



The aim of the Key Stage 3 scheme of work is to extend the mathematical content taught and understood from Key Stage 2, building on the five key areas of maths with additional objectives to take their understanding further. The content is directly from the National Curriculum for Mathematics at Key Stage 3.

### Year 9

This section of the scheme of work includes support objectives that students need to have mastered first; core objectives and extension objectives that students may move onto if they successfully master the core objectives quickly.

This is the plan for the taught curriculum during achievement period: **One (Sept-Dec)**

#### **Brief summary of the topic/work being covered during this period**

##### **Substantive knowledge**

- To know circle definitions and properties, including: tangent, arc, sector and segment
- To know Pythagoras' theorem
- To know the criteria for triangles to be congruent (**SSS, SAS, ASA, RHS**)
- To know the meaning of the lower quartile and upper quartile and the interquartile range
- To understand the meaning of cumulative frequency

##### **Disciplinary knowledge**

- To calculate with positive indices, roots and with negative indices in the context of standard form and to use a calculator to evaluate numerical expressions involving powers and roots
- To add, subtract, multiply and divide numbers written in standard form with and without a calculator
- To calculate the probabilities of independent and dependent combined events
- To construct and list outcomes of combined events using a tree diagram and to use a tree diagram to solve simple and complex problems involving independent and dependent combined events
- To understand that relative frequency tends towards theoretical probability as sample size increases
- To convert a fraction to a recurring decimal and a recurring decimal of the form  $0.\dot{x}$ ,  $0.\dot{x}\dot{y}$ ,  $0.\dot{x}y\dot{z}$  to a fraction
- To calculate the result of a repeated percentage change, including compound interest and problems involving growth and decay
- To calculate the arc length and area of a sector, including calculating exactly with multiples of  $\pi$
- To calculate the angle of a sector when the arc length and radius are known
- To calculate the surface area of a right prism and a cylinder, including calculating exactly with multiples of  $\pi$
- To use Pythagoras' theorem to calculate the hypotenuse of a right-angled triangle or one of the shorter sides
- To use the criteria for triangles to be congruent (**SSS, SAS, ASA, RHS**)
- To solve problems, including geometrical proof, involving congruence or similarity and to test conjectures using known facts
- To understand the limitations of sampling
- To know the meaning of the lower quartile and upper quartile and the interquartile range, and to find the quartiles for discrete data sets
- To construct and interpret a box plot for discrete data and use box plots to compare distributions
- To complete a cumulative frequency table and construct a cumulative frequency curve
- To use a cumulative frequency curve to estimate the quartiles for grouped continuous data sets and properties of grouped continuous data sets

#### **Prior knowledge needed for this unit/topic from previous teaching**

- Know the meaning of powers and roots
- Know the multiplication and division laws of indices
- Understand and use standard form to write numbers, interpret a number written in standard form
- Add and multiply fractions (decimals) and convert between fractions, decimals and percentages
- Use frequency trees to record outcomes of probability experiments and experimental and theoretical probability to calculate expected outcomes
- Identify if a fraction is terminating or recurring, move freely between terminating fractions, decimals and percentages
- Use a multiplier to calculate the result of percentage changes
- Know and use the number  $\pi$ , the formula for area and circumference of a circle and the area of rectangles, parallelograms, triangles and trapezia
- Know angle facts including angles at a point, on a line and in a triangle, angle facts involving parallel lines and vertically opposite angles
- Know the properties of special quadrilaterals
- Know Pythagoras' theorem
- Know the meaning of discrete and continuous data
- How to interpret and construct frequency tables and analyse data using measures of central tendency

### Rationale for students studying this unit/topic

Across Key Stage 3 students periodically return to topics in order to ensure skills are continually practised and not forgotten across the space of a year or two. As such, students across Y7-9 will return regularly to the 5 key strands of mathematics; number, data handling, algebra, geometry and ratio and proportion, gradually building and developing their knowledge and skills in these areas.

All students study the core objectives in the scheme of work, the most able students in year 7, those who exceeded the expected standard at the end of KS2 may move onto the extension objectives after successfully mastering the core. These build upon the more challenging skills covered in year 6, so that they can move, at a brisk pace, on to more complex calculations and concepts that engage, challenge and motivate. Support objectives are given as guidance for lower attainers with the priority being to build solid foundations of understanding before progressing.

### Rationale for timing of this topic

The sequencing of the schemes of work across Key Stage 3 are such that each year begins with a recap of number work, in order that students have the necessary basic skills to use when dealing with more complex topics later on in the year.

- The ability to calculate with positive and negative indices will lead to students being able to evaluate numerical expressions comprising of negative fractional indices at GCSE
- The construction of tree diagrams will allow students to solve more complex probability problems (including conditional probabilities where a structure for diagrams may not be given).
- The conversion of simple recurring decimals is the groundwork for more complex decimals at GCSE
- An ability to calculate repeated percentage change is the foundation for more complex problem solving questions met at GCSE
- An understanding of Pythagoras will allow students to apply this to 3D problems at GCSE
- A recognition of congruent triangles and the criteria is further built on at GCSE in the context of geometric proof
- The construction of frequency diagrams is revisited at GCSE where the emphasis is on a means of comparison, an understanding of the fundamentals is important at this stage

### Key concepts/ideas that are taught to students in this unit/topic, including any anticipated gaps in knowledge and plan to overcome these

- When using standard form, many students use the number of zeros for the power of 10 instead of the number of decimal places, clear examples need to be modelled.
- In the calculation of negative indices, many students think a negative power negates the answer instead of meaning the reciprocal, clear examples and lots of practise is necessary.
- The application of Pythagoras to find a missing shorter side is often confused with finding the hypotenuse, encouraging students to use a sketch can help overcome this misconception
- When setting out reasons for congruence, often all three criteria are not explained fully. A clear way of setting out is important in the initial modelling of a solution

### New key terminology students will be taught during this topic/unit

#### Tier 3

Inequality, Tree diagrams, Theoretical and Experimental probability, Compound and Simple interest, Terminating decimal, Recurring decimal, (Exponential) growth and decay. Congruent; SSS, SAS, ASA, RHS, the 'implies that' symbol ( $\Rightarrow$ ).

Categorical data, Discrete data, Continuous data, Grouped data, Population

Sample, Cumulative frequency, Box plot, box-and-whisker diagram, Central tendency, dispersion, consistency and Skewness

### Plan for Assessment

- Informal assessment is ongoing through class work, contributions to class discussion and teacher assessment during lessons.
- Teachers record homework marks each week on a centrally held department tracker; the homework tasks are detailed on the schemes of work and outlined centrally within the department to ensure consistency across all classes. Teachers will take in and formally mark a written piece of homework once every two weeks. Students will then have time during a subsequent lesson to review their work and make any corrections
- Formal assessment will take place during this achievement period; after October half term. This is a synoptic paper that aims to assess students' progress in mathematics generally and covers questions from all topics that have been covered at any point in the students' mathematical history (not just this academic year).
- Mini start-of-topic tests will provide information for teachers regarding prior knowledge and existing misconceptions and mini end-of-topic tests will help students and teachers see the progress that has been made over the course of the teaching of the topic.