

Year 10 and 11 Foundation Course Outline for school website

Students on the foundation course will study from blocks 1 to 10 across the 2 year course. Timings are approximately Blocks 1 to 5 in year 10, and the remaining elements of the course in year 11. Some students will not study all of the blocks, and will spend more time progressing through the earlier blocks of work. The blocks will vary in length depending on the difficulty of the topics, and so cannot be allocated into terms.

Block 1 - Coordinates

Coordinates
Plot and read coordinates in the first quadrant.
Plot and read coordinates in all quadrants.
Plot and name shapes using coordinates.
Find missing coordinates using properties of a shape.

Block 1 - Scales and Units

Scales and Units
Make estimates of length, volume and capacity.
Make conversions between metric and imperial units.
Choose suitable units for real life quantities.
Use compound units such as density in numerical context.
Use compound units such as density in an algebraic context.
Read measurements from clocks and scales.
Do calculations involving time and using timetables.
Do money calculations.

Block 1 - Properties of Number 1

Properties of Number 1
Find squares, cubes, square roots without a calculator.
Find squares, cubes, square roots with a calculator.
Understand what odd, even and prime numbers are.
Find the HCF of a pair of numbers.
Find the LCM of a pair of numbers.

Block 1 – Symmetry

Symmetry
Draw lines of symmetry on 2 - D shapes.
Reflect shapes in a mirror line using lines parallel to the axis, e.g. $y = 3$ or $x = 2$.
Determine if a shape has rotational symmetry.
Find the order of rotational symmetry of a shape.
Find missing angles on a straight line.
Find missing angles around a point.

Block 1 – Fractions

Fractions
Visualise a fraction diagrammatically.
Understand a fraction as part of a whole.
Recognise and write fractions in everyday situations.
Write a fraction in its simplest form.
Find equivalent fractions.
Compare the size of fractions using common denominators.
Add and subtract fractions using a common denominator.
Write an improper fraction as a mixed number.
Find a fraction of an amount.
Find the reciprocal of whole numbers and fractions.

Block 1 – Maps and Angles

Maps and Angles
Be able to follow and give directions using a map.
Interpret map scales as a ratio.
Read and consult scale drawings, e.g. work out the real distance if the map distance is 6cm scale 1:25000.
Distinguish between acute, obtuse reflex and right angles.
Estimate the size of an angle in degrees.
Measure and draw angles to the nearest degree.

Block 2 – Decimals

Decimals
Put digits in the correct place in a decimal number.
Write decimals in an ascending order of size.
Convert between decimal, tenths and hundredths.
Multiply and divide decimal numbers by whole and decimal numbers (up to 2 dp)
Know that $13.5 \div 0.5 = 135 \div 5$

Block 2 - Directed Numbers

Directed Numbers
Be able to place negative and positive numbers on a number line.
Use the symbols $=$, \neq , $<$, $>$, \leq , \geq
Add and subtract positive and negative numbers.
Multiply and divide positive and negative numbers.

Block 2 - Shape

Shape
Work out angles at point, on a straight line and vertically opposite angles.
Work of alternate and corresponding angles.
Recognise and recall angle properties of equilateral, isosceles and right angle triangles.
Recall correct vocabulary and notation.
Draw diagrams from written description.
Recognise and recall angle properties of squares, rectangles, parallelograms, trapeziums and rhombuses.
Recall the meaning of circle, radius, diameter, circumference as well as chord, tangent , arc , sector and segment .

Block 2 - Percentages

Percentages
Know the fraction and decimal equivalents of 25%, 50%, and 75%.
Work with % over 100%
Understand that a percentage is a fraction in hundredths.
Write a percentage as a decimal; or as a fraction in its simplest terms.
Write one number as a percentage of another number.
Calculate the percentage of a given amount.
Find a percentage increase/decrease of an amount

Block 2 - Ratio and Proportion

Ratio and Proportion
Use and draw arrow diagrams to show proportion.
Understand what is meant by ratio.
Write a ratio in its simplest form.
Express a ratio as a fraction.
Use and interpret conversion graphs.

Block 2 - Statistics

Statistics
Draw pictograms, bar charts, vertical line charts.
Draw pie charts, frequency charts and frequency polygons.
Work with grouped data.
Calculate the mean, median, range and mode of a set of data.
Compare distributions of data through appropriate graphical representation, and appropriate measures of central tendency and spread.

Block 3 - Spending Money

Spending Money
Decide on the appropriate units to use in real life problems.
Read measurements from instruments.
Use all four operations to calculate problems involving money.
Use percentages to calculate VAT

Block 3 - Introduction to Algebra and Formulae

Introduction to Algebra and Formulae
Use letters or words to state the relationship between different quantities.
Simplify algebraic expressions in one or more like terms, by adding and subtracting like terms.
Multiply and divide with letters and numbers in brackets.
Substitute positive and negative numbers into simple algebraic formulae including scientific formulae .

Block 3 - Collecting and Recording Data

Collecting and Recording Data
Design a suitable question for a questionnaire. (Not specifically mentioned)
Understand the difference between categorical and numerical data.
Design suitable data collection sheets for surveys and experiments.
Understand about bias in sampling.
Draw frequency tables.
Use and interpret stem and leaf diagrams. (Not listed on content)

Block 3 – Perimeter and Area

Perimeter and Area
Find the perimeter and areas of shapes made up from triangles and rectangles.
Find areas of shapes by counting squares.
Use the formulae to find circumference and area of a circle.
Calculate and give answers in terms of π
Calculate arc lengths, angles and areas of sectors of circles
Calculate areas of compound shapes involving circles
Convert between units of area

Block 3 – Powers and Primes

Powers and Primes
Multiply and divide powers of the same number.
Understand and use the index rules to simplify algebraic expressions, e.g. $5^5 \div 5^2 = 5^3$
Use of brackets when adding and subtracting negative numbers.
Use brackets to expand and simplify algebraic expressions involving positive and negative numbers.
Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals

Block 4 – Graphs

Graphs
Draw straight line graphs, including real world examples particularly distance, speed and acceleration
Interpret straight line graphs, including distance time graphs.
Identify and interpret roots, intercepts of straight lines from their graphs.
Draw and interpret graphs in the form $y = mx + c$
Know that the slope of a travel graph shows the speed and be able to calculate this speed from the graph.
Identify and interpret gradients and intercepts of linear functions graphically and algebraically (may be as travel graph above)
Interpret the gradient of a straight line graph as a rate of change
Use the form $y=mx+c$ to identify parallel lines
Find the equation of the line through two given points, or through one point with a given gradient

Block 4 - Probability

Probability
Apply systematic listing strategies
Construct sample space diagrams for single and combined experiments with equally likely outcomes
Write down the theoretical probability of an equally likely event
Estimate a probability by relative frequency.
Know that a better estimate for a probability is achieved by increasing the number of trials.
Understand that the probability of an event not happening is $1 - \text{probability of it happening}$.

Block 4 - 3 Dimensional Shapes

3 Dimensional Shapes
Draw solids using isometric paper.
Draw nets of solids and recognise solids from their nets.
Count the vertices, faces and edges of 3-D shapes.
Identify properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, cones and spheres.
Construct and interpret plans and elevations.
Find volumes of shapes by counting cubes.
Find the surface area of a prism.

Block 4 - Earning Money

Earning Money
Use of operations with money and number to calculate wages.
Reading, using and interpreting real life tables to solve problems.
Using percentages to calculate commissions, simple interest and tax.

Block 5 - Estimation

Estimation
Approximate to the nearest whole number, nearest 10, nearest 100.
Estimate prices to the nearest pound.
Round to ANY given number of decimal places.
Round to ANY number of significant figures.
Use inequalities to specify simple error intervals due to truncation or rounding
Apply and interpret limits of accuracy
Check calculations by rounding, e.g. $29 \times 31 \approx 30 \times 30$

Block 5 - Equations

Equations
Where appropriate, interpret simple expressions as functions with inputs and outputs
Solve linear equations with one or more operators.
Solve linear equations involving a single pair of brackets and fractions.

Block 5 - Fractions 2

Fractions 2
Multiply and divide a number with a fraction, and a fraction with a fraction.
Calculate exactly with fractions
Simplify multiplication of fractions by first cancelling common factors.
Convert a fraction to a decimal or a decimal to a fraction.
Work interchangeably with terminating decimals and their corresponding fractions
Use comparisons between fractions, decimals and percentages in contextualised problems.

Block 5 - Properties of Number 2

Properties of Number 2
Find squares; cubes; square roots of numbers, with and without a calculator.
Use positive integer powers and associated real roots.
Recognise powers of 2,3,4,5
Calculate with roots, and with integer indices
Find the HCF and LCM of numbers.
Write a number as a product of its prime factors, e.g. $108 = 2 \times 2 \times 3 \times 3 \times 3$
Write numbers in standard form and do calculations with numbers in standard form
Interpret standard index form from calculator display.
Understand and use the index rules to simplify algebraic expressions, e.g. $5^5 \div 5^2 = 5^3$
Understand simple instances of BIDMAS, e.g. work out $12 \times (5 - 24) \div 8$

Block 5 - Constructions of Triangles and Bearings

Constructions of Triangles and Bearings	1st check	2nd check
Use a ruler, protractor and compass to draw accurate triangles and rectangles.		
Measure a bearing (acute and obtuse).		
Measure a bearing (reflex).		
Calculate bearings.		

Block 5 – Angles and Shape

Angles and Shape
Work out angles at point, straight line, vertically opposite, alternate and corresponding AND give reasons.
Mark parallel lines in a diagram.
Use angle properties of triangles and quadrilaterals to find missing angles.
Derive that the angle sum of a triangle is 180° .
Use angle sum of triangle to deduce angle sum in any polygon and to derive properties of regular polygons
Explain why the angle sum of a quadrilateral is 360° .
Calculate and use the sums of the interior angles of convex polygons of sides 3, 4, 5, 6, 8, 10.
Know, or work out, the relationship between the number of sides of a polygon and the sum of its interior angles.
Find the size of each exterior/interior angle of a regular polygon.
Use results to obtain simple proofs
Understand why shapes tessellate.

Block 6 – Coordinates and Graphs

Coordinates and Graphs
Plot and read coordinates on a coordinate grid (in all four quadrants)
Find the coordinates of the fourth vertex of a parallelogram
Identify the coordinates of the vertex of a cuboid on a 3-D grid
Work out the coordinates of the midpoint of the line connecting two points
Calculate the length of the line segment joining two points in the plane (all four quadrants)

Block 6 – Decimals 2

Decimals 2
Multiply and divide decimal numbers by whole numbers including 10, 100, 1000 and decimal numbers (up to two decimal places), e.g. $266.22 \div 0.34$.
Work out squares and square roots of decimals.

Block 6 – Sequences

Sequences
Find the missing number in a number pattern or sequence.
Find term to term rule.
Find the n th term of a number sequence.
Recognise sequences of triangular, square and cube numbers and simple arithmetic APs
Recognise and use Fibonacci type sequences and simple geometrical progressions (r^n where n is an integer and r is a rational number)

Block 6 – Using Statistics

Using Statistics
Construct and interpret pie charts.
Calculate the mean, median mode and range of discrete data.
Compare distributions of data through graphical representation, and appropriate measures of central tendency and spread.
Apply statistics to describe a population.
Grouped data; frequency tables, identify the modal class, estimate the mean and construct frequency polygons.
Construct and interpret scatter diagrams, draw lines of best fit, describe correlation and make estimates.

Block 6 – Percentages 2

Percentages 2
Convert between percentages, fractions and decimals.
Calculate a percentage increase or decrease.
Use percentage to calculate proportion.
Work back to original value problems
Simple interest and financial maths.
Work out compound interest
Work out growth and decay of populations etc.

Foundation Block 7 – Using Formulae

Using Formulae
Derive a formula in words and symbols.
Translate simple situations or procedures into algebraic expressions or formulae
Expand single and double brackets and simplify.
Substitute into a formula
Change the subject of a formula
Use algebraic expressions involving surds

Block 7 – Expressions, Equations and Inequalities

Expressions, Equations and Inequalities
Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments
Solve equations; unknown on one/both sides, involving fractions and brackets.
Use trial and improvement to solve equations.
Understand and use the inequality signs.
Represent an inequality on a number line.
Solve linear inequalities in one variable.
Simplify and manipulate expressions (including those involving surds) by expanding double brackets
Factorising expressions of form $x^2+bx + c$, including the difference of two squares
Solve quadratic equations by factorising

Block 7 – Area and Volume

Area and Volume
Calculate the area of parallelograms and trapezia.
Calculate the volume of a cuboid.
Calculate the volume of a prism.
Calculate the volume of cylinders.
Calculate the surface area of spheres, pyramids, cones and composite solids

Foundation Block 8 – Ratio and Proportion

Ratio and Proportion
Simplify ratios
Divide a quantity into two parts, or express the division of a quantity into two parts as a ratio
Use the unitary method.
Solve problems involving real context such as exchanging currencies.
Solve problems involving distance, speed and time.
Use compound measure such as rates of pay, unit pricing for example when answering best value questions

Block 8 – Transformations

Transformations
Reflect, rotate and translate a two dimensional shape in the coordinate axis.
Translate a shape and describe a translation using column vector notation.
Reflect a shape in a given line.
Rotate a shape about a point.

Enlarge a shape given a centre of enlargement and a positive or fractional scale factor of enlargement.

Enlarge a shape by a scale factor less than one.
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Determine the scale factor of enlargement of similar shapes.
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Block 8 - Locus

Locus

Solve problems involving loci, including intersecting loci.

Construct the bisector of an angle.

Construct the perpendicular bisector of a line.

Construct a perpendicular to a given line from/at a given point

Find the locus of a point which is a fixed distance from a point, a fixed distance from a line, equidistant from two points or two lines.

Block 8 - Pythagoras' Theorem

Pythagoras' Theorem

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| <ul style="list-style-type: none">▪ Know the formula for Pythagoras' and be able to prove it.▪ Calculate the hypotenuse of a right angled triangle.▪ Calculate one of the short sides. |
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Foundation Block 9 - Similar and Congruent Shapes

Similar and Congruent Shapes

Compare lengths area and volumes using ratio notation

Use basic congruence criteria for triangles (SSS, SAS, ASA, RHS)
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Find corresponding lengths in similar shapes
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Identify, describe and construct congruent and similar shapes, including on co-ordinate axes by considering rotation, reflection, translation and enlargement.
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Use angle facts, congruence etc. to obtain simple proofs.

Block 9 - Similar Triangles and Trigonometry

Similar Triangles and Trigonometry

Know the right angle trig ratios

Know exact values for sin and cos for 30° , 45° , 60° , 90° and exact value of tan for 30° , 45° , 60°

Use connections between angles and lengths in right angled triangles to calculate unknown angles and lengths
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Solve real life problems

Block 9 - Vectors

Vectors
Represent a vector diagrammatically and by column notation
Add and subtract vectors.
Multiply vectors by a scalar.

Block 10 - Graphs, Quadratics and Cubics

Graphs, Quadratics and Cubics
▪ Recognise, sketch and interpret graphs of straight lines and quadratic curves
▪ Recognise, sketch and interpret simple cubic functions and the reciprocal function $y = 1/x$ with $x \neq 0$
▪ Identify and interpret roots, intercepts of straight lines graphically.
▪ Identify and interpret roots, intercepts and turning points of quadratic functions graphically.
▪ Find approximate solutions using a graph
▪ Deduce roots of a quadratic algebraically

Block 10 - Simultaneous Equations

Simultaneous Equations
Solve simultaneous equations algebraically
Solve simultaneous equations graphically
Derive and solve simultaneous equations.
Interpret the solution of a pair of simultaneous equations

Block 10 - Direct and Inverse Proportion

Direct and Inverse Proportion
Solve problems involving direct and inverse proportion, including graphical and algebraic representations
Understand that X is inversely proportional to Y is equivalent to Y is proportional to $1/x$
Interpret equations that describe direct and inverse proportion
Recognise and interpret graphs that illustrate direct and inverse proportion

Block 10 - Probability

Probability
<ul style="list-style-type: none">▪ Enumerate sets and combinations of sets systematically using tables, grids and Venn diagrams
<ul style="list-style-type: none">▪ Calculate the probability of independent and dependent events, including using tree diagrams and other representations and know the underlying assumptions