



Dallam School

Curriculum Overview

Department: Mathematics - Higher
Year Group: 10 and 11

Autumn Term Y10

Theme/ topic:

Calculations, checking and rounding

Autumn Term Y10

Theme/ topic:

Indices, roots, reciprocals and hierarchy of operations

Autumn Term Y10

Theme/ topic:

Factors, multiples, primes, standard form and surds

Autumn Term Y10

Theme/ topic:

Algebra: the basics, setting up, rearranging and solving equations

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

- Add, subtract, multiply and divide decimals, whole numbers including any number between 0 and 1;
- Put digits in the correct place in a decimal calculation and use one calculation to find the answer to another;

Key Words

Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate,

- Use index notation for integer powers of 10, including negative powers;
- Find the value of calculations using indices including positive, fractional and negative indices;
- Recall that $n^0 = 1$ and $n^{-1} = \frac{1}{n}$ for positive integers n as well as, $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive number n ;

Key Words

Power, roots

- Identify factors, multiples and prime numbers;
- Find the prime factor decomposition of positive integers – write as a product using index notation;
- Find common factors and common multiples of two numbers;
- Convert large and small numbers into standard form and vice versa;

Key Words

Factor, multiple, primes, square, cube, even, odd, surd, rational, irrational standard form, simplify

- Use algebraic notation and symbols correctly;
- Know the difference between a term, expression, equation, formula and an identity;
- Write and manipulate an expression by collecting like terms;
- Know that squaring a linear expression is the same as expanding double brackets;

Key Words

Expression, identity, equation, formula, substitute, term, 'like' terms, index, power, negative and fractional indices, collect, substitute, expand, bracket, factor, factorise, quadratic, linear, simplify

They will understand (key concepts):

- Round numbers to the nearest 10, 100, 1000, the nearest integer, to a given number of decimal places and to a given number of significant figures;

- 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

- Understand that the prime factor decomposition of a positive integer is unique, whichever factor pair you start with, and that every number can be written as a product of prime factors;
- Understand surd notation

- Simplify expressions by cancelling
- Use instances of index laws, including use of zero, fractional and negative powers;
- Understand the \neq symbol (not equal), e.g. $6x + 4 \neq 3(x + 2)$, and introduce identity \equiv sign;

They will know how to (key skills including speaking, reading and writing in this subject):

<ul style="list-style-type: none"> • Use the product rule for counting • 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. 	<ul style="list-style-type: none"> • Solve problems using index laws; • Use brackets and the hierarchy of operations up to and including with powers and roots inside the brackets, or raising brackets to powers or taking roots of brackets; • Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations. 	<ul style="list-style-type: none"> • Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors – include finding LCM and HCF given the prime factorisation of two numbers; • Solve problems using HCF and LCM, and prime numbers; • Add, subtract, multiply and divide numbers in standard form; • Interpret a calculator display using standard form and know how to enter numbers in standard form; • Simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$). 	<ul style="list-style-type: none"> • Substitute numbers into expressions and formulae from mathematics and other subjects • Multiply a single term over a bracket and recognise factors of algebraic terms involving single brackets and simplify expressions by factorising, including subsequently collecting like terms; • Expand the product of two linear expressions • Factorise quadratic expressions of the form $ax^2 + bx + c$ and using the difference of two squares • Solve linear equations in one unknown, with integer or fractional coefficients; • Set up and solve linear equations to solve a problem; • Derive a formula and set up simple equations from word problems, then solve these equations, interpreting the solution in the context of the problem; • Change the subject of a formula, including cases where the subject is on both sides of the original formula, or involving fractions and small powers of the subject;
--	---	---	--

AUTUMN Half Term 2

<p>Autumn Term Y10</p> <p>Theme/ topic:</p> <p>Sequences</p>	<p>Spring Term Y11</p> <p>Theme/ topic:</p> <p>Averages and range</p>	<p>Spring Term Y11</p> <p>Theme/ topic:</p> <p>Representing and interpreting data and scatter graphs</p>	<p>Autumn Term Y10</p> <p>Theme/ topic:</p> <p>Fractions and percentages</p>
---	--	---	---

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

<ul style="list-style-type: none"> • Recognise simple sequences including, triangular, square and 	<ul style="list-style-type: none"> • Calculate mean and range, find median and mode from a small data set; 	<p>Key Words</p>	<ul style="list-style-type: none"> • Express a given number as a fraction of another;
--	---	-------------------------	--

<p>cube numbers and Fibonacci-type sequences</p> <ul style="list-style-type: none"> Describe in words a term-to-term sequence and identify which terms cannot be in a sequence <p>Key Words</p> <p>Arithmetic, geometric, function, sequence, nth term, derive</p>	<ul style="list-style-type: none"> Recognise the advantages and disadvantages between measures of average; <p>Key Words</p> <p>Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data,</p>	<p>Scatter graph, line of best fit, correlation, positive, negative, sample, population, stem and leaf, frequency, table, sort, pie chart, estimate</p>	<ul style="list-style-type: none"> Find equivalent fractions and compare the size of fractions; Write a fraction in its simplest form Find a fraction of a quantity or measurement, including within a context; Convert between mixed numbers and improper fractions; Add, subtract, multiply and divide fractions, including mixed numbers; Understand and use unit fractions as multiplicative inverses; <p>Key Words</p> <p>Addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, reciprocal, integer, decimal, termination, percentage, VAT, increase, decrease, multiplier, profit, loss</p>
--	---	---	--

They will understand (key concepts):

<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<ul style="list-style-type: none"> Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values. 	<ul style="list-style-type: none"> Understand that correlation does not imply causality 	<ul style="list-style-type: none"> Understand and use unit fractions as multiplicative inverses;
--	--	--	---

They will know how to (key skills including speaking, reading and writing in this subject):

<ul style="list-style-type: none"> Generate sequences of numbers, squared integers and sequences derived from diagrams; Generate specific terms in a sequence using the position-to-term rule and term-to-term rule; Find and use (to generate terms) the nth term of an arithmetic sequence; Use the nth term of an arithmetic sequence to decide if a given 	<ul style="list-style-type: none"> Use information provided to complete a two-way table; Sort, classify and tabulate data and discrete or continuous quantitative data; 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 	<ul style="list-style-type: none"> Produce and interpret composite, comparative and dual bar charts; Produce and interpret pie charts: Compare data from pie charts that represent different-sized samples; Produce and interpret frequency polygons for grouped data: 	<ul style="list-style-type: none"> Convert a fraction to a recurring decimal and vice versa; Find the reciprocal of an integer, decimal or fraction; Convert between fractions, decimals and percentages; Express a given number as a percentage of another number; Express one quantity as a percentage of another where the percentage is greater than 100%
---	--	--	--

<p>number is a term in the sequence, or find the first term above or below a given number;</p> <ul style="list-style-type: none"> • Identify which terms cannot be in a sequence by finding the nth term; • Continue a quadratic sequence and use the nth term to generate terms; • Find the nth term of quadratic sequences; • Recognise and use simple geometric progressions (rn 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; 	<p>from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams (mode, median, range);</p> <ul style="list-style-type: none"> • Calculate the mean, mode, median and range from a frequency table (discrete data); • Construct and interpret grouped frequency tables for continuous data: • for grouped data, find the interval which contains the median and the modal class; • estimate the mean with grouped data; • 	<ul style="list-style-type: none"> • Produce frequency diagrams for grouped discrete data: • Read off frequency values, calculate total population, find greatest and least values; • Produce histograms with equal class intervals: • estimate the median from a histogram with equal class width or any other information, such as the number of people in a given interval; • Produce line graphs: • read off frequency values, calculate total population, find greatest and least values; • Construct and interpret time-series graphs, comment on trends; • Compare the mean and range of two distributions, or median or mode as appropriate; • Draw and interpret scatter graphs in terms of the relationship between two variables; • Draw lines of best fit by eye and use to predict values of a variable given values of the other variable; • Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem; • Explain an isolated point on a scatter graph; • Use the line of best fit make predictions; interpolate and extrapolate apparent trends 	<ul style="list-style-type: none"> • Find a percentage of a quantity; • Find the new amount after a percentage increase or decrease; • Work out a percentage increase or decrease, including: simple interest, income tax calculations, value of profit or loss, percentage profit or loss; • Compare two quantities using percentages • Find a percentage of a quantity using a multiplier and use a multiplier to increase or decrease by a percentage in any scenario where percentages are used; • Find the original amount given the final amount after a percentage increase or decrease (reverse percentages), including VAT; • Use calculators for reverse percentage calculations by doing an appropriate division;
---	---	--	---

		whilst knowing the dangers of so doing.	
--	--	--	--

Spring Term Y11	Spring Term Y10	Autumn Term Y11
<p>Theme/ topic:</p> <p>Ratio and proportion</p>	<p>Theme/ topic:</p> <p>Polygons, angles and parallel lines</p>	<p>Theme/ topic:</p> <p>Pythagoras' theorem and trigonometry</p>
<p>By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):</p>		
<ul style="list-style-type: none"> • Express the division of a quantity into a number parts as a ratio; • Write ratios in form 1 : m or m : 1 and to describe a situation; • Identify direct proportion from a table of values, by comparing ratios of values; <p>Key Words</p> <p>Ratio, proportion, share, parts</p>	<ul style="list-style-type: none"> • Classify quadrilaterals by their geometric properties and distinguish between scalene, isosceles and equilateral triangles; • Understand 'regular' and 'irregular' as applied to polygons; • Explain why the angle sum of a quadrilateral is 360°; use the angle properties of quadrilaterals and the fact that the angle sum of a quadrilateral is 360°; • 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°; <p>Key Words</p> <p>Quadrilateral, angle, polygon, interior, exterior, proof, tessellation, symmetry, parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, segment, length</p>	<ul style="list-style-type: none"> • Understand, recall and use Pythagoras' Theorem in 2D; • 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°. <p>Key Words</p> <p>Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, segment, length</p>
<p>They will understand (key concepts):</p>		
<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<ul style="list-style-type: none"> • Understand the proof that the angle sum of a triangle is 180°, and derive and use the sum of angles in a triangle; • Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding and alternate angles, giving reasons; 	<ul style="list-style-type: none"> • Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures;

They will know how to (key skills including speaking, reading and writing in this subject):

<ul style="list-style-type: none"> • Write ratios in their simplest form, including three-part ratios; • Divide a given quantity into two or more parts in a given part : part or part : whole ratio; • Use a ratio to find one quantity when the other is known; • Write a ratio as a fraction and as a linear function; • Use a ratio to compare a scale model to real-life object; • Use a ratio to convert between measures and currencies, e.g. £1.00 = €1.36; • Scale up recipes; • Convert between currencies. 	<ul style="list-style-type: none"> • Use symmetry property of an isosceles triangle to show that base angles are equal; • Find missing angles in a triangle using the angle sum in a triangle AND the properties of an isosceles triangle; • Calculate and use the sums of the interior angles of polygons; use the sum of angles in a triangle and use the angle sum in any polygon to derive the properties of regular polygons; • 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 	<ul style="list-style-type: none"> • Given three sides of a triangle, justify if it is right-angled or not; • Give an answer to the use of Pythagoras' Theorem in surd form; • Calculate the length of the hypotenuse in a right-angled triangle (including decimal lengths and a range of units); • Find the length of a shorter side in a right-angled triangle; • Calculate the length of a line segment AB given pairs of points; • Use the trigonometric ratios to solve 2D problems; • Find angles of elevation and depression;
---	---	--

<p>Summer Term Y10</p> <p>Theme/ topic:</p> <p>Graphs: the basics and real-life graphs</p>	<p>Summer Term Y10</p> <p>Theme/ topic:</p> <p>Linear graphs and coordinate geometry</p>	<p>Summer Term Y10</p> <p>Theme/ topic:</p> <p>Quadratic, cubic and other graphs</p>
<p>By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):</p>		
<ul style="list-style-type: none"> • Identify and plot points in all four quadrants; <p>Key Words</p> <p>Coordinate, axes, 3D, graph, speed, distance, time, velocity,</p>	<ul style="list-style-type: none"> • Plot and draw graphs of $y = a$, $x = a$, $y = x$ and $y = -x$, drawing and recognising lines parallel to axes, plus $y = x$ and $y = -x$; • Identify and interpret the gradient of a line segment; • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane; 	<ul style="list-style-type: none"> • Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape; • Generate points and plot graphs of simple quadratic functions, then more general quadratic functions; <p>Key Words</p> <p>Circle, cubic, quadratic</p>

	<ul style="list-style-type: none"> Identify and interpret the gradient and y-intercept of a linear graph given by equations of the form $y = mx + c$; <p>Key Words</p> <p>Solution, root, function, linear, approximate, gradient, perpendicular, parallel, equation</p>	
--	---	--

They will understand (key concepts):

<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>
---	---	---

They will know how to (key skills including speaking, reading and writing in this subject):

<ul style="list-style-type: none"> Draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item; Draw distance–time and velocity–time graphs; Use graphs to calculate various measures (of individual sections), including: unit price (gradient), average speed, distance, time, acceleration; including using enclosed areas by counting squares or using areas of trapezia, rectangles and triangles; Find the coordinates of the midpoint of a line segment with a diagram given and coordinates; Find the coordinates of the midpoint of a line segment from coordinates; Calculate the length of a line segment given the coordinates of the end points; Find the coordinates of points identified by geometrical information. Find the equation of the line through two given points. 	<ul style="list-style-type: none"> Find the equation of a straight line from a graph in the form $y = mx + c$; Plot and draw graphs of straight lines of the form $y = mx + c$ with and without a table of values; Sketch a graph of a linear function, using the gradient and y-intercept (i.e. without a table of values); Find the equation of the line through one point with a given gradient; Identify and interpret gradient from an equation $ax + by = c$; Find the equation of a straight line from a graph in the form $ax + by = c$; Plot and draw graphs of straight lines in the form $ax + by = c$; Interpret and analyse information presented in a range of linear graphs: <ul style="list-style-type: none"> use gradients to interpret how one variable changes in relation to another; find approximate solutions to a linear equation from a graph; Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line; 	<ul style="list-style-type: none"> Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function; Draw graphs of simple cubic functions using tables of values; Interpret graphs of simple cubic functions, including finding solutions to cubic equations; Draw graphs of the reciprocal function $\frac{a}{x}$ with $x \neq 0$ using tables of values; Draw circles, centre the origin, equation $x^2 + y^2 = r^2$.
--	---	---

- Select and use the fact that when $y = mx + c$ is the equation of a straight line, then the gradient of a line parallel to it will have a gradient of m and a line perpendicular to this line will have a gradient of $\frac{1}{m}$.

Spring Term Y10	Spring Term Y10	Autumn Term Y10	Spring Term Y11
Theme/ topic: Perimeter, area and circles	Theme/ topic: 3D forms and volume, cylinders, cones and spheres	Theme/ topic: Accuracy and bounds	Theme/ topic: Solving quadratic and simultaneous equations

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

<ul style="list-style-type: none"> • Recall and use the formulae for the area of a triangle, rectangle, trapezium and parallelogram using a variety of metric measures; • Recall the definition of a circle and name and draw parts of a circle; • Recall and use formulae for the circumference of a circle and the area enclosed by a circle (using circumference = $2\pi r = \pi d$ and area of a circle = πr^2) using a variety of metric measures; • Use $\pi \approx 3.142$ or use the π button on a calculator; • Give answers to an appropriate degree of accuracy or in terms of π; <p>Key Words</p> <p>Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, compound, measurement, polygon, circle, segment, arc, sector, circumference, radius, diameter, pi,</p>	<ul style="list-style-type: none"> • Recall and use the formula for the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures; • Recall and use the formula for volume of pyramid; • Use the formulae for volume and surface area of spheres and cones; • Give answers to an appropriate degree of accuracy or in terms of π; <p>Key Words</p> <p>Prism, cuboid, volume, nets, isometric, symmetry, vertices, edge, face, cylinder, composite, sphere, cone, capacity, hemisphere, frustum, surface area</p>	<ul style="list-style-type: none"> • 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. <p>Key Words</p> <p>Bounds, accuracy,</p>	<p>Key Words</p> <p>Quadratic, solution, root, linear, solve, simultaneous, inequality, completing the square, factorise, rearrange, surd, function, solve, circle, sets, union, intersection</p>
---	---	---	--

They will understand (key concepts):

The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.	The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.	The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.	The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.
They will know how to (key skills including speaking, reading and writing in this subject):			
<ul style="list-style-type: none"> • Calculate the area of compound shapes made from triangles, rectangles, trapezia and parallelograms using a variety of metric measures; • Find the perimeter of a rectangle, trapezium and parallelogram using a variety of metric measures; • Calculate the perimeter of compound shapes made from triangles and rectangles; • Estimate area and perimeter by rounding measurements to 1 significant figure to check reasonableness of answers; • Calculate perimeters and areas of composite shapes made from circles and parts of circles (including semicircles, quarter-circles, combinations of these and also incorporating other polygons); • Calculate arc lengths, angles and areas of sectors of circles; • Find radius or diameter, given area or circumference of circles in a variety of metric measures; • Form equations involving more complex shapes and solve these equations. 	<ul style="list-style-type: none"> • Find the surface area of prisms using the formulae for triangles and rectangles, and other (simple) shapes with and without a diagram; • Draw sketches of 3D solids and identify planes of symmetry of 3D solids, and sketch planes of symmetry; • Convert between metric measures of volume and capacity, e.g. 1 ml = 1 cm³; • Find the volume and surface area of a cylinder; • Find the surface area of a pyramid; • Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones; • Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders; • Form equations involving more complex shapes and solve these equations. 	<ul style="list-style-type: none"> • 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; 	<ul style="list-style-type: none"> • Factorise quadratic expressions in the form $ax^2 + bx + c$ • Set up and solve quadratic equations; • Solve quadratic equations by factorisation and completing the square; • Solve quadratic equations that need rearranging; • Solve quadratic equations by using the quadratic formula; • Find the exact solutions of two simultaneous equations in two unknowns; • Use elimination or substitution to solve simultaneous equations; • Set up and solve a pair of linear simultaneous equations in two variables, including to represent a situation; • Interpret the solution in the context of the problem;

Autumn Term Y10	Summer Term Y10	Spring Term Y11
-----------------	-----------------	-----------------

Theme/ topic: Inequalities	Theme/ topic: Transformations	Theme/ topic: Constructions, loci and bearings
By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):		
<ul style="list-style-type: none"> Show inequalities on number lines; Write down whole number values that satisfy an inequality; Use the correct notation to show inclusive and exclusive inequalities. <p>Key Words</p> <p>Linear, solve, inequality, rearrange</p>	<ul style="list-style-type: none"> Distinguish properties that are preserved under particular transformations; Recognise and describe rotations – know that that they are specified by a centre and an angle; Recognise and describe reflections on a coordinate grid – know to include the mirror line as a simple algebraic equation, $x = a$, $y = a$, $y = x$, $y = -x$ and lines not parallel to the axes; Recognise and describe single translations using column vectors on a coordinate grid; Know that an enlargement on a grid is specified by a centre and a scale factor; <p>Key Words</p> <p>Rotation, reflection, translation, transformation, enlargement, scale factor, vector, centre, angle, direction, mirror line, centre of enlargement, describe, distance, congruence, similar, combinations, single, corresponding,</p>	<ul style="list-style-type: none"> Know that the perpendicular distance from a point to a line is the shortest distance to the line. <p>Key Words</p> <p>Constructions, compasses, protractor, bisector, bisect, line segment, perpendicular, loci, bearing</p>
They will understand (key concepts):		
<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<ul style="list-style-type: none"> Understand and draw front and side elevations and plans of shapes made from simple solids; Understand, draw and measure bearings;
They will know how to (key skills including speaking, reading and writing in this subject):		
<ul style="list-style-type: none"> Solve simple linear inequalities in one variable, and represent the solution set on a number line; Solve two linear inequalities in x, find the solution sets and compare them to see 	<ul style="list-style-type: none"> Rotate 2D shapes using the origin or any other point (not necessarily on a coordinate grid); Reflect 2D shapes using specified mirror lines including lines parallel to the axes and also Identify the equation of a line of symmetry; 	<ul style="list-style-type: none"> Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid; Use and interpret maps and scale drawings, using a variety of scales and units; Read and construct scale drawings, drawing lines and shapes to scale;

<p>which value of x satisfies both solve linear inequalities in two variables algebraically;</p>	<ul style="list-style-type: none"> • Enlarge a shape on a grid without a centre specified; • Describe and transform 2D shapes using enlargements by a positive integer, positive fractional, and negative scale factor; • Translate a given shape by a vector; • Identify the scale factor of an enlargement of a shape; • Enlarge a given shape using a given centre as the centre of enlargement by counting distances from centre, and find the centre of enlargement by drawing; • Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements; • Describe the changes and invariance achieved by combinations of rotations, reflections and translations. 	<ul style="list-style-type: none"> • Estimate lengths using a scale diagram; • Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings • Use the standard ruler and compass constructions: • bisect a given angle; • construct a perpendicular to a given line from/at a given point; • construct angles of 90°, 45°; • perpendicular bisector of a line segment; • Construct: • a region bounded by a circle and an intersecting line; • a given distance from a point and a given distance from a line; • equal distances from two points or two line segments; • regions which may be defined by 'nearer to' or 'greater than'; • Find and describe regions satisfying a combination of loci, including in 3D; • Use constructions to solve loci problems including with bearings;
--	---	--

<p>Spring Term Y11</p> <p>Theme/ topic:</p> <p>Probability</p>	<p>Spring Term Y11</p> <p>Theme/ topic:</p> <p>Multiplicative Reasoning</p>	<p>Spring Term Y10</p> <p>Theme/ topic:</p> <p>Similarity and congruence in 2D and 3D</p>	<p>Spring Term Y11</p> <p>Theme/ topic:</p> <p>Graphs and trigonometric functions</p>
--	---	---	---

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

- Write probabilities using fractions, percentages or decimals;
- Understand selection with or without replacement;
- List all outcomes for single events, and combined events, systematically;
- Know that the sum of the probabilities of all outcomes is 1;

Key Words

Probability, mutually exclusive, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, Venn diagram, fairness, experimental

- Express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when A:B are in the ratio 3:5, A is $\frac{3}{5}$ B. When $4a = 7b$, then $a = \frac{7}{4}b$ or a:b is 7:4;
- Use kinematics formulae from the formulae sheet to calculate speed, acceleration, etc (with variables defined in the question)

Key Words

Ratio, proportion, best value, unitary, proportional change, compound measure, density, mass, volume, speed, distance, time, density, mass, volume, pressure, acceleration, velocity, inverse, direct, constant of proportionality

- Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of two corresponding sides, using integer or fraction scale factors;
- Write the lengths, areas and volumes of two shapes as ratios in their simplest form;
- Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids;

Key Words

Congruence, side, angle, compass, construction, shape, volume, length, area, volume, scale factor, enlargement, similar, perimeter, frustum

- Recognise, sketch and interpret graphs of the trigonometric functions (in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size.
- Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° and exact value of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60° and find them from graphs.

Key Words

Axes, coordinates, sine, cosine, tan, angle, graph, transformations,

They will understand (key concepts):

- Understand and use experimental and theoretical measures of probability

- Understand and use compound measures to convert between metric speed measures; density measures and pressure measures;

- Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and pair of compasses constructions;
- Understand similarity of triangles and of other plane shapes, and use this to make geometric inferences;
- Understand the effect of enlargement on angles,

		perimeter, area and volume of shapes and solids;	
They will know how to (key skills including speaking, reading and writing in this subject):			
<ul style="list-style-type: none"> • Estimate the number of times an event will occur, given the probability and the number of trials; • Find the probability of successive events, such as several throws of a single dice; • Draw sample space diagrams and use them for adding simple probabilities; • Use $1 - p$ as the probability of an event not occurring where p is the probability of the event occurring; • Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values; • Use union and intersection notation; • Find a missing probability from a list or two-way table, including algebraic terms; • Understand conditional probabilities and decide if two events are independent; • Draw a probability tree diagram based on given information, and use this to find probability and expected number of outcome; • Calculate the probability of independent and dependent combined events; • Use a two-way table, tree diagram or Venn diagram, to calculate conditional probability; • Compare experimental data and theoretical probabilities; 	<ul style="list-style-type: none"> • Solve proportion problems using the unitary method; • Work out which product offers best value and consider rates of pay; • Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation; • Calculate an unknown quantity from quantities that vary in direct or inverse proportion; • Recognise when values are in direct proportion by reference to the graph form, and use a graph to find the value of k in $y = kx$; • Relate algebraic solutions to graphical representation of the equations; • Recognise when values are in inverse proportion by reference to the graph form; • Set up and use equations to solve word and other problems involving inverse proportion, and relate algebraic solutions to graphical representation of the equations. 	<ul style="list-style-type: none"> • Solve angle problems by first proving congruence; • 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; • Find missing lengths, areas and volumes in similar 3D solids; • Use the relationship between enlargement and areas and volumes of simple shapes and solids; • Solve problems involving frustums of cones where you have to find missing lengths first using similar triangles. 	<ul style="list-style-type: none"> • Apply to the graph of $y = f(x)$ the transformations $y = -f(x)$, $y = f(-x)$ for sine, cosine and tan functions $f(x)$. • Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(x + a)$ for sine, cosine and tan functions $f(x)$.

<ul style="list-style-type: none"> Compare relative frequencies from samples of different sizes. 			
---	--	--	--

Autumn Term Y11 Theme/ topic: Further trigonometry	Spring Term Y11 Theme/ topic: Collecting data	Spring Term Y11 Theme/ topic: Cumulative frequency, box plots and histograms	Summer Term Y10 Theme/ topic: Quadratics, expanding more than two brackets, sketching graphs, graphs of circles, cubes and quadratics
---	--	---	--

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

<ul style="list-style-type: none"> Know and apply $\text{Area} = ab \sin C$ to calculate the area, sides or angles of any triangle. Know the sine and cosine rules, and use to solve 2D problems (including involving bearings). Key Words Side, angle, inverse, square root, 2D, 3D, diagonal, plane, cuboid	Key Words Sample, population, fraction, decimal, percentage, bias, stratified sample, random, cumulative frequency, box plot, histogram, frequency density, frequency, mean, median, mode, range, lower quartile, upper quartile, interquartile range, spread, comparison, outlier	<ul style="list-style-type: none"> Know the appropriate uses of cumulative frequency diagrams; Know the appropriate uses of histograms; 	Key Words Sketch, estimate, quadratic, cubic, function, factorising, simultaneous equation, graphical, algebraic
---	--	---	--

They will understand (key concepts):

<ul style="list-style-type: none"> Understand the language of planes, and recognise the diagonals of a cuboid. Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations. 	<ul style="list-style-type: none"> Specify the problem and plan: decide what data to collect and what analysis is needed; understand primary and secondary data sources; consider fairness; Understand what is meant by a sample and a population; Understand how different sample sizes may affect the 	The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.	The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.
--	--	---	---

	reliability of conclusions drawn;		
They will know how to (key skills including speaking, reading and writing in this subject):			
<ul style="list-style-type: none"> • Use the sine and cosine rules to solve 3D problems. • Solve geometrical problems on coordinate axes. • Calculate the length of a diagonal of a cuboid. • Find the angle between a line and a plane. 	<ul style="list-style-type: none"> • Identify possible sources of bias and plan to minimise it; • Write questions to eliminate bias, and understand how the timing and location of a survey can ensure a sample is representative 	<ul style="list-style-type: none"> • Construct and interpret cumulative frequency tables, cumulative frequency graphs/diagrams and from the graph: estimate frequency greater/less than a given value; find the median and quartile values and interquartile range • Compare the mean and range of two distributions, or median and interquartile range, as appropriate; • Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions; • Produce box plots from raw data and when given quartiles, median and identify any outliers; • Construct and interpret histograms from class intervals with unequal width; • Use and understand frequency density; • From histograms: • complete a grouped frequency table; • understand and define frequency density; • Estimate the mean and median from a histogram with unequal class widths or any other information from a histogram, such as the 	<ul style="list-style-type: none"> • Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots, y-intercept and turning point by completing the square; • Be able to identify from a graph if a quadratic equation has any real roots; • Find approximate solutions to quadratic equations using a graph; • Sketch a graph of a quadratic function and a linear function, identifying intersection points; • Solve simultaneous equations graphically: • find graphically the intersection points of a given straight line with a circle; • solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem; • Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values; • Represent the solution set for inequalities using set notation, i.e. curly brackets and 'is an element of' notation; • for problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets • Solve linear inequalities in two variables graphically; • Use iteration with simple converging sequences.

		number of people in a given interval.	
--	--	---------------------------------------	--

Spring Term Y10	Summer Term Y10	Autumn Term Y10
Theme/ topic: Circle theorems	Theme/ topic: Circle geometry	Changing the subject of formulae (more complex), algebraic fractions, solving equations arising from algebraic fractions, rationalising surds, proof

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

<ul style="list-style-type: none"> Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment; Prove and 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; the perpendicular from the centre of a circle to a chord bisects the chord; angles in the same segment are equal; alternate segment theorem; opposite angles of a cyclic quadrilateral sum to 180°; Find and give reasons for missing angles on diagrams using: circle theorems; isosceles triangles (radius properties) in circles; the fact that the angle between a tangent and radius is 90°; the fact that tangents from an external point are equal in length. 	<ul style="list-style-type: none"> Recognise and construct the graph of a circle using $x^2 + y^2 = r^2$ for radius r centred at the origin of coordinates. <p>Key Words</p> <p>Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem</p>	<ul style="list-style-type: none"> Use function notation; Know that $f^{-1}(x)$ refers to the inverse function; <p>Key Words</p> <p>Rationalise, denominator, surd, rational, irrational, fraction, equation, rearrange, subject, proof, function notation, inverse, evaluate</p>
---	---	---

They will understand (key concepts):

<ul style="list-style-type: none"> Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point; 	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>
---	--	--

They will know how to (key skills including speaking, reading and writing in this subject):

<ul style="list-style-type: none"> Break problems down by applying the circle theorems to challenging angle questions within circles and compound circle shapes. 	<ul style="list-style-type: none"> Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines; Find the equation of a tangent to a circle at a given point 	<ul style="list-style-type: none"> Rationalise the denominator involving surds; Simplify algebraic fractions; Multiply and divide algebraic fractions; Solve quadratic equations arising from algebraic fraction equations; 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; Solve 'Show that' and proof questions using consecutive integers (n, n + 1), squares a^2, b^2, even numbers $2n$, odd numbers $2n + 1$; Find $f(x) + g(x)$ and $f(x) - g(x)$, $2f(x)$, $f(3x)$ etc algebraically; Find the inverse of a linear function; For two functions $f(x)$ and $g(x)$, find $gf(x)$.
---	--	--

Autumn Term Y11

Theme/ topic:

Vectors and geometric proof

Summer Term Y10

Theme/ topic:

Reciprocal and exponential graphs; gradient and area under graphs

Autumn Term Y11

Theme/ topic:

Direct and inverse proportion

By the end of this half term pupils will know (key knowledge, including tier 3 vocabulary):

<ul style="list-style-type: none"> Represent vectors, combinations of vectors and scalar multiples in the plane pictorially. <p>Key Words</p> <p>Vector, direction, magnitude, scalar, multiple, parallel, collinear, proof, ratio, column</p>	<ul style="list-style-type: none"> Recognise, sketch and interpret graphs of the reciprocal function $\frac{a}{x}$ with $x \neq 0$ State the value of x for which the equation is not defined; Recognise, sketch and interpret graphs of exponential functions $y = k^x$ for positive values of k and integer values of x; <p>Key Words</p> <p>Reciprocal, linear, gradient, quadratic, exponential, functions, estimate, area, transformations, rate of change, distance, time, velocity</p>	<ul style="list-style-type: none"> Recognise and interpret graphs showing direct and inverse proportion; <p>Key Words</p> <p>Direct, indirect, proportion, constant of proportionality</p>
--	---	--

They will understand (key concepts):		
<ul style="list-style-type: none"> Understand and use vector notation, including column notation, and understand and interpret vectors as displacement in the plane with an associated direction. Understand that $2a$ is parallel to a and twice its length, and that a is parallel to $-a$ in the opposite direction. 	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>	<p>The majority of new mathematical content in this unit is procedural so falls in to the "they will they know how to" section.</p>
They will know how to (key skills including speaking, reading and writing in this subject):		
<ul style="list-style-type: none"> Calculate the sum of two vectors, the difference of two vectors and a scalar multiple of a vector using column vectors (including algebraic terms). Find the length of a vector using Pythagoras' Theorem. Calculate the resultant of two vectors. Solve geometric problems in 2D where vectors are divided in a given ratio. Produce geometrical proofs to prove points are collinear and vectors/lines are parallel. 	<ul style="list-style-type: none"> Use calculators to explore exponential growth and decay; Set up, solve and interpret the answers in growth and decay problems; Interpret and analyse transformations of graphs of functions and write the functions algebraically, e.g. write the equation of $f(x) + a$, or $f(x - a)$; apply to the graph of $y = f(x)$ the transformations $y = -f(x)$, $y = f(-x)$, $y = f(x) + a$, $y = f(x + a)$ for linear, quadratic, cubic functions; Estimate area under a quadratic or other graph by dividing it into trapezia; Interpret the gradient of linear or non-linear graphs, and estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient; Interpret the gradient of non-linear graph in curved distance–time and velocity–time graphs: <ul style="list-style-type: none"> for a non-linear distance–time graph, estimate the speed at one point in time, from the tangent, and the average speed over several seconds by finding the gradient of the chord; for a non-linear velocity–time graph, estimate the acceleration at one point in time, from the 	<ul style="list-style-type: none"> Identify direct proportion from a table of values, by comparing ratios of values, for x squared and x cubed relationships; Write statements of proportionality for quantities proportional to the square, cube or other power of another quantity; Set up and use equations to solve word and other problems involving direct and inverse proportion; Use $y = kx$ to solve direct proportion problems, including questions where students find k, and then use k to find another value; Solve problems involving inverse proportion using graphs by plotting and reading values from graphs;

tangent, and the average acceleration over several seconds by finding the gradient of the chord;

- Interpret the gradient of a linear or non-linear graph in financial contexts;
- Interpret the area under a linear or non-linear graph in real-life contexts;
- Interpret the rate of change of graphs of containers filling and emptying;
- Interpret the rate of change of unit price in price graphs.