



## Curriculum Detail: Mathematics

In Year 7, students focus on basic mathematical skills - in particular the four operations (addition, subtraction, multiplication and division), the measurement of time and the use of travel timetables. They learn how to use mathematical equipment like protractors and compasses and are introduced to negative numbers and how these are used in context (e.g. in relation to money and temperature). They examine areas and perimeters as these relate to various shapes and are introduced to simple algebraic problems. Angle rules and number types are studied and students learn how to recognise factors, multiples, squares, cubes, primes and roots and how to represent numbers as products of primes. When studying averages, students learn how to find the mode, median, range and mean from a discrete data set as well as how to find averages from stem and leaf diagrams and frequency tables. They learn how to calculate using fractions and percentages both with and without a calculator.

Year 8 students revisit, consolidate and build on what they have already learned. They use the four operations with decimals and learn how to round up as well as estimate. They calculate the area and circumference of circles and order positive and negative numbers. They are taught how to plot co-ordinates and find midpoints in 2D and 3D planes and, in algebra, how to simplify, to expand brackets, to factorise expressions and use algebraic substitution to solve simple linear equations. Students learn how to substitute into formulae and expressions and are familiarised with the order of operations. They are introduced to simultaneous equations and look at solving equations using trial and improvement as well as algebraic fractions featuring unknowns on both sides. Students collect and record both discrete and continuous data and construct bar charts, frequency polygons, pictograms, pie charts and scatter diagrams. They design questionnaires, employ data collection sheets and consider different sampling methods. Real life functional problems are solved and students learn about equivalent fractions and how to use the four operations with fractions (including mixed number fractions). They are taught to recognize, measure and estimate angles (including interior and exterior angles and angles at parallel lines) and to use angle rules in calculations. They find the volume of 3D shapes and prisms as well as the surface area of cuboids, learn to convert between fractions, decimals and percentages and examine percentage increase and decrease.

In Year 9, students revisit, consolidate and build on what they have already learned. They create scale drawings and study further function problems involving fractions. Using compasses and protractors, students construct a variety of triangles, angle and perpendicular bisectors and learn how to find the locus of a point that moves by a given rule. They use a multiplier to solve

percentage problems over time and reverse percentages to find the original value. In algebra, students find highest common factors and lowest common multiples and convert to and from standard form. They use formulae to express worded problems, solve simple quadratic equations and linear equations with an unknown on both sides and learn how to solve linear inequalities and simultaneous equations. Year 9 maths students also learn how to interpret graphs, draw simple conclusions and investigate different types of correlation. They begin to use histograms with groups of unequal length. Cumulative frequency graphs are drawn and students learn how to locate medians and quartiles as well as how to draw and compare the distribution of box plots. They place events on a probability scale, represent probabilities as fractions, percentages and decimals and locate the outcomes of two successive events using a space diagram. Tree diagrams are used as a method of representing events and understanding probability with and without replacement. The volume and surface area of prisms including cylinders is calculated as well as the lengths of arcs and the areas of segments. Students reflect shapes in a given mirror line, rotate them, and enlarge shapes by a given scale factor and centre of enlargement as well as by a fractional and/or negative scale factor. Translations are viewed as a combination of horizontal and vertical shifts.

Year 10 students revisit, consolidate and build on what they have already learned. They examine negative decimal numbers and the multiplication and division of numbers between 0 and 1. They use brackets, indices, division, multiplication, addition and subtraction to find the midpoint of a line within a 3D plane. Students generate simple sequences from diagrams and learn how to find term-to-term rules in words, how to find an  $n$ th term for a position-to-term rule and use an  $n$ th term to generate a number sequence. They learn how to rearrange the elements of an equation to change the subject of a formula and show regions bounded by inequalities. Isometric paper is used to draw 3D shapes and students learn to recognise side, front and plan elevations as well as nets. They find the locus of a point that moves by a given rule and plot straight-line graphs in the form of  $y = m + c$ . They learn how to find the gradient of a straight line and explore gradients and equations of parallel and perpendicular lines. Students set up and solve a pair of simultaneous equations using the process of elimination and/or substitution.

In Year 11, students revisit, consolidate and build on what they have already learned. They learn to recognise the advantages and disadvantages of using each type of average, draw cumulative frequency graphs and use them to find inter-quartile ranges. They compare the measure of spreads between two box plots and learn how to identify mutually exclusive outcomes in probability. Students write ratios in their simplest forms, divide quantities in given ratios, use and interpret maps and scale drawings and calculate direct and inverse proportion problems by finding the constant of proportionality. They study similarity and congruence to learn the conditions for various principles. They learn the effects of enlargement on the perimeter, area and volume of shapes and find the surface area and volumes of variously constructed compound solids. Trial and improvement is used to solve cubic functions and find approximate solutions for equations. Students learn how to convert various

units of measurement and gain an understanding of the rough metric equivalents of pounds, feet, miles, pints and gallons. The relationship between speed, distance and time is examined and used to construct and interpret distance-time graphs. The relationship between mass, density and volume is explored and students learn how to convert between metric units of density. They find the upper and lower bounds of calculations involving perimeter, areas and volumes and use these to find final answers to appropriate degrees of accuracy. Students learn about circle theorems as they relate to tangents, angles and radii, how to offer proof and give reasons for angle calculations. They describe and transform shapes using a combination of rotations, reflections, translations and enlargements and use trigonometry to find lengths and angles including angles of elevation and depression; Pythagoras' Theorem is used in connection with 2D and 3D problems. Index laws are used to simplify and calculate numerical expressions involving powers and negative indices. Students learn how to rationalise denominators, expand brackets involving surds and use different methods to solve a variety of linear, simultaneous and quadratic equations. They plot a variety of further graphs and apply horizontal and vertical shifts and stretches to given functions. Students apply, interpret and analyse transformations of reflection, rotation and enlargement and translate functions expressed algebraically. They study vectors, using standard vector notation to combine vectors, and learn how to prove that two vectors are parallel.