢ Add and subtract algebraic fractions. ➢ Multiply and divide algebraic fractions. ➢ Change the subject of a formula involving fractions where all the variables are in the denominators. ➢ Simplify algebraic fractions. ➢ Add and subtract more complex algebraic fractions. ➢ Multiply and divide more complex algebraic fractions. ➢ Simplify expressions involving surds. ➢ Expand expressions involving surds. ➢ Rationalise the denominator of a fraction. ➢ Solve equations that involve algebraic fractions. ➢ Use function notation. ➢ Find composite functions. ➢ Find inverse functions. ➢ Prove a result using algebra. ➢ Write and use equations to solve problems involving direct proportion. ➢ Write and use equations to solve problems involving direct proportion. ➢ Solve problems involving square and cubic proportionality. ➢ Write and use equations to solve problems involving inverse proportion. ➢ Use and recognise graphs showing inverse proportion. ➢ Recognise graphs of exponential functions. ➢ Sketch graphs of exponential functions. ➢ Calculate the gradient of a tangent at a point. ➢ Estimate the area under a non-linear graph.	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 the relationship between translating a graph and the change in its function notation. ➢ Understand the effect stretching a curve parallel to one of the axes has on its function form. ➢ Understand the effect reflecting a curve in one of the axes has on its function form.	