



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 8

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: **Two (March-July)**

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

##### **Substantive knowledge**

- identify and apply circle definitions and properties, including; centre, radius, chord, diameter, circumference and know and use the formulae: circumference of a circle =  $2\pi r = \pi d$ , area of a circle =  $\pi r^2$
- appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)

##### **Disciplinary knowledge**

- work fluently with fractions, decimals and percentages including; interpreting fractions and percentages as operators, percentages greater than 100% and solving problems involving percentage change, including original value problems, and simple interest including in financial mathematics
- solve linear equations with the unknown on both sides of the equation
- find approximate solutions to linear equations using a graph
- compare lengths, areas and volumes using ratio notation
- calculate perimeters of 2D shapes, including circles
- calculate areas of circles and composite shapes
- plot graphs of equations that correspond to straight-line graphs, identifying and interpreting gradients and intercepts of linear functions and recognise; sketch and interpret graphs of linear functions and simple quadratics
- plot and interpret graphs and graphs of non-standard (*piece-wise linear*) functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance and speed
- record describe and analyse the frequency of outcomes of probability experiments using frequency trees
- enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams
- construct theoretical possibility spaces for combined experiments with equally likely outcomes, calculating theoretical probabilities
- interpret, analyse and compare the distributions of data sets through appropriate graphical representation involving discrete, continuous and grouped data; use and interpret scatter graphs of bivariate data, recognising correlation
- interpret, analyse and compare the distributions of data sets

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

- Apply the four operations to proper fractions, improper fractions and mixed numbers
- Use calculators to; find a percentage of an amount using multipliers, perform a percentage increase or decrease
- Know that percentage change = actual change  $\div$  original amount
- Solve linear equations by balancing when the solution is a whole number or a fraction
- Know how to use formulae to find the area of rectangles, parallelograms, triangles and trapezia
- Use coordinates in all four quadrants; write and draw the equation of a line parallel to the x-axis or the y-axis
- Identify and draw the lines  $y = x$  and  $y = -x$
- Substitute positive and negative numbers into formula
- Work out theoretical probabilities for events with equally likely outcomes; know how to represent a probability and know that the sum of probabilities for all outcomes is 1
- Know the meaning of discrete data, interpret and construct frequency tables and construct and interpret pictograms, bar charts, pie charts, tables and vertical line charts Understand the mean, mode and median as measures of typicality (or location)
- Find the mean, median, mode and range of a set of data and from a frequency table

## Rationale for students studying this unit/topic

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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 will return regularly to the 5 key strands of mathematics: number, data handling, algebra, geometry, 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 8, those who exceeded the expected standard at the end of Year 7 may move onto the extension objectives after successfully mastering the core. These build upon the more challenging skills covered in Year 7, 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 topics later in the school year involve using and applying the basic number skills picked up and practised in the first half of the year.

#### In Year 8

- Calculation skills across all numerical mathematical areas should be becoming fluent for these able students, but practice is necessary so is built into a wide variety of topics including fractions and decimals. After Year 8 such calculations will increasingly be included in a wide variety of word problems, requiring additional problem-solving skills.
- Equation work continues to progress from previously taught skills, to more complex equations, using balancing equation techniques that allow for progression to more complex work at Year 9, GCSE and even A level.
- Shape work from achievement period one is built upon and now includes work on perimeter and area, including scale factor enlargements linking to earlier work on ratio.
- Straight-line graphs are introduced, which can be linked to earlier work on sequences.
- Work on probability is further developed this period, with appropriate diagrammatic representations introduced.
- Data is collected and analysed, building on new learning in Year 7 and preparing students to be able to talk statistically about information they collect – a very useful cross-curricular skill.

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

- When working with percentages some pupils may think that the multiplier for a 150% increase or that increasing an amount by 200% is the same as doubling.
- Some pupils may think that you always have to manipulate the equation to have the unknowns on the LHS of the equal sign, for example  $2x - 3 = 6x + 6$ , is more easily solved by leaving the  $x$  term on the RHS.
- Substitution into the formula for the area of a circle should be carefully modelled, only the radius  $r$  is squared then multiplied by  $\pi$ , not  $\pi r$  all squared.
- When plotting linear graphs some pupils may draw a line segment that stops at the two most extreme points plotted, rather than continue across the entire plane.
- Some pupils may think that a sketch is a very rough drawing. It should still be in pencil, identify key features, and look neat, but will just not be drawn to scale
- Some pupils may think that a positive gradient on a distance-time graph corresponds to a section of the journey that is uphill – describing graphs in words helps avoid this
- Careful attention should be drawn to the differences between bar charts and histograms.

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

### Tier 3

Multiplier, (simple) interest, graph, point of intersection, radius, diameter, chord, circumference, pi, prism, cross-section, plot, equation (of a graph), coordinate plane, gradient, y-intercept, substitute, linear, quadratic, frequency tree, set, Venn diagram, relative frequency, discrete data, continuous data, grouped data, frequency, scatter graph, bivariate data, correlation, positive correlation, negative correlation, average, spread, mean, mode, median, range, statistics

## Plan for Assessment

- Informal assessment is ongoing through class work, contributions to class discussion, 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 twice during this achievement period, after October half term and February half term. This synoptic paper 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.