

Unit 3 (Number and Algebra, Shape and Space) - Higher Topic Checklist

Number and Algebra

- **Number:** Add, subtract, divide and multiply integers, including negatives
Multiply or divide any number by a number between 0 and 1
- **Ratio and Proportion:** Divide a quantity into a given ratio (e.g. £15 in a ratio of 1:2)
Simplifying ratios
Ratio notation – maps and scale drawings
- **Fractions:** Calculate a fraction of an amount
Convert simple fractions to decimals
Add, subtract, multiply and divide fractions
Addition, subtraction, multiplication and division of mixed numbers
Convert simple fractions to percentages (and vice versa)
Reciprocals
- **Percentages:** Percentages in real life – simple interest, VAT, compound interest
Percentage increase and decrease (e.g. 30% increase on £150)
Percentage of an amount
Reverse percentage problems
- **Powers:** Indices – The Laws of Indices
Standard index form
Inverse operations
Multiplication and division of fractional and negative powers
- **Algebra:** Using expressions and formulae
Substituting values into an expression
Simplifying expressions
Expanding brackets
Writing formulae
Changing the subject of the formula – including cases where the subject occurs twice or where a power of the subject appears

Solve linear equations
Trial and improvement to solve equations
Linear inequalities in two variables, graphs of linear inequalities
Surds
Direct and inverse proportion
Solve quadratic equations – factorisation, completing the square, using the quadratic formula
Simultaneous equations – including where one is a quadratic and how to solve graphically
Exponential growth and decay
- **Graphs:** Line of best fit through a set of points
Linear graphs ($y = mx + c$) – gradients, find the equation of a straight line
Gradients of parallel lines and perpendicular lines
Plot simple quadratic functions
Approximate solutions of a quadratic equation from its graph
Plot real-life graphs - e.g. distance-time, velocity-time
Interpret graphs e.g. describe trends, distance-time graphs, conversion graphs, height against age, real-life graphs

Plot cubic functions
Plot the reciprocal function $y = 1/x$
Plot the exponential function $y = k^x$
Plot the circular functions $y = \sin x$ and $y = \cos x$

Shape, Space and Measure

- **Measurements:** Conversion between metric and common imperial units
Accuracy - draw lines to the nearest mm and angles to the nearest degree
Convert between area measures – square centimetres and square metres
Convert between volume measures – cubic centimetres and cubic metres
- **2D and 3D Shapes:** Congruence
Area of a triangle and parallelogram
Surface area and volume of cuboids, prisms, cones and spheres
Solving problems using frustums of cones
2D representation of 3D shapes – nets, plans and elevations
Surface area and volume of a cylinder
Use of π in calculations, without a calculator
- **Triangles:** SSS.SAS.ASA and RHS to prove congruence of triangles
Pythagoras' theorem – including 3D problems
Trigonometry in right-angled triangles – including 3D problems
Area of a triangle using $\frac{1}{2} ab \sin C$
Graphs of trigonometric functions
Sine and Cosine rules
- **Circles** Circumference and area of a circle
Sectors of a circle
Angle properties inside a circle
Alternate segment theorem
Calculate the lengths of arcs and areas of sectors of circles
- **Angles:** Angle properties of triangles and quadrilaterals
Angles of regular polygons – interior and exterior angles
- **Transformations:** Symmetry
Rotations
Rotational symmetry
Reflections on a coordinate grid
Translations – distance and direction, vector notation
Enlargements – centre of enlargement, use of scale factors including positive fractional and negative scale factors
- **Vectors:** Adding and subtracting vectors
Scalar multiple of a vector
Calculate the resultant of two vectors
Solving 2D geometrical problems using vectors
- **Construction:** Triangles
Perpendicular bisector of a line
Perpendicular from a point on the line
Perpendicular from a point to a line
Bisector of an angle
- **Coordinates:** Identify the coordinates of the midpoint of a line segment in 3D
Coordinate geometry of a circle – $x^2 + y^2 = r^2$ (where r = radius of circle)