Testbourne Community School

Mathematics Department Curriculum Overview Level 2 Document Key Stage 3 Year 9

Maths	Autumn 1 (Half term 1)	Autumn 2 (Half term 2)	Spring 1 (Half term 3)	Spring 2 (Half term 4)	Summer 1 (Half term 5)	Summer 2 (Half term 6)
Year 9H	**Curriculum (H)** **1 Number Properties 1** • Understand how to use 4 operations (+/-/x/÷) with integers, decimals, fractions and directed numbers including worded problems and problems set in context and problems involving where clear logical written solutions are required. • Become confident with reciprocals, understand that x by 0.2 is the same as divide by 5 and equivalent. • Understand how to use BIDMAS where there are several operations including brackets, indices, roots and understand how to put brackets into calculations in order to make them correct. • Understand how to put numbers in order of size where fractions, decimals, surds and pi are included, converting to one representation where necessary to aid comparison and understand how to find a fraction half-way between two fractions or a fraction and an integer. **2 Geometry & Measures** • Learn how to derive the formula for finding the sum of interior angles of any polygon is 180(n-2) where n represents the number of sides. • Understand that the sum of exterior angles of any polygon (2D shape) = 360° therefore 360 ÷ n (where n represents the number of sides) = the size of an exterior angle and 360 ÷ an exterior angle = n. • Investigate the properties of the special quadrilaterals. • Understand how to use these properties to deduce the values of missing angles in special quadrilaterals, regular and irregular polygons. • Understand how to use units of measurement to calculate, estimate, measure and solve problems in a variety of contexts; convert between area measures (mm^2 to cm^2, cm^2 to m^2, and vice versa) and between volume measures (mm^3 to cm^3, cm^3 to m^3, and vice versa). **3 Number Properties 2** • Understand how to write numbers in standard form and convert freely between numbers written in standard form and as ordinary numbers. • Understand how to complete calculations using all four operations using numbers in standard form without calculator and with a calculator. • Understand how to solve problems in context where the numbers are either very large or small and which require the use of standard form. **4 Algebra 1** • Understand how to substitute positive and negative integers into formulae and expressions including expressions with squared and cubed terms. • Substitute fractions and decimals into formulae and expressions including those that contain brackets. • Understand how to use formulae for perimeter and area of standard shapes, the volume and surface area of standard prisms including cylinder based problems working backwards to find missing lengths etc. • Understand how to solve problems involving the use of compound measures such as speed and density. • Solve problems involving the use of unit pricing including solving worded problems and finding best value. **11 Ratio and Scale** • Understand that trigonometric functions are commonly defined as ratios of two sides of a right triangle containing the angle and start to introduce how these can be used with the aid of a calculator to find missing sides of a right-angled triangle given one side and an angle and missing angles given two sides.	**Curriculum (H)** **5 Fractions, decimals, %** • Understand and use fractions, percentages and decimals to compare proportions. • Convert freely between fractions, percentages and decimals to use the most appropriate method in any given question. Interpret fractions, percentages and decimals as a multipliers when solving problems and use these to solve problems using a calculator. • Understand how to solve problems involving percentage increase/decrease and finding percentage increases/decreases following changes in values. • Understand how to solve original value (reverse percentage) problems after a percentage change and solve simple interest problems in financial mathematics. • Learn to work out the price after VAT and income after tax in problems in a variety of contexts. • Solve financial problems by working out the value of savings after a period of compound interest. • Understand how to calculate a fraction of an amount. • In problems solve calculations where it is necessary to express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1. **6 Approximation** • Understand how to round numbers to the nearest integer, 10, 100, 1000 and how to round to a given number of decimal places. • Understand how to round to a given number of significant figures. • Understand how to estimate answers to calculations using rounding to 1sf and solve worded estimation problems. • Understand how to use a calculator to enter complex calculations and round the answer to a given degree of accuracy. • Recognise that upper and lower bounds exist for rounded values. • Understand how to give the limits of accuracy of measurements using inequality notation. • Understand how to solve simple problems involving upper and lower bounds. **7 Algebra 2** • Understand and use the vocabulary of expression, equation, inequality, term and factor. • Understand how to expand double brackets to give quadratics of the form $ax^2 + bx + c$. • Learn to Factorise single brackets by taking out common factors. • Understand how to factorise quadratics of the form $x^2 + bx + c$, including the difference of 2 squares. • Understand how to simplify algebraic expressions involving sums, products, and index laws. • Learn to solve more complex linear equations with the unknown on both sides. • Understand how to solve simple inequalities including those of the form $16<2n\leq24$. **8 Collecting & Interpreting Data** • Consider data sets with outliers and whether the outliers should be ignored or included and how they could/do affect measures of central tendency and range. • Understand how to take samples of data by random, stratified, systematic, quota and cluster. • Be able to understand when sampling can be representative of population data.	**Curriculum (H)** **9 Sequences and Graphs** • Deduce and justify an expression to describe the nth term of an arithmetic sequence (include ascending and descending sequences) • Understand how to find the nth term and explain where it is has come from in relation to a pictorial sequence. • Link the nth term of a sequence to the corresponding graphical representation. • Understand how to generate a sequence from a formula for the nth term. e.g.. nth term = $n^2 + 2n$ gives 3, 8, 15, … • Be able to recognise and find the next term and the nth term of quadratic sequences and explore their properties. • Understand how to draw scatter graphs accurately (interpreting a variety of scales) including being able to draw and use a line of best fit. • Understand and explain what correlation means in relation to the question, understand that it does not indicate causation. • Use a scatter graph to predict patterns, however, understand the dangers of doing so when extrapolating the results. **10 Proportion 1** • Understand what a ratio actually means and reduce a ratio to its lowest form including those with different units. • Understand equivalent ratios. • Understand how to divide quantities in a given ratio with and without a calculator. • Understand how to compare proportions when given a ratio of two quantities. • Solve ratio and proportion problems in a variety of contexts and appreciate that a ratio or fraction can be used to represent a multiplicative relationship between two quantities given as a ratio. • Understand and use the ratio 1 : n for use with map scales and plans and x:y for mixing concentrations. • State the meaning of the term proportion. • Understand how to calculate proportional amounts in a variety of contexts using methods including the unitary method. • Recognise some fractions equivalent to terminating decimals and some to recurring decimals. • Understand how to convert fractions to recurring decimals and vice versa (using an algebraic method). • Understand that all recurring decimals can be represented as exact fractions. **10 Ratio and Scale** • Link ratios and proportion. Link ratios and fractions, ratios to linear functions and to patterns/sequences. **12 Shape Properties** • Understand how to label correctly and use correct notation for angles and sides in shapes. • Know and use notation for angles, parallel lines, equal length sides, lines of symmetry. • Understand how to identify from correctly labelled diagrams, congruent shapes, similar shapes and those with line and given orders of rotational symmetry.	**Curriculum (H)** **13 Algebra 3** • Understand how to change the subject of a formula where the subject appears twice. • Understand how to use algebra to support and understand a proof. • Construct a proof. • Understand how to represent expressions as functions with input and output and understand inverse functions. • Understand how to solve linear simultaneous equations including some where the two equations have to be multiplied by 2 different numbers. **14 Transformations** • Understand how to transform shapes being able to describe rotations, complete reflections, given a reflection line and equations of lines. • Understand how to complete and describe enlargements with positive, fractional and negative scale factors (on a square grid or plan paper). • Understand how to complete and describe translations. • Understand how to describe fully all transformations and determine the result of combinations of transformations. **15 Probability** • Understand how to use a variety of representations to show all the possible outcomes of an event, for example Venn diagrams, two-way tables, lists, tallies. • Discuss the pros and cons of using each different representation and understand that in certain situations some are more appropriate. • Understand how to calculate the probability of an event occurring when presented information in a sample space diagram including Venn diagrams. **16 Triangles & Construction** • Understand and apply the criteria for congruent triangles; Justify and give reasons when determining congruency of triangles.	**Curriculum (H)** **16 Triangles & Construction** • Understand how to draw the 2-D representations of a 3-D shape, (elevations and plan) • Understand how to sketch a 3-D shape from 2-D views. **17 Interpreting Data** • Understand how to draw and interpret pie charts, frequency diagrams stem anandd leaf diagrams. • Understand how to Interpret cumulative frequency and box and whisker plots. • Understand and calculate the interquartile range from a list of data or a cumulative frequency curve. • Understand how to solve problems using cumulative frequency diagrams and box plots. • Understand how to calculate the average from grouped data. **18 Circles** • Understand how to label a circle with all its properties. • Understand how to solve area and circumference of a circle problems related to compound shapes and calculate the area and perimeter of other compound shapes. • Understand and use the formula for surface area and volume of spheres, pyramids, cones and composite solids. • Learn and solve problems using Circle theorems: including angle subtended by an arc at the centre is equal to twice the angle subtended at any point on the circumference, angle subtended at the circumference by a semicircle is 90°, angles in the same segment are equal, opposite angles in a cyclic quadrilateral sum to 180°, tangent at any point on a circle is perpendicular to the radius at that point, tangents from an external point are equal in length, the perpendicular from the centre to a chord bisects the chord, alternate segment theorem. **19 Proportion 2** • Understand how to find gradients of straight lines and interpret them if appropriate as speed or acceleration or rate of change. • Be able to construct graphs given information and then interpret the gradient and intercept in a real life context. • Understand, use and construct formulae for direct and inverse proportion problems. • Understand that x is inversely proportional to y means that x is proportional to 1/y	**Curriculum (H)** **19 Proportion 2 continued** • Understand how to solve problems related to growth and decay and compound interest being able to identify from worded questions that this is repeated percentage change. **20 Solving equations and inequalities** • Understand how to solve two linear simultaneous equations algebraically and graphically. • Understand how to solve quadratic equations by factorising, including those that need simple rearrangement. • Understand how to interpret worded questions which require the creation of two linear simultaneous equations; be able to solve the equations and interpret the answer. • Understand how to solve linear inequalities in two variables and represent the solution set on a graph or using set notation. **21 Plotting and sketching graphs** • Understand how to draw graphs of quadratic, cubic, reciprocal and exponential functions. • Understand how to find roots and turning points of quadratic functions in one variable by completing the square and recognise the connection between the algebra and the graphical representation. • Understand how to plot, draw and interpret graphs of real life issues including speed time, distance time and acceleration. • Understand that lines in the form y = mx + c will always result in a straight line and that the c gives the y-intercept and m is the gradient. • Understand that the gradient of a perpendicular line is the negative reciprocal of the other. • Understand that parallel lines have the same gradient. • Understand how to find equations of parallel and perpendicular lines given the equation (and a coordinate) of another line or two coordinates. **11 Ratio and Scale** • Understand that trigonometric functions are commonly defined as ratios of two sides of a right triangle containing the angle and apply SOHCAHTOA to questions in context. • Extension to introduce the sine rule (non-right angle triangles)