FLIGHTPATH   MATHS

	Year 11 — 1	Year 11 — 2	Year 11 — 3	Year 11 — 4	Year 11 — 5	Year 11 — 6	Year 11 — 7	Year 11 — 8
Number	Round decimals to whole numbers and decimal places; Multiply and divide decimals by 10, 100, 1000; Multiply and divide whole numbers; + and - decimals with up to two places; Extend written methods to e.g. 36 × 27; Know and use the simple order of operations; Recognise and use factors, multiples and prime numbers; Find the factor pairs for any whole number and identify common multiples; Recall known facts for fraction to decimal conversions; Convert terminating decimals to fractions, e.g. 0.23 = 23/100; Compare decimals in different contexts; Calculate simple percentages; Know square numbers up to 10 × 10; Find roots of square numbers up to 100; Approximate before carrying out an addition or subtraction	Round numbers to decimals; Use symbols =, ≠, <, >; Multiply and divide 3 digit by 2 digit numbers; Use 4 rules with positive integers; Use +, - with negative integers; Multiply decimals by a whole number; + and - decimals with up to two decimal places; Begin to + and - simple fractions and those with simple common denominators; Simplify fractions; Calculate simple fractions of an amount; Extend strategies to find any percentage, e.g. finding 10%, 5%, 1% and 2.5%; Order fractions, decimals and percentages; Use order of operations, including brackets and powers; Find factors, multiples, primes and identify common factors and multiples; Make estimates and approximations of calculations; Use a calculator for simple calculations e.g. (1.4 + 2.8)/(10 − 3)	Multiply and divide decimals by whole numbers; Be able to x and ÷ any number by 0.1 and 0.01; Multiply and divide negative numbers; Add and subtract simple fractions with different denominators including mixed numbers; Multiply a fraction by an integer; Estimate answers to calculations involving 2 or more operations and BIDMAS; Find factors, multiples and primes and find the of HCF and LCM of two or more numbers; Use division to convert a fraction to a decimal; Convert any terminating decimal to a fraction; Calculate fractions of quantities and measurements; Use the equivalence of fractions, decimals and percentages to compare proportions (i.e. compare a fraction and a percentage); Extend mental calculations to squares, square roots and cubes, cube roots; Find roots of non-square numbers using square root key and estimate square roots of non-square numbers less than 100	Multiply and divide two decimals; Divide an integer by a fraction; Add, subtract, multiply and divide fractions (proper and improper) and all FDP conversions; Order fractions by converting them to decimals or otherwise; Be able to use 4 operations on directed integers; Write numbers as product of primes; Recognise and use relationships between operations, including inverse operations; Calculate average speed, distance, time; Recall the squares of numbers up to 12 x 12; Simplify expressions containing powers; Establish index laws for positive powers for × and ÷; Use an extended range of calculator functions	Find the reciprocal of simple numbers and fractions; Start to use standard form; Start to work with simple surds; Use BIDMAS including powers and brackets as part of a fraction; Round to an appropriate degree of accuracy (d p or sig fig); Find the prime factors of a number in index form; Find HCF and LCM using Prime Factors; Add and subtract fractions including mixed numbers; Use the square, cube and power keys on a calculator; Estimate answers to calculations by rounding numbers to 1 s.f.	Multiply and divide simple fractions (mixed) - positive and negative; Convert recurring decimals to fractions and have an understanding of the proof; Calculate with roots (surds - exact values); Start to develop an understanding of lower and upper bounds; Convert between large and small numbers into standard form and vice-versa; Order numbers written in standard index form; Add subtract multiply and divide numbers in standard form; Confidently recall the laws of indices to multiply and divide numbers written in index notation, including negative power answers and understand that these answers are smaller than 1	4 rules for numbers in standard form; Understand a recurring decimal to fraction proof; Find the value of calculations using indices including fractional and negative indices; 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; Simplify surd expressions involving squares (e.g. √12 =√ (4 x 3) = 2 √3); Use fractions, surds and pi in exact calculations, without a calculator	Calculate the upper and lower bounds of 2-D measurements and compound measures e.g. area and density; Write (3 - √3)2 in the form a + b√3; Rationalise a denominator
Algebra	Collect simple like terms; Substitute positive integers into simple expressions; Find the inputs and outputs of function machines; Begin to construct expressions expressed in words; Form simple expressions from worded descriptions, using addition and subtraction e.g. add 7 to a number (answer n+7); Solve simple one-step equations; Plot co-ordinates in all four quadrants; Use function machines to generate coordinates; Start to use simple notation and symbols correctly; Describe and generate sequences given in words (e.g. add 3, multiply by 6, subtract 4); Generate and describe simple integer sequences – square and triangle numbers	Multiply together two simple algebraic expressions; Simplify algebraic expressions by collecting like terms; Start to solve simple two-step equations; Form expressions from worded descriptions; Begin to multiply a single term over a bracket; Substitute integers into algebra equations and formulae; Find outputs of more complex functions and inputs using inverse operations; Read and identify x and y coordinates in all four quadrants; Draw label and scale axes; Plot and draw graphs of y = a, x = a, y = x and y = -x; Draw straight-line graphs for real-life situations, read values from the real life graphs	Solve two-step linear equations; Form expressions using all 4 operations; Start to construct equations by linking expressions to given information; Substitute positive and negative integers into simple formulae; Draw and use graphs to solve distance-time problems.; Find the coordinates of points identified by geometrical information in 2D (all four quadrants) for simple shapes e.g. squares and rectangles; Plot and draw graphs of straight lines using a table of values in the first quadrant; Draw and recognise simple graphs for axes, plus y = x and y = -x; Generate terms of a linear sequence; Begin to use linear expressions to describe the nth term of a simple sequence; Draw the next term in a pattern sequence; Recognise simple sequences including triangular, square, cube and Fibonacci-type sequences	Solve equations with brackets and fractions where the unknown appears on either side or on both sides of the equation.; Expand and simplify brackets; Simplify simple algebraic fractions; Construct and solve simple equations; Substitute positive and negative integers into expressions involving powers; Substitute integers into more complex formulae including squares and cubes; Begin to consider the features of graphs of simple linear functions (intercepts and gradients); Use gradients to interpret how one variable changes in relation to another; Interpret distance-time graphs and velocity-time graphs; Calculate the nth term of a linear sequence; Find the coordinates of the midpoint of a line from a given graph; Plot the graphs of simple linear functions in the form y = mx + c in four quadrants; Recognise that equations of the form y = mx + c correspond to straight line graphs; Begin to use formal algebra to describe the nth term in an arithmetic sequence.; Find a specific term in the sequence	Solve equations which include brackets, negatives, fractions and those with a negative solution; + and – simple algebraic fractions; Derive a simple formula; Expand and simplify brackets; Simplify simple algebraic fractions; Solve simple simple equations; Substitute integers into more complex formulae including squares and powers; Expand and simplify more complex brackets; Factorise an expression with more than 1 factor; Rearrange simple equations; Plot the graphs of linear functions; Find the gradient of a line and identify parallel lines from their equations; Draw and recognise a quadratic graph; Calculate the midpoint of a line segment; Argue mathematically that algebraic expressions are equivalent e.g. 2x(x + 3) - 4(3x - x2) = 6x(x - 1); Find and use the nth term of an arithmetic sequence; Simplify simple expressions involving index notation; Change the subject of a formula in one and two step	Confidently solve linear equations which involve brackets, negatives, fractions and those with a negative solution; Simplify change the subject of a formula where the subject is on both sides; Solve quadratic equations algebraically by factorising; Solve the equations of parallel and perpendicular lines given two co-ordinates; Solve quadratic equations by completing the square, deduce the turning point and sketch the corresponding graph.; Expand double brackets (ax ± b)(cx ± d); Plot linear & quadratic graphs from a table of values; Identify the gradient from an equation and write down the equation of a line parallel to it; Find the equation of a straight-line from its graph; Identify the line of symmetry of a quadratic graph and interpret roots, intercepts and turning points.; Have knowledge of cubic, exponential and reciprocal graphs; Interpret distance-time graphs and calculate the speed of individual sections, total distance and total time; Interpret gradient as rate of change in real life graphs; Solve inequalities and represent the solution on a number line; Find the nth term and generate arithmetic sequences of numbers and identify which term cannot be in a sequence; Deduce the nth term for triangular numbers and generate terms in the sequence; Recognise and find the nth term of quadratic sequences; Solve by elimination simultaneous equations, including where one or both need multiplying; Solve simultaneous equations graphically; Set up and solve a pair of simultaneous equations represent a real life situation; Use algebra to support and construct arguments and begin to use algebra to support proofs	Change the subject of a formula where the subject is on both sides; Solve quadratic equations algebraically by factorising; Solve the equations of parallel and perpendicular lines given two co-ordinates; Solve quadratic equations by completing the square, deduce the turning point and sketch the corresponding graph.; Solve quadratic equations arising from algebraic fractions; Solve quadratic equations by using the quadratic formula; Simplify and manipulate algebraic expressions involving surds and algebraic fractions; Find the equation of the line through two given points; Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values; Plot and recognise graphs of linear, quadratic, cubic and reciprocal functions; Plot graphs of the exponential function y = abx; Begin to recognise, sketch and interpret graphs of trigonometric functions; Interpret coordinates for trigonometric graphs; Find the gradient of the radius that meets the circle at a given point; Find the equation of a tangent to a circle at a given point; Estimate the gradient of a quadratic or non-linear graph at a given point by sketching the tangent and finding its gradient; Estimate area under a quadratic graph by dividing it into trapezia; Find f(x) + g(x), 2f(x), f(3x) etc. algebraically	Solve quadratic equations by completing the square, deduce the turning point and sketch the corresponding graph.; Solve quadratic equations by using the quadratic formula; Find the equations of parallel and perpendicular lines given two co-ordinates; Recognise, sketch and interpret graphs of trigonometric functions (in degrees) for sin, cos and tan within the range -360° to +360°; Interpret transformations of graphs and write the functions algebraically; Apply the following transformations to the graph of y = f(x), y = -f(x), y = f(-x), y = f(ax) and y = af(x); Construct the graph for a circle of radius r centred at the origin of the coordinate plane (x2 + y2 = r2); Find the gradient of the radius that meets the circle at a given point; Find the equation of a tangent to a circle at a given point; 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; Estimate area under a quadratic graph by dividing it into trapezia; Find the nth term of a quadratic sequence; Use iteration with simple converging sequences; Solve by elimination, linear/quadratic simultaneous equations; Interpret the succession of two functions as a 'composite function' e.g. for f(x) and g(x) find gf(x)
Probability and Statistics	Use a probability scale with words.; Mark probabilities on the probability scale; Represent data in a table; Draw and interpret line graphs, pictograms and bar charts; Find the mode median mean and range for a small set of data; Compare two simple distributions using the range and the mode; Find the mode and range from a bar chart; Interpret simple pie charts using simple fraction sections; Start to solve simple problems using sets and Venn diagrams	Use vocabulary of probability and understand and use probability scale from 0 to 1; Understand that the probabilities of a set of outcomes sum to 1; Identify all mutually exclusive outcomes of an event; Understand and use relative frequency; Extract data and interpret frequency tables; Design & use data collection sheets for grouped data; Group data in equal class intervals; Choose a suitable graph to represent data; Confidently draw and interpret simple diagrams and charts including, line graphs, pictograms, dual bar charts and scatter graphs; Use information provided to complete a two-way table; Find the mode and total frequency from a pie chart; Calculate the mean, mode, median and range of a set of data; Solve questions using sets and Venn diagrams	Know that if the probability of an event is p, the probability of it not occurring is 1-p; Estimate the number of times an event will occur, given the probability and the number of trials; Compare experimental and theoretical probabilities; Find the probability of an event happening using relative frequency; Record outcomes of events in tables and grids; Write probabilities in words, fractions, decimals and percentages; Interpret pie charts and line graphs taking into account different sized samples; Construct simple line graphs for time series; Solve questions involving simple sets by drawing Venn diagrams	Calculate the probability of mutually exclusive events.; Record outcomes of probability experiments in tables and use and draw sample space diagrams; Start to use graphs; Identify which graphs are the most useful in the context of the problem, including stem and leaf, scatter; Use two-way tables; Calculate the mean and range from a frequency table; Calculate mean, median, mode and range from a list; Understand and use sets and Venn diagrams, including 3 way Venn diagrams; Draw and interpret pie charts; Interpret composite bar charts	Record outcomes of events in a Venn diagram; Find a missing probability from a list or table; Draw a stem and leaf diagram and find the median, mode and range; Recognise the advantages and disadvantages between measures of average; Draw a scatter graph, recognise and interpret correlation and draw and use a line of best fit to make predictions; Understand different forms of data collection	Use Venn diagrams to solve problems; Draw and complete a probability tree diagram based on given information (no more than 3 branches per event); Use the 'and' and 'or' rule to find probabilities of events; Construct cumulative frequency tables and draw the corresponding curve; Draw box plots and find the median, quartiles, range and interquartile range.; Do simple questions with moving averages	Understand conditional probabilities and decide if two events are independent; Use tree diagrams to calculate the probability of two independent events; Draw a cumulative frequency graph and use it to estimate frequency greater/less than a given value; Start to understand how to construct a histogram; Compare the measures of spread between a pair of box plots/CF graphs; Find the median, quartiles and interquartile range for large data sets with grouped data; Compare the mean, median, mode and range as appropriate of two distributions; Select and justify a sampling method to investigate a population, including random and stratified sampling	Understand selection with or without replacement; Use a tree diagram to calculate conditional probability; Use a two-way tables, tree diagrams and Venn diagrams to calculate conditional probability; Know the appropriate use of Histograms and use and understand frequency density; Construct and interpret histograms from class intervals with unequal width; From a histogram complete a grouped frequency table; Estimate the median and mean from a histogram with unequal class width; Find a stratified sample of a set of data and understand the advantages of using this method of sampling
Geometry	Measure lines to the nearest millimetre; Use a protractor to measure acute angles; Tessellate shapes; Know the sum of angles round a point, on a straight line and in a triangle; Draw parallel lines and identify parallel lines on a diagram; Calculate the perimeter of a square/rectangle; Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone; Know the terms face, edge and vertex; Understand that area is measured in cm2; Choose suitable metric units to estimate length and area.; Begin to construct triangles given ASA; Recognise reflection symmetry and visualise the reflection in a mirror line of a 2-D shape; Translate a shape on a square/coordinate grid; Understand and use the language associated with rotations	Estimate the size of angles and distinguish between acute, obtuse and reflex angles; Use a protractor to measure and draw acute, obtuse and reflex angles; Use correct notation for labelling angles; Identify perpendicular lines; Identify simple properties of triangles and some quadrilaterals; Measure Shapes to find perimeters and areas; Calculate perimeter of compound shapes; Use the formula for the area of a rectangle, square, parallelogram and triangle; Know and use properties of cuboids; Use nets to calculate the surface area of simple cuboids; Find the volume of a simple cuboid; Identify different nets of a cuboid; Estimate real life measures to a suitable degree of accuracy; Use units of measurement to estimate and solve problems in everyday contexts; Construct triangles given SAS; Recognise and visualise the symmetry of a 2-D shape: line symmetry; Draw 3D shapes on isometric paper; Rotate a shape about a given point	Use a protractor to draw and measure angles; Recognise parallel and perpendicular lines in all diagrams; Recognise and find vertically opposite angles; Find missing angles around a point and in a triangles and quadrilaterals; Substitute numbers into a formula to calculate the area of squares, rectangles, triangles, trapezia and parallelograms; Calculate areas of compound shapes; Know the formulae for the volume of a cube and cuboid; Identify simple nets of 3D shapes – regular polyhedra; Construct the perpendicular bisector of a line segment; Perform and describe a rotation, reflection, translation and simple enlargement.; Solve simple problems involving units of measurement in the context of length and area; Identify regular and irregular polygons; Recognise and visualise the rotational symmetry of a 2-D shape; Draw or complete diagrams with a given number of lines of symmetry or rotational symmetry; Identify co-ordinates of a point determined by geometric information	Find missing angles in triangles and quadrilaterals and give reasons for your answers; Identify alternate, opposite and corresponding angles on parallel lines and their values.; Use a formula to calculate the area of squares, rectangles, triangles, trapezia and parallelograms; Calculate areas of compound shapes; Know the formulae for the volume of a cube and cuboid; Identify simple nets of 3D shapes – regular polyhedra; Construct the perpendicular bisector of a line segment; Perform and describe a rotation, reflection, translation and simple enlargement.; Draw plans and elevations of 3-D shapes; Perform and describe a rotation, reflection, translation and enlargement (including the centre of enlargement and fractional scale factors); Enlarge 2-D shapes, given a centre of enlargement and a positive whole number scale factor	Solve problems involving bearings; Use Pythagoras' Theorem to solve simple problems; Recall the sum of the exterior angles of any polygon; Calculate the interior angles of regular polygons; Know the names of parts of a circle; Know and use formulae for the circumference and area of a circle; Calculate surface area and volume of shapes made from cuboids; Calculate the volume and surface area of right prisms and cylinders; Use the information given to determine whether triangles are congruent, or similar; Construct triangles and bisectors of lines and angles; Draw plans and elevations of 3-D shapes; Perform and describe a rotation, reflection, translation and enlargement (including the centre of enlargement and fractional scale factors); Enlarge 2-D shapes, given a centre of enlargement and a positive whole number scale factor	Use the sum of the interior angles of an n-sided polygon to find missing angles in problems; Find the size of an interior angle, exterior angle or the number of sides of a regular polygon; Find the surface area of simple prisms; Calculate the lengths and areas given the volumes in right prisms and cylinders; Use similarity to solve problems in 2D shapes; Use the formulae for length of arcs in a circle.; Use the formulae for area of sectors in a circle.; Perform and describe combinations of rotations, reflections and translations; Use ruler and compasses to construct bisectors, triangles and angles of 60, 90, 30, 45; Use loci to solve problems; Use and apply Pythagoras' theorem to solve problems; Use Pythagoras Theorem to justify if a triangle is right-angled given its three lengths; Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle; Use vector notation for translations	Find the surface area and volumes cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders and compound shapes made from them; Find areas and volumes of similar shapes; Find the area of a simple segment; Find the area of a segment of a circle given the radius and length of the chord; Use trigonometry to solve problems; Find angles of elevation and angles of depression; Complete a formal geometric proof of similarity of two given triangles; Add and subtract vectors; Use the formulae for length of arcs and area of sectors of circles to solve problems.; Prove and use the fact that the angle in a semicircle is a right angle; Prove and use the fact that angles in the same segment are equal; Prove and use the fact that opposite angles of a cyclic quadrilateral sum to 180°; know and apply the cosine rule to find unknown lengths and angles; Use the sine and cosine rules to solve 2-D problems; Know and apply Area = 1/2 ab sin C to calculate the sides or angles of any triangle	Enlarge 2D shapes, given a negative, fractional scale factor; Work out the magnitude of a vector; Solve problems in 2-D using vector methods; Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones; Find the area of a segment of a circle given the radius and length of the chord; Solve problems for areas and volumes of similar shapes and solids; Understand, recall and use Pythagoras' theorem in 3-D problems; Use the trigonometric ratios to solve 3-D problems; Use the sine and cosine rules to solve 3-D problems; Know the exact values of sin θ, cos θ, tan θ, for θ = 0°, 30°, 45°, 60° and 90; Apply vector methods for simple geometrical proofs; Prove and use the alternate segment theorem; Know the tangent at any point on a circle is perpendicular to the radius at that point.; Prove and use the fact that the angle in a semicircle is a right angle; Prove and use the fact that angles in the same segment are equal; Prove and use the fact that opposite angles of a cyclic quadrilateral sum to 180°; Prove and use facts about the angle subtended at the centre and at the circumference; Use that tangents from a point are equal
Ratio, proportion and rates of change	Convert fractions to percentages; Begin to simplify ratios; Convert lengths from simple scale drawings to real life; Solve simple direct proportion questions	Convert a larger whole number metric unit to a smaller unit (e.g. 3 kilograms to 3000 grams); Convert between simple metric units.; Express the division of a quantity into a number of parts as a ratio and simplify (including 3 part); Start to use scale drawings with decimals; Express one number as a fraction of another; Use percentages to compare simple proportions; Use ratio notation; Reduce a ratio to its simplest form	Write ratios in the form 1: m or m: 1; Solve a ratio problem in context; Divide a given quantity into a ratio; Write a ratio as a fraction; Start to recognise graphs showing constant rates of change,; Begin to solve problems involving the unitary method, e.g. if £40 is 60%, find 1% by dividing by 60 and then 100% by multiplying by 100.; Compare two quantities using percentages, including a range of calculations and contexts; Use percentages in real-life situations; Use and interpret maps, using map scales (1 : 25 000)	Write a ratio as a linear function; Compare proportions using percentages; Use algebraic methods to solve problems involving variables in direct proportion; Start to recognise expressions of the form y α x; Set up equations to show direct proportion; Start t use percentage increase and decrease	Write a ratio as a linear function; Use graphs to calculate measures including unit price, average speed, distance, time, and acceleration; Use percentages in real-life situations: compound interest, depreciation, percentage profit and loss; Calculate repeated proportional change; Find the original amount given the final amount after a percentage change (reverse percentages); Identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments; Enlarge 2-D shapes and recognise the similarity of resulting shapes and understand the implications of enlargement for perimeter	Solve problems involving inverse proportion using graphs; Solve problems involving inverse proportionality, including problems where y is inversely proportional to the square of x; Calculate an unknown quantity from direct or inverse proportion		Set up and use equations to solve word and other problems involving direct or inverse proportion; Calculate the new area or volume of a shape after enlargement