

Year 10H Scheme of Work

Unit	Key Objectives
Rounding, Estimation and Bounds	Estimate answers to one- or two-step calculations, including use of rounding numbers and formal estimation to 1 significant figure: mainly whole numbers and then decimals Truncate numbers to a given degree of accuracy Calculate the upper and lower bounds of numbers given to varying degrees of accuracy; Use inequality notation to specify an error interval due to truncation or rounding Calculate the upper and lower bounds of an expression involving the four operations Find the upper and lower bounds in real-life situations using measurements given to appropriate degrees of accuracy Find the upper and lower bounds of calculations involving perimeters, areas and volumes of 2D and 3D shapes Calculate the upper and lower bounds of calculations, particularly when working with measurements
Volume	Recall and use the formula for the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures Convert between metric measures of volume and capacity, e.g. $1 \text{ ml} = 1 \text{ cm}^3$ Use volume to solve problems Estimating volume by rounding measurements to 1 significant figure to check reasonableness of answers Find the volume of a cylinder Recall and use the formula for volume of pyramid Use the formulae for volume of spheres and cones Find the volume of a frustum of a cone Find the volume of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders Give answers to an appropriate degree of accuracy or in terms of π Form equations involving more complex shapes and solve these equations

Representing and Interpreting Data

Recognise the advantages and disadvantages between measures of average
Calculate the mean, mode (or modal class), median (or interval containing the median) and range from a frequency table for both discrete and continuous (grouped) data
Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values
Compare the mean and range of two distributions, or median or mode as appropriate
Construct and interpret stem and leaf diagrams (including back-to-back diagrams)
Find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams
Produce and interpret frequency polygons for grouped data
Read off frequency values, compare distributions, calculate total population, mean, estimate greatest and least possible values (and range)
Draw lines of best fit by eye, understanding what these represent
Identify outliers and give a reason why it might be an outlier
Ignore outliers on scatter graphs
Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing
Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem
Understand that correlation does not imply causality, and appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply 'no relationship' but merely 'no linear correlation'

<p>Algebraic Manipulation and Introducing Functions</p>	<p>Expand the product of two linear expressions, i.e. double brackets working up to negatives in both brackets and also similar to $(2x + 3y)(3x - y)$ Understand and use $(x + a)^2 = (x + a)(x + a)$ Expand the product of more than two linear expressions Factorise quadratic expressions of the form $ax^2 + bx + c$, including cases where $a > 1$ Factorise quadratic expressions using the difference of two squares Simplify algebraic fractions by cancelling and by factorising Substitute positive and negative numbers into expressions involving brackets and powers Substitute numbers into formulae from mathematics and other subjects including kinematics formulae, $v = u + at$, $v^2 - u^2 = 2as$, and $s = ut + at^2$ Substitute positive and negative numbers into a formula, solve the resulting equation including brackets, powers or standard form Use function notation and evaluate $f(x)$ for a given value of x Find $f(x) + g(x)$ and $f(x) - g(x)$, $2f(x)$, $f(3x)$ etc algebraically</p>
<p>Angles: Parallel Lines, Polygons and Circle Theorems 1</p>	<p>Angles in Parallel Lines Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding, alternate, vertically opposite and co-interior angles, giving reasons Angles in Polygons: Use the sum of the exterior angles of any polygon is 360° Use the sum of the interior angles of an n-sided polygon Use the sum of the interior angle and the exterior angle is 180° Find the size of each interior angle, or the size of each exterior angle, or the number of sides of a regular polygon, and use the sum of angles of irregular polygons Calculate the angles of regular polygons and use these to solve problems; Use the side/angle properties of compound shapes made up of triangles, lines and quadrilaterals, including solving angle and symmetry problems for shapes in the first quadrant, more complex problems and using algebra Use angle facts to demonstrate how shapes would 'fit together' and work out interior angles of shapes in a pattern</p>

	<p>Circle Theorems Use the facts that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference; the angle in a semicircle is a right angle angles in the same segment are equal opposite angles of a cyclic quadrilateral sum to 180° along with isosceles triangles (radius properties) to find and give reasons for missing angles on diagrams</p>
Indices and Surds	<p>Find the value of calculations using indices including positive, fractional and negative indices; Recall that $n^0 = 1$ and $n^{-1} = 1/n$ for positive integers Understand that the inverse operation of raising a positive number to a power n is raising the result of this operation to the power $1/n$ Understand and use fractional indices Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractional and negative powers, and powers of a power Solve problems using index laws Solve equations involving indices by changing the base, e.g. $16^x = 2^{12}$ Simplify and calculate with surds, including the four operations and the use of brackets Rationalise the denominator</p>
Sequences	<p>Continue a quadratic sequence and use the nth term to generate terms Find the nth term of quadratic sequences Distinguish between arithmetic and geometric sequences Use finite/infinite and ascending/descending to describe sequences Recognise and use simple geometric progressions (r^n where n is an integer, and r is a rational number > 0 or a surd) Continue geometric progression and find term to term rule, including negative, fraction and decimal terms Solve problems involving sequences from real life situations</p>
Plans and Elevations	<p>Understand and draw front and side elevations and plans of shapes made from simple solids; Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid</p>

Quadratic Equations and Graphs	<p>Set up and solve quadratic equations</p> <p>Solve quadratic equations by factorisation and sketch an appropriate graph</p> <p>Complete the square on a quadratic expression and use to solve a quadratic equation, including leaving answers in surd form</p> <p>Solve quadratic equations that need rearranging</p> <p>Solve quadratic equations by using the quadratic formula</p> <p>Identify roots, turning points and lines of symmetry of quadratic graphs</p> <p>Use roots, turning points and lines of symmetry to sketch a quadratic graph</p>
Growth and Decay	<p>Find the original amount given the final amount after a percentage increase or decrease (reverse percentages), including VAT</p> <p>Use calculators for reverse percentage calculations by doing an appropriate division</p> <p>Work out the multiplier for repeated proportional change as a single decimal number</p> <p>Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation</p> <p>Use trial and improvement to find an unknown power in proportional change problems</p>
Changing the Subject and Inverse Functions	<p>Change the subject of a formula, including cases where the subject occurs on both sides of the formula, or where a power of the subject appears</p> <p>Change the subject of a formula where all variables are in the denominators</p> <p>Know that $f^{-1}(x)$ refers to the inverse function</p> <p>Find the inverse of a linear function</p>

Proportion 1	<p>Understand and use compound measures and convert between metric speed measures, density measures and pressure measures</p> <p>Solve problems involving speed, density or pressure</p> <p>Work with multiple compound measures to find an average speed or density of a compound</p> <p>Calculate an unknown quantity from quantities that vary in direct or inverse proportion</p> <p>Identify direct proportion from a table of values, by comparing ratios of values, for x^2 and x^3 relationships</p> <p>Identify inverse proportion from a table of values, by looking for a constant product</p> <p>Write statements of proportionality for quantities directly proportional to the square, cube or other power of another quantity</p> <p>Use $y = kx$ to solve direct proportion problems, including two stage problems</p> <p>Use $y = k/x$ to solve inverse proportion problems</p> <p>Identify direct proportion from a graph</p> <p>Recognise when values are in direct or inverse proportion by reference to the graph form, and use a graph to find the value of k in $y = kx$</p> <p>Relate algebraic solutions to graphical representation of the equations</p> <p>Solve problems involving inverse proportion using graphs by plotting and reading values from graphs</p> <p>Set up and use equations to solve word and other problems involving direct or inverse proportion</p> <p>Solve problems involving inverse proportionality e.g. number of workers</p>
Linear Graphs and Inequalities	<p>Plot and draw graphs of straight lines in the form $ax + by = c$</p> <p>Identify and interpret gradient from an equation $ax + by = c$</p> <p>Find the equation of a straight line from a graph in the form $ax + by = c$</p> <p>Find the equation of the line through one point with a given gradient</p> <p>Find the equation of the line through two given points</p> <p>Interpret and analyse information presented in a range of linear graphs</p> <p>Use gradients to interpret how one variable changes in relation to another</p> <p>Understand that perpendicular lines have gradients that are negative reciprocals of each other</p> <p>Find the equation of a line perpendicular to a given line going through a given point</p> <p>Solve linear inequalities in two variables graphically</p> <p>Show the solution set of several inequalities in two variables on a graph</p> <p>Solve two linear inequalities in x, find the solution sets and compare them to see which value of x satisfies both</p> <p>solve linear inequalities in two variables algebraically</p> <p>Use the correct notation to show inclusive and exclusive inequalities</p>

<p>Right Angled Triangles in 2D and 3D</p>	<p>Recall and apply Pythagoras' Theorem Recall and apply trigonometric ratios to find missing lengths and angles Deduce whether Pythagoras' Theorem or trigonometry is an appropriate method to solve a problem Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90°; know the exact value of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60° Understand, recall and use trigonometric relationships and Pythagoras' Theorem to solve problems in 3D configurations Calculate the length of a diagonal of a cuboid Find the angle between a line and a plane</p>
<p>Solving Linear and Quadratic Simultaneous Equations</p>	<p>Find the exact solutions of two simultaneous equations in two unknowns Use elimination or substitution to solve simultaneous equations Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns: linear / linear, including where both need multiplying linear / quadratic linear / $x^2 + y^2 = r^2$ Set up and solve a pair of simultaneous equations in two variables for each of the above scenarios, including to represent a situation Interpret the solution in the context of the problem Understand that a point of intersection of two graphs represents a solution of a pair of simultaneous equations Solve simultaneous equations graphically, including two linear equations, one linear and one quadratic function (line and circle graphically follows later) Solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem Rearrange an equation to identify an appropriate straight line to draw to find a solution</p>
<p>Column Vectors</p>	<p>Understand and use column notation in relation to vectors Be able to represent information graphically given column vectors Identify two column vectors which are parallel Calculate using column vectors, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector</p>

<p>Transformations</p>	<p>Translate a shape given a column vector Understand the effect of one translation followed by another, in terms of column vectors Reflect a shape in a given mirror line Rotate a shape given a centre, an angle and a direction Enlarge a shape given a scale factor (positive, negative or fractional) and a centre Transform 2D shapes using combined rotations, reflections, translations, or enlargements Identify the equation of a line of symmetry Describe reflections on a coordinate grid Find the centre of rotation, angle and direction of rotation and use to describe rotations fully Use column vectors to describe and transform 2D shapes using single translations on a coordinate grid Find the centre of enlargement by drawing Describe enlargements by a positive integer, negative integer or fractional scale factor Describe 2D shapes using combined rotations, reflections, translations, or enlargements Understand that distances and angles are preserved under rotations and translations, so that any figure is congruent under either of these transformations Understand that distances and angles are preserved under reflections, so the image is congruent to the object Understand that an enlargement results in a similar shape Identify invariant points Describe the changes and invariance achieved by combinations of rotations, reflections and translations</p>
<p>Similarity</p>	<p>Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor Use formal geometric proof for the similarity of two given triangles Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of corresponding sides Write the lengths, areas and volumes of two shapes as ratios in their simplest form Find missing lengths, areas and volumes in similar 3D solids Know the relationships between linear, area and volume scale factors of similar shapes and solids Use the relationship between enlargement and areas and volumes of simple shapes and solids Understand the effect of enlargement on angles, perimeter, area and volume of shapes and solids Solve problems involving frustums of cones where you have to find missing lengths first using similar triangles</p>
<p>Recurring Decimals</p>	<p>Convert a fraction to a recurring decimal and vice versa</p>