



A Level Maths Checklist (Year 1)

Prior knowledge

- Algebraic manipulation:
 - Indices, including negative and fractional
 - Expanding brackets and factorising
 - Surds including rationalising the denominator
- Quadratics:
 - Completing the square including understanding what it indicates on the quadratic graph
 - Solving quadratic equations including quadratic factorisation, quadratic formula, completing the square
 - Simultaneous equations: solving linear, quadratic and more complicated
- Inequalities:
 - Solving linear inequalities
 - Representing and solving linear inequalities graphically
- Straight Line Graphs:
 - Understanding the equation $y=mx+c$, what 'm' and 'c' mean. Calculating the equation of a straight line from two sets of coordinates, a parallel line and a coordinate, a perpendicular line and a coordinate etc.
 - Understanding relationship between the gradient of parallel and perpendicular lines
- Harder graphs:
 - Familiarity with graphs such as cubic, quartic, reciprocal (including $1/x^2$)
 - Understanding and finding points of intersection of linear and harder graphs
 - Graph transformations - stretching, translating, reflecting
- Trigonometry:
 - SOHCAHTOA
 - Sine and cosine rules
 - Area of a triangle
- Statistics:
 - Mean, median, mode
 - Box plot
 - Cumulative frequency
 - Histograms
 - Probability: tree diagrams, Venn diagrams
- Mechanics:
 - Basic vectors
 - Understanding quantities and units



Core Maths

- ❑ Algebra:
 - ❑ Algebraic fractions - manipulation and simplification
 - ❑ Polynomial division - long hand but also by inspection methods
 - ❑ The Factor Theorem
 - ❑ Binomial expansion
 - ❑ Quadratics - the discriminant and how to use it
 - ❑ Quadratic inequalities
- ❑ Circles:
 - ❑ Equation of a circle including finding the coordinates of the centre and radius
 - ❑ Finding the points of intersection of a straight line and circle. Number of intersection points (e.g. 2 points or 1 point if it is a tangent). Including link to the discriminant
 - ❑ Solving circles questions using geometry - e.g. right angles triangles, the coordinates of the centre etc.
 - ❑ Finding the equation of a tangent to the circle using the coordinates of the centre and a point on the circle
- ❑ Trigonometry:
 - ❑ Graphs of trigonometric functions, including transformations of trig graphs
 - ❑ Exact trigonometric ratios and how to remember them
 - ❑ Trigonometric identities, including remembering which aren't in formula booklet
 - ❑ Difference between a trig **identity** and **equation**
 - ❑ Proving trig identities
 - ❑ Solving trig equations
- ❑ Vectors
 - ❑ Understanding vector notation, including column vectors and **i, j, k** notation, position vectors
 - ❑ Understanding what a vector is (magnitude (including modulus notation) and direction)
 - ❑ How to solve vector problems using algebra or geometry as appropriate
- ❑ Differentiation
 - ❑ Differentiating tells us the gradient of a curve - this is the same as the gradient of a tangent at that point
 - ❑ How to differentiate standard polynomials - including using index notation to differentiate roots and $1/x^n$ etc
 - ❑ Using a differentiation to find the equation of a tangent and normal
 - ❑ Increasing and decreasing functions
 - ❑ Second derivatives
 - ❑ Stationary points
 - ❑ Convex and concave



- ❑ Integration
 - ❑ How to integrate standard polynomials
 - ❑ Indefinite integrals (always add +c), definite integrals
 - ❑ Integration to find the area under a curve, note: the area is negative if the curve is below the x-axis
 - ❑ How to find the area between two curves or a curve and a line
- ❑ Exponentials and Logarithms
 - ❑ What is an exponential function, including $y=e^x$
 - ❑ Logarithms as a function (inverse function of an exponential), including natural logarithms (ln)
 - ❑ Laws of logs
 - ❑ Using logarithms in non-linear data

Statistics

- ❑ Statistical Data Collection:
 - ❑ Understanding what a population is and what a sample is
 - ❑ Sampling techniques - strengths and weaknesses of each technique, including non-random sampling
 - ❑ Large Data Set (understand the large data set for the exam and what types of questions may be asked relating to it)
- ❑ Understanding location and spread of data:
 - ❑ Understanding the types of average (see previous knowledge), quartiles and percentiles and the inter quartile range, outliers
 - ❑ Variance and standard deviation - understand what they are and how to calculate them
 - ❑ Linear interpolation methods for grouped data
- ❑ Correlation:
 - ❑ Understanding correlation and regression
- ❑ Probability:
 - ❑ Calculating probabilities using appropriate methods
 - ❑ Mutually exclusive and independent events
- ❑ Statistical Distributions:
 - ❑ Probability distributions
 - ❑ Binomial distribution
 - ❑ Cumulative probabilities in distributions
- ❑ Hypothesis Testing:
 - ❑ What is hypothesis testing?
 - ❑ How to find critical values
 - ❑ One and two tailed tests



Mechanics

- ❑ Kinematics:
 - ❑ Constant acceleration \Rightarrow SUVAT (including motion due to gravity)
 - ❑ Plotting and interpreting displacement-time and velocity-time graphs
 - ❑ Variable acceleration (when acceleration is a function of time) \Rightarrow solve by differentiating or integrating with respect to time
- ❑ Forces and motion:
 - ❑ Drawing force diagrams
 - ❑ Normal reaction force: always perpendicular to direction of potential movement
 - ❑ $F=ma$
 - ❑ Motion in two dimensions (without resolving - no slopes)
 - ❑ Connected particles - pulley questions