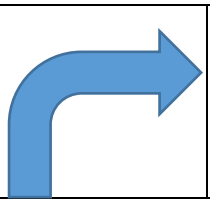
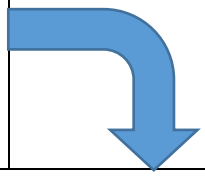
Curriculum Sequencing - Year 7

Year 11 Unit: 13a Graphs of Trigonometric Functions		HIGHER
	WHAT WE ARE STUDYING Understanding trigonometric graphs and problem solving with these	

LINKS TO EARLIER TOPICS	**WHAT IT WILL HELP US LEARN**
Plotting in all four quadrants; Pythagoras' Theorem and trigonometric ratios; substitute into formulae.	Solving problems with trigonometric graphs

Key Skills:	**R**	**A**	**G**
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 θ, cos θ and tan θ			
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).			

WHY WE STUDY THIS	**SPARX**	**Code**
to develop an understanding of graphs and their uses	Translating graphs Reflecting graphs Transforming graphs Graphs of trigonometric functions	U598 U487 U455 U450
KEY WORDS Axes, coordinates, sine, cosine, tan, angle, graph, transformations, side, angle, inverse, square root, 2D, 3D, diagonal, plane, cuboid		

Year 11 Unit: 13b Further Trigonometry		HIGHER
	**WHAT WE ARE STUDYING** Solving problems with non-right-angled triangles	

LINKS TO EARLIER TOPICS	WHAT IT WILL HELP US LEARN
Plotting in all four quadrants; Pythagoras' Theorem and trigonometric ratios; substitute into formulae.	Advanced trigonometry

Key Skills:	R	A	G
Know and apply 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).			
Use the sine and cosine rules to solve 3D problems.			
Understand the language of planes, recognise the diagonals of a cuboid.			
Solve geometrical problems on coordinate axes.			
Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations.			
Calculate the length of a diagonal of a cuboid.			
Find the angle between a line and a plane.			

WHY WE STUDY THIS

Justify when to use the cosine rule, sine rule, Pythagoras' Theorem or normal trigonometric ratios to solve problems.

KEY WORDS

Axes, coordinates, sine, cosine, tan, angle, graph, transformations, side, angle, inverse, square root, 2D, 3D, diagonal, plane, cuboid

SPARX	Code
Understanding sin, cos and tan	U605
Finding unknown sides in right-angled triangles	U283
Finding unknown angles in right-angled triangles	U545
Using the exact values of trigonometric ratios	U627
Using the exact values of trigonometric ratios (Higher)	U319
Angles of elevation and depression	U967
Trigonometry in 3D shapes	U170
Calculating with trigonometry and bearings	U164
The sine rule	U952
The cosine rule	U591
The area rule	U592

Year 11 Unit: 14a Collecting Data

HIGHER

WHAT WE ARE STUDYING

The properties of populations or distributions from a sample, whilst knowing the limitations of sampling apply statistics to describe a population

LINKS TO EARLIER TOPICS

discrete/continuous data;
inequality notation; multiply a fraction by a number; data handling cycle.

WHAT IT WILL HELP US LEARN

Statistical Hypothesis Testing

Key Skills:

Key Skills:	R	A	G
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 reliability of conclusions drawn;			
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			

WHY WE STUDY THIS

Understand why a sample may not be representative of a whole population, and how to construct a statistical investigation and justify how sources of bias have been eliminated.

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

SPARX

SPARX	Code
Types of data	U322
Designing and using questionnaires	U911
Collecting and recording data using tables	U120
Presenting data and making conclusions	U571
Comparing populations using diagrams	U520
Sampling and bias	U162
Capture-recapture	U328

Year 11 Unit: 14b Cumulative frequency, box plots and histograms	HIGHER

WHAT WE ARE STUDYING

Interpret and construct diagrams for grouped discrete and continuous data

LINKS TO EARLIER TOPICS	WHAT IT WILL HELP US LEARN
discrete/continuous data; inequality notation; multiply a fraction by a number; data handling cycle.	Statistical Hypothesis Testing

Key Skills:	R	A	G
Use statistics found in all graphs/charts in this unit to describe a population;			
Know the appropriate uses of cumulative frequency diagrams;			
Construct and interpret cumulative frequency tables;			
Construct and interpret 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;			
Know the appropriate uses of histograms;			
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 from a histogram;			
Estimate the median from a histogram with unequal class widths or any other information from a histogram, such as the number of people in a given interval.			

WHY WE STUDY THIS

to compare data sets and justify their comparisons based on measures extracted from their diagrams .

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

SPARX	Code
Drawing histograms	U185
Drawing histograms	U814
Interpreting histograms	U983
Calculating averages from histograms	U267
Drawing and interpreting frequency polygons	U840
Drawing cumulative frequency graphs	U182
Interpreting cumulative frequency graphs	U642
Drawing box plots	U879
Interpreting box plots	U837
Comparing populations using box plots and cumulative frequency graphs	U507

Year 11 Unit: 15 Quadratics	HIGHER

WHAT WE ARE STUDYING

Manipulate algebraic expressions, identify roots and turning points, solve advanced simultaneous equations and explore iteration

LINKS TO EARLIER TOPICS	WHAT IT WILL HELP US LEARN
Solve quadratics and linear equations, solve simultaneous equations algebraically.	Algebraic manipulation and problem solving

Key Skills:	R	A	G
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;			
Expand the product of more than two linear expressions;			
Sketch a graph of a quadratic function and a linear function, identifying intersection points;			
Sketch graphs of simple cubic functions, given as three linear expressions;			
Solve simultaneous equations graphically: find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach; 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, i.e. solution of $x^2 - 3x - 10 < 0$ as $\{x: -3 < x < 5\}$;			
Solve linear inequalities in two variables graphically;			
Show the solution set of several inequalities in two variables on a graph;			
Use iteration with simple converging sequences.			

WHY WE STUDY THIS

To develop a logical and clear chain of reasoning.

KEY WORDS

Sketch, estimate, quadratic, cubic, function, factorising, simultaneous equation, graphical, algebraic

SPARX	Code
Factorising to solve quadratic equations	U228
Factorising to solve quadratic equations	U960
Completing the square	U589
Quadratic formula	U665
Constructing and solving quadratic equations	U150
Solving quadratic equations graphically	U601
Solving simultaneous equations involving quadratics	U547
Solving simultaneous equations graphically	U836
Solving simultaneous equations involving quadratics graphically	U875
Constructing and solving simultaneous equations	U137
Substituting into iterative formulae	U434
Finding approximate solutions to equations using iteration	U168

Y11 Unit: 16a Circle Theorems

HIGHER

WHAT WE ARE STUDYING

identify and apply circle definitions and properties; apply and prove the standard circle theorems and use them to prove related results

LINKS TO EARLIER TOPICS

drawing circles with compasses; understand: centre, radius, diameter and circumference.

WHAT IT WILL HELP US LEARN

Setting up geometric proof

Key Skills:	R	A	G
Recall definitions and identify 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°;			
Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;			
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.			

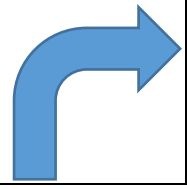
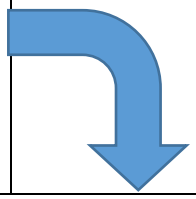
WHY WE STUDY THIS

To understand geometric proofs and how to problem solve with them.

KEY WORDS

Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem

SPARX	Code
Angles subtended at the centre or circumference of a circle	U459
Angles in segments and cyclic quadrilaterals	U251
Circle theorems for chords and tangents	U489
Alternate segment theorem	U130
Mixed problems: Circle theorems	U808
Proving the circle theorems	U807

Year 11 Unit: 16b Circle Geometry		HIGHER
	**WHAT WE ARE STUDYING** recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point	

LINKS TO EARLIER TOPICS	**WHAT IT WILL HELP US LEARN**
gradient between two perpendicular lines; equation of the straight line, given a gradient and a coordinate	Gain depth of understanding between equations of lines and tangents

Key Skills:	**R**	**A**	**G**
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, by: finding the gradient of the radius that meets the circle at that point (circles all centre the origin); finding the gradient of the tangent perpendicular to it; using the given point; Recognise and construct the graph of a circle using $x^2 + y^2 = r^2$ for radius r centred at the origin of coordinates.			

WHY WE STUDY THIS	**SPARX**	**Code**
Justify if a straight-line graph would pass through a circle drawn on a coordinate grid.	Equations of circles and tangents	U567

KEY WORDS

Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem

Year 11 Unit: 17 Further algebra, surds and proof

HIGHER

WHAT WE ARE STUDYING

simplify surd expressions and rationalise denominators; simplify and manipulate algebraic expressions; functions; solve quadratic equations

LINKS TO EARLIER TOPICS

Simplifying surds; use negative numbers with all four operations; use the hierarchy of operations.

WHAT IT WILL HELP US LEARN

argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs

Key Skills:	R	A	G
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;			
Change the subject of a formula such as , where all variables are in the denominators;			
Solve 'Show that' and proof questions using consecutive integers (n, n + 1), squares a^2, b^2, even numbers 2n, odd numbers 2n +1;			
Use function notation;			
Find f(x) + g(x) and f(x) – g(x), 2f(x), f(3x) etc algebraically;			
Find the inverse of a linear function;			
Know that f –1(x) refers to the inverse function;			
For two functions f(x) and g(x), find gf(x).			

WHY WE STUDY THIS

Formal proof is an ideal opportunity for students to provide a clear logical chain of reasoning providing links with other areas of mathematics.

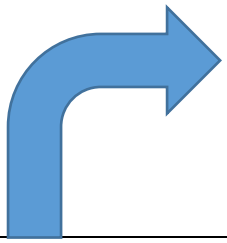
KEY WORDS

Rationalise, denominator, surd, rational, irrational, fraction, equation, rearrange, subject, proof, function notation, inverse, evaluate

SPARX	Code
Multiplying and dividing surds	U633
Simplifying surds	U338
Adding and subtracting surds	U872
Expanding brackets with surds	U499
Rationalising denominators containing a single term	U707
Rationalising denominators containing two terms	U281
Substituting into functions	U637
Substituting into composite functions	U895
Finding composite functions	U448
Finding inverse functions	U996

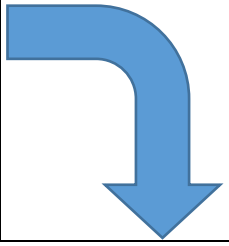
Year 11 Unit: 18 Vectors and Geometric Proof

HIGHER



WHAT WE ARE STUDYING

apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; use vectors to construct geometric arguments and proof



LINKS TO EARLIER TOPICS

Students will have used vectors to describe translations and will have knowledge of Pythagoras' Theorem and the properties of triangles and quadrilaterals.

WHAT IT WILL HELP US LEARN

Vector and Matrices

Key Skills:	R	A	G
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.			
Represent vectors, combinations of vectors and scalar multiples in the plane pictorially.			
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.			

WHY WE STUDY THIS

Solve geometric problems and produce proofs

KEY WORDS

Vector, direction, magnitude, scalar, multiple, parallel, collinear, proof, ratio, column vector

SPARX	Code
Understanding column vectors	U632
Adding and subtracting column vectors	U903
Multiplying column vectors by a scalar	U564
Solving geometric problems using vectors	U781
Identifying parallel vectors	U660

Year 11 Unit: 19a Reciprocal/Exponential graphs; Area under graphs

HIGHER

WHAT WE ARE STUDYING

recognise, sketch and interpret graphs of the reciprocal functions; translations and reflections of a given function; calculate or estimate gradients of graphs and areas under graphs;

LINKS TO EARLIER TOPICS

linear and quadratic graphs; gradient of a linear function between two points; transformations of trigonometric functions; direct proportion

WHAT IT WILL HELP US LEARN

An understanding of the problems that use Differentiation

Key Skills:	R	A	G
Recognise, sketch and interpret graphs of the reciprocal function			
State the value of x for which the equation is not defined;			
Recognise, sketch and interpret graphs of exponential functions y = kx			
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 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) for linear, quadratic, cubic functions; apply to the graph of y = f(x) the transformations 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: 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 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.			

WHY WE STUDY THIS

Interpreting many of these graphs in relation to their specific contexts.

KEY WORDS

Reciprocal, linear, gradient, quadratic, exponential, functions, direct, indirect, proportion, estimate, area, rate of change, distance, time, velocity, transformations, cubic, transformation, constant of proportionality

SPARX	Code
Graphs of reciprocal functions	U593
Graphs of exponential functions	U229
Translating graphs	U598
Reflecting graphs	U487
Transforming graphs	U455
Estimating gradients of non-linear graphs using tangents	U800
Estimating areas under non-linear graphs	U882

Year 11 Unit: 19b Direct and Indirect proportion

HIGHER

WHAT WE ARE STUDYING

solve problems involving direct and inverse proportion, including graphical and algebraic representations; interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change; set up, solve and interpret the answers in growth and decay problems

LINKS TO EARLIER TOPICS

linear and quadratic graphs; gradient of a linear function between two points; transformations of trigonometric functions; direct proportion

WHAT IT WILL HELP US LEARN

An understanding of the problems that use Differentiation

Key Skills:	R	A	G
Recognise and interpret graphs showing direct and inverse proportion;			
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 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;			
Solve problems involving inverse proportionality;			
Set up and use equations to solve word and other problems involving direct proportion or inverse proportion.			

WHY WE STUDY THIS

Justify and infer relationships in real-life scenarios to direct and inverse proportion such as ice cream sales and sunshine.

KEY WORDS

Reciprocal, linear, gradient, quadratic, exponential, functions, direct, indirect, proportion, estimate, area, rate of change, distance, time, velocity, transformations, cubic, transformation, constant of proportionality

SPARX	Code
Solving direct proportion	U721
Solving inverse proportion	U357
Currency conversion	U610
Interpreting direct proportion equations	U640
Constructing direct proportion equations	U407
Interpreting inverse proportion equations	U364
Constructing inverse proportion equations	U138
Graphs of direct and inverse proportion	U238

Year 11 Unit: 13a Probability I	FOUNDATION

WHAT WE ARE STUDYING

systematic listing strategies, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees;

LINKS TO EARLIER TOPICS

add and multiply fractions and decimals; expressing one number as a fraction of another number.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur;			
Mark events and/or probabilities on a probability scale of 0 to 1;			
Write probabilities in words or fractions, decimals and percentages;			
Find the probability of an event happening using theoretical probability;			
Use theoretical models to include outcomes using dice, spinners, coins;			
List all outcomes for single events systematically;			
Work out probabilities from frequency tables;			
Work out probabilities from two-way tables;			
Record outcomes of probability experiments in tables;			
Add simple probabilities;			
Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;			
Using 1 – p as the probability of an event not occurring where p is the probability of the event occurring;			
Find a missing probability from a list or table including algebraic terms.			

WHY WE STUDY THIS

Students should be given the opportunity to justify the probability of events happening or not happening.

KEY WORDS

Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness, experimental

SPARX	Code
Using probability phrases	U803
Writing probabilities as fractions	U408
Writing probabilities as fractions, decimals and percentages	U510
Probabilities of mutually exclusive events	U683
Expected results from repeated experiments	U166
Sample space diagrams	U104
Venn diagrams	U476
Venn diagrams with set notation	U748
Using set notation	U296
Frequency trees	U280
Tree diagrams for independent events	U558
Tree diagrams for dependent events	U729
Calculating experimental probabilities	U580

Year 11 Unit: 13b Probability II

FOUNDATION

WHAT WE ARE STUDYING

applying systematic listing strategies to record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees

calculate the probability of independent and dependent combined events,

LINKS TO EARLIER TOPICS

add and multiply fractions and decimals; expressing one number as a fraction of another number.

WHAT IT WILL HELP US LEARN

Higher level probability; GCSE Statistics

Key Skills:	R	A	G
Find the probability of an event happening using relative frequency;			
Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities;			
List all outcomes for combined events systematically;			
Use and draw sample space diagrams;			
Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values;			
Use union and intersection notation;			
Compare experimental data and theoretical probabilities;			
Compare relative frequencies from samples of different sizes;			
Find the probability of successive events, such as several throws of a single dice;			
Use tree diagrams to calculate the probability of two independent events;			
Use tree diagrams to calculate the probability of two dependent events.			

WHY WE STUDY THIS

Provides a real-life link to lotteries and develops probabilistic thinking.

KEY WORDS

Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness, experimental

SPARX	Code
Using probability phrases	U803
Writing probabilities as fractions	U408
Writing probabilities as fractions, decimals and percentages	U510
Probabilities of mutually exclusive events	U683
Expected results from repeated experiments	U166
Sample space diagrams	U104
Venn diagrams	U476
Venn diagrams with set notation	U748
Using set notation	U296
Frequency trees	U280
Tree diagrams for independent events	U558
Tree diagrams for dependent events	U729
Calculating experimental probabilities	U580

Year 11 Unit: 14 Multiplicative Reasoning

FOUNDATION

WHAT WE ARE STUDYING

interpret and solve problems with fractions and percentages; use standard units of mass, length, time, money and other measures; rearrange formulae to change the subject; direct and inverse proportion; growth and decay, including compound interest.

LINKS TO EARLIER TOPICS

interpret scales of measuring instruments; percentages;

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Understand and use compound measures: density; pressure; speed: convert between metric speed measures.			
Read values in km/h and mph from a speedometer; calculate average speed, distance, time – in miles per hour as well as metric measures;			
Change d/t in m/s to a formula in km/h, i.e. d/t × (60 × 60)/1000			
Express a given number as a percentage of another number in more complex situations;			
Calculate percentage profit or loss;			
Make calculations involving repeated percentage change, not using the formula;			
Find the original amount given the final amount after a percentage increase or decrease;			
Use compound interest;			
Use a variety of measures in ratio and proportion problems: currency conversion; rates of pay; best value;			
Set up, solve and interpret the answers in growth and decay problems;			
Understand that X is inversely proportional to Y is equivalent to X is proportional to ;			
Interpret equations that describe direct and inverse proportion.			

WHY WE STUDY THIS

Know that measurements using real numbers depend upon the choice of unit,
Develop proportional thinking.

KEY WORDS

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

SPARX

	Code
Reading, converting and calculating with time	U902
Estimating and measuring	U102
Converting units of length, mass and capacity	U388
Converting units of area	U248
Converting units of volume	U468
Problem solving: units of length, area and volume	U663
Using appropriate units	U497
Calculating with speed	U151
Calculating with rates	U256
Calculating with density	U910
Calculating with pressure	U527
Mixed problems: density and pressure	U842
Solving direct proportion word problems	U721
Solving inverse proportion word problems	U357
Currency conversion	U610
Interpreting direct proportion equations	U640
Interpreting inverse proportion equations	U364

Year 11 Unit: 15a Plans and Elevations

FOUNDATION

WHAT WE ARE STUDYING

scale factors, scale diagrams and maps;; identify and apply definitions and properties of shapes and solids; construct and interpret plans and elevations of 3D shapes

LINKS TO EARLIER TOPICS

Students should be able to measure and draw lines.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Understand clockwise and anticlockwise;			
Draw circles and arcs to a given radius or given the diameter;			
Measure and draw lines, to the nearest mm;			
Measure and draw angles, to the nearest degree;			
Know and use compass directions;			
Draw sketches of 3D solids;			
Know the terms face, edge and vertex;			
Identify and sketch planes of symmetry of 3D solids;			
Make accurate drawings of triangles and other 2D shapes using a ruler and a protractor;			
Construct diagrams of everyday 2D situations involving rectangles, triangles, perpendicular and parallel lines;			
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.			

WHY WE STUDY THIS

Interpreting scale drawings and maps involving lengths that need to be measured (rather than given in the problem).

SPARX

Nets of 3D shapes
Plans and elevations

Code

U761
U743

KEY WORDS

Construct, circle, arc, sector, face, edge, vertex, two-dimensional, three-dimensional, solid, elevations, congruent, angles, regular, irregular, bearing, degree, bisect, perpendicular, loci, map, scale, plan, region

Year 11 Unit: 15b Constructions, Loci and bearings — FOUNDATION

WHAT WE ARE STUDYING

use ruler and compass constructions to solve loci problems; basic congruence criteria for triangles; measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings.

LINKS TO EARLIER TOPICS

measure and draw lines.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Understand congruence, as two shapes that are the same size and shape;			
Visually identify shapes which are congruent;			
Use straight edge and a pair of compasses to do standard constructions:			
Understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not;			
Construct the perpendicular bisector of a given line;			
Construct the perpendicular from a point to a line;			
Construct the bisector of a given angle;			
Construct angles of 90°, 45°;			
Draw and construct diagrams from given instructions, including the following: 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 may be defined by 'nearer to' or 'greater than';			
Find and describe regions satisfying a combination of loci;			
Use constructions to solve loci problems (2D only);			
Use and interpret maps and scale drawings;			
Estimate lengths using a scale diagram;			
Make an accurate scale drawing from a diagram;			
Use three-figure bearings to specify direction;			
Mark on a diagram the position of point B given its bearing from point A;			
Give a bearing between the points on a map or scaled plan;			
Given the bearing of a point A from point B, work out the bearing of B from A;			
Use accurate drawing to solve bearings problems;			
Solve locus problems including bearings.			

WHY WE STUDY THIS

Links to other topics such as Pythagoras' theorem and trigonometry

KEY WORDS

Construct, circle, arc, sector, face, edge, vertex, two-dimensional, three-dimensional, solid, elevations, congruent, angles, regular, irregular, bearing, degree, bisect, perpendicular, loci, map, scale, plan, region

SPARX	Codes
Using a pair of compasses	U678
Constructing triangles	U187
Constructing bisectors of angles	U787
Constructing perpendicular bisectors and lines	U245
Mixed problems: Constructing bisectors and perpendicular lines	U979
Constructing loci	U820

Year 11 Unit: 16a Quadratic Equations

FOUNDATION

WHAT WE ARE STUDYING

simplify and manipulate algebraic expressions; identify and interpret roots, intercepts, turning points of quadratic functions; recognise, sketch and interpret graphs; solve quadratic equations algebraically

LINKS TO EARLIER TOPICS

square negative numbers; substitute into formulae; plot points on a coordinate grid; expand single brackets and collect 'like' terms.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Define a 'quadratic' expression;			
Multiply together two algebraic expressions with brackets;			
Square a linear expression, e.g. $(x + 1)^2$;			
Factorise quadratic expressions of the form $x^2 + bx + c$;			
Factorise a quadratic expression $x^2 - a^2$ using the difference of two squares;			
Solve quadratic equations by factorising;			
Find the roots of a quadratic function algebraically.			

WHY WE STUDY THIS

To gain a better understanding of quadratic graphs

KEY WORDS

Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket

SPARX

Expanding double brackets

Factorising quadratic expressions of the form x^2+bx+c

Factorising the difference of two squares

Factorising to solve quadratic equations of the form $x^2+bx+c=0$

Codes

U768

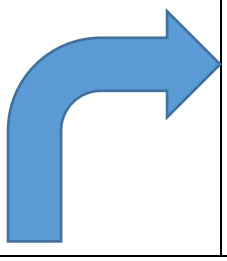
U178

U963

U228

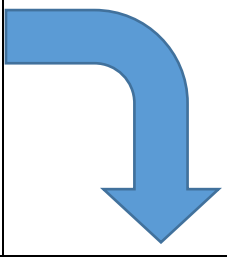
Year 11 Unit: 16b Quadratic Graphs

FOUNDATION



WHAT WE ARE STUDYING

simplify and manipulate algebraic expressions; identify and interpret roots, intercepts, turning points of quadratic functions; recognise, sketch and interpret graphs; solve quadratic equations algebraically



LINKS TO EARLIER TOPICS

square negative numbers; substitute into formulae; plot points on a coordinate grid; expand single brackets and collect 'like' terms.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Generate points and plot graphs of simple quadratic functions, then more general quadratic functions;			
Identify the line of symmetry of a quadratic graph;			
Find approximate solutions to quadratic equations using a graph;			
Interpret graphs of quadratic functions from real-life problems;			
Identify and interpret roots, intercepts and turning points of quadratic graphs.			

WHY WE STUDY THIS

Recognise a quadratic graph from its shape.

KEY WORDS

Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket

SPARX

Plotting graphs of quadratic functions

Interpreting graphs of quadratic functions

Code

U989

U667

Year 11 Unit: 17 Circles, cylinders, cones and spheres	FOUNDATION

WHAT WE ARE STUDYING

calculate with multiples of π; know the formula for circumference and area of a circle; calculate perimeters and areas of circles and composite shapes; surface area and volume of spheres, pyramids, cones and composite solids; calculate arc lengths, angles and areas of sectors of circles

LINKS TO EARLIER TOPICS

formula for calculating the area of a rectangle; how to use the four operations on a calculator.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Recall the definition of a circle;			
Identify, name and draw parts of a circle including tangent, chord and segment;			
Recall and use formulae for the circumference of a circle and the area enclosed by a circle circumference of a circle = 2πr = πd, area of a circle = πr2;			
Find circumferences and areas enclosed by circles;			
Use π ≈ 3.142 or use the π button on a calculator;			
Give an answer to a question involving the circumference or area of a circle in terms of π;			
Find radius or diameter, given area or perimeter of a circles;			
Find the perimeters and areas of semicircles and quarter-circles;			
Calculate perimeters and areas of composite shapes made from circles and parts of circles;			
Calculate arc lengths, angles and areas of sectors of circles;			
Find the surface area of a cylinder;			
Find the volume of a cylinder;			
Find the surface area and volume of spheres, pyramids, cones and composite solids;			
Round answers to a given degree of accuracy.			

WHY WE STUDY THIS

Geometrical reasoning

KEY WORDS

Area, perimeter, formula, length, width, measurement, volume, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area

SPARX	Code
Finding the circumference of circles	U604
Finding the area of circles	U950
Finding the arc length of sectors	U221
Finding the area of sectors	U373
Finding the surface area of cubes and cuboids	U929
Finding the surface area of prisms	U259
Finding the surface area of pyramids	U871
Mixed problems: Finding the surface area of cuboids, prisms and pyramids	U142
Finding the surface area of cylinders	U464
Finding the surface area of cones	U523
Finding the surface area of spheres	U893
Mixed problems: Finding the surface area of cones and spheres	U771

	Finding the surface area of frustums	U334
	Finding the surface area of composite shapes	U561
	Finding the volume of cubes and cuboids	U786
	Finding the volume of prisms	U174
	Finding the volume of pyramids	U484
	Finding the volume of cylinders	U915
	Finding the volume of cones	U116
	Finding the volume of spheres	U617
	Mixed problems: Finding the volume of cones and spheres	U426
	Finding the volume of composite shapes	U543

Year 11 Unit: 18a Fractions and reciprocals — FOUNDATION

WHAT WE ARE STUDYING

apply the four operations to integers, decimals, simple fractions and mixed numbers; recognise and use relationships between operations, including inverse operations; use conventional notation for priority of operations, including brackets, powers, roots and reciprocals

LINKS TO EARLIER TOPICS

four operations with fractions; write powers of 10 in index form and recognise and recall powers of 10, i.e. $10^2 = 100$; recall the index laws.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Add and subtract mixed number fractions;			
Multiply mixed number fractions;			
Divide mixed numbers by whole numbers and vice versa;			
Find the reciprocal of an integer, decimal or fraction;			
Understand 'reciprocal' as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal because division by zero is not defined).			

WHY WE STUDY THIS

Links with other areas of mathematics that fractions are not just used in isolation, e.g. use 6 $\frac{1}{2}$ cm instead of 6.5 cm.

KEY WORDS

Add, subtract, multiply, divide, mixed, improper, fraction, decimal, indices, standard form, power, reciprocal, index

SPARX	Code
Adding and subtracting fractions	U736
Converting between mixed numbers and improper fractions	U692
Adding and subtracting mixed numbers	U793
Ordering fractions and mixed numbers	U439
Multiplying fractions	U475
Multiplying with mixed numbers	U224
Dividing fractions	U544
Dividing with mixed numbers	U538
Problem solving: Fractions and mixed numbers	U874

Year 11 Unit: 18b Indices and Standard Form	FOUNDATION

WHAT WE ARE STUDYING

calculate with roots, and with integer indices; calculate with and interpret standard form A x 10n, where 1 ≤ A < 10 and n is an integer.

LINKS TO EARLIER TOPICS

four operations with fractions; write powers of 10 in index form and recognise and recall powers of 10, i.e. $10^2 = 100$; recall the index laws.

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WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractions and powers of a power;			
Use numbers raised to the power zero, including the zero power of 10;			
Convert large and small numbers into standard form and vice versa;			
Add and subtract numbers in standard form;			
Multiply and divide numbers in standard form;			
Interpret a calculator display using standard form and know how to enter numbers in standard form.			

WHY WE STUDY THIS

Link with other areas of mathematics, such as compound measures, by using speed of light in standard form.

KEY WORDS

Add, subtract, multiply, divide, mixed, improper, fraction, decimal, indices, standard form, power, reciprocal, index

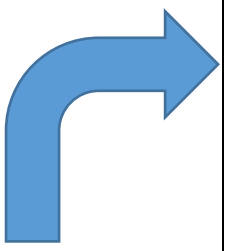
SPARX

	Code
Index rules with positive indices	U235
Index rules with negative indices	U694
Using standard form with positive indices	U330
Using standard form with negative indices	U534
Multiplying and dividing numbers in standard form	U264
Adding and subtracting numbers in standard form	U290
Standard form with a calculator	U161

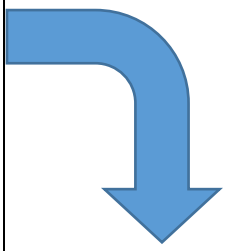
Year 11 Unit: 19a Similarity and Congruence in 2D

FOUNDATION

WHAT WE ARE STUDYING



compare lengths, areas and volumes using ratio notation; use the basic congruence criteria for triangles; identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement;



LINKS TO EARLIER TOPICS

column vectors; Pythagoras' Theorem; enlarge shapes and calculate scale factors; calculate area and volume in various metric measures; measure lines and angles and using compasses, ruler and protractor, and construct standard constructions.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Use the basic congruence criteria for triangles (SSS, SAS, ASA and RHS); Solve angle problems involving congruence;			
Identify shapes which are similar; including all circles or all regular polygons with equal number of sides;			
Understand similarity of triangles and of other plane shapes, use this to make geometric inferences, and solve angle problems using similarity;			
Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides;			
Understand the effect of enlargement on perimeter of shapes;			
Solve problems to find missing lengths in similar shapes;			
Know that scale diagrams, including bearings and maps are 'similar' to the real-life examples.			

WHY WE STUDY THIS

Using scale diagrams, including bearings and maps, provides a rich source of real-life examples and links to other areas of mathematics.

KEY WORDS

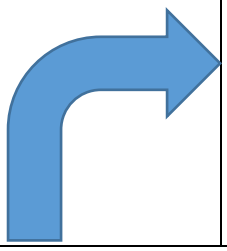
Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, congruence, side, angle, compass, construction, shape, volume, length, area, volume, scale factor, enlargement, similar, perimeter,

SPARX	Code
Understanding congruence	U790
Understanding similarity	U551
Mixed problems: Understanding similarity and congruence	U112
Congruent triangles	U866
Finding unknown sides in similar shapes	U578

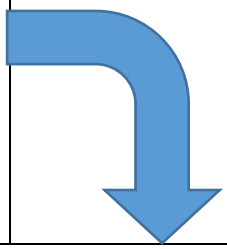
Year 11 Unit: 19b Vectors

FOUNDATION

WHAT WE ARE STUDYING



apply the concepts of congruence and describe translations as 2D vectors; apply addition and subtraction of vectors, multiplication by vectors by a scalar, and diagrammatic and column representations of vectors



LINKS TO EARLIER TOPICS

column vectors; Pythagoras' Theorem; enlarge shapes and calculate scale factors; calculate area and volume in various metric measures; measure lines and angles and using compasses, ruler and protractor, and construct standard constructions.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
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.			

WHY WE STUDY THIS

Investigations involving vectors around 2D shapes

KEY WORDS

Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, congruence, side, angle, compass, construction, shape, volume, length, area, volume,
scale factor, enlargement, similar, perimeter,

SPARX	Code
Understanding column vectors	U632
Adding and subtracting column vectors	U903
Multiplying column vectors by a scalar	U564

Year 11 Unit: 20 Rearranging equations, graphs of cubic and reciprocal functions and simultaneous equations	FOUNDATION

WHAT WE ARE STUDYING

order positive and negative integers, decimals and fractions; understand expressions, equations, formulae, identities, inequalities, terms and factors; und; rearrange formulae; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments; use the form y = mx + c to identify parallel lines; equation of the line through two given points, or through one point with a given gradient; recognise, sketch and interpret graphs; solve two simultaneous equations in two variables (linear/linear); solve linear inequalities in one or two variable(s) represent the solution set on a number line; solve problems involving direct and inverse proportion, including graphical and algebraic representations; recognise and interpret graphs that illustrate direct and inverse proportion

LINKS TO EARLIER TOPICS

draw linear graphs;
plot coordinates and sketch simple functions with a table of values; substitute into and solve equations;
have experience of using formulae;
recall and use the hierarchy of operations and use of inequality symbols.

WHAT IT WILL HELP US LEARN

Key Skills:	R	A	G
Know the difference between an equation and an identity and use and understand the ≠ symbol;			
Change the subject of a formula involving the use of square roots and squares;			
Answer 'show that' questions using consecutive integers (n, n + 1), squares a^2, b^2, even numbers 2n, and odd numbers 2n +1;			
Solve problems involving inverse proportion using graphs, and read values from graphs;			
Find the equation of the line through two given points;			
Recognise, sketch and interpret graphs of simple cubic functions;			
Recognise, sketch and interpret graphs of the reciprocal function with $x \neq 0$;			

Use graphical representations of inverse proportion to solve problems in context;			
identify and interpret the gradient from an equation ax + by = c;			
Write simultaneous equations to represent a situation;			
Solve simultaneous equations (linear/linear) algebraically and graphically;			
Solve simultaneous equations representing a real-life situation, graphically and algebraically, and interpret the solution in the context of the problem;			

WHY WE STUDY THIS

To be able to translate simple situations or procedures into algebraic expressions or formulae

KEY WORDS

Reciprocal, linear, gradient, functions, direct, indirect, estimate, cubic, subject, rearrange, simultaneous, substitution, elimination, proof

SPARX	Code
Reading and plotting coordinates	U789
Calculating midpoints	U933
Solving shape problems involving coordinates	U889
Plotting straight line graphs	U741
Finding equations of straight line graphs	U315
Interpreting equations of straight line graphs	U669
Finding the equation of a straight line from its gradient and a point	U477
Finding the equation of a straight line from two points on the line	U848
Equations of parallel lines	U377
Graphs of direct and inverse proportion	U238
Solving simultaneous equations using elimination	U760
Solving simultaneous equations using substitution	U757
Solving simultaneous equations graphically	U836
Constructing and solving simultaneous equations	U137