# AS Level Maths Topic List

## Pure Maths

| Topics | Revised |
|---|---|
| **Proof** | |
| Proof by deduction | |
| Proof by exhaustion | |
| Disproof by counter example | |
| **Algebra and functions** | |
| Laws of indices | |
| Manipulate surds and rationalise denominators | |
| Quadratic graphs | |
| The discriminant | |
| Factorise by completing the square | |
| Stealth quadratics | |
| Simultaneous equations (both linear) | |
| Simultaneous equations (one linear, one non-linear) | |
| Solve linear inequalities | |
| Solve quadratic inequalities | |
| Use set notation to express solutions to inequalities | |
| Represent linear and quadratic inequalities graphically | |
| Expand multiple brackets | |
| The factor theorem | |
| Factorise polynomials | |
| Simplify rational expressions by factorising, cancelling and algebraic division | |
| Use factorisation to simplify algebraic fractions | |
| Use algebraic division | |
| Sketch the graphs of simple equations, including polynomials | |
| Sketch the graphs of reciprocal functions ($\frac{1}{x}$ and $\frac{1}{x^2}$) | |
| Transformations of graphs | |
| **Coordinate geometry** | |
| Parallel and perpendicular lines | |
| Equations of straight lines, in the form $ax + by + c = 0$ and $y = mx + c$ | |
| Equations of circles, in the form $(x - a)^2 + (y - b)^2 = r^2$ | |
| Apply circle theorems to circles, their tangents and chords | |
| **The Binomial Expansion** | |
| Expand $(a + bx)^n$, where $n$ is a positive integer | |
| Solve problems by using and applying the binomial expansion | |

| **Trigonometry** | |
|---|---|
| Sine rule, cosine rule and area of any triangle | |
| Sine, cosine and tangent graphs | |
| Know and use trigonometric identities | |
| Solve trigonometric equations in a given interval | |
| **Exponentials and logarithms** | |
| Functions of the form $e^x$ and $a^x$, where $a$ is positive | |
| Use $\log_a x$ as the inverse of $a^x$ | |
| Understand the function $\ln x$ | |
| Laws of logarithms | |
| Solve exponential equations | |
| Model exponential growth and decay | |
| Logarithmic graphs of the form $y = ba^x$ and $y = bx^a$ | |
| **Differentiation** | |
| Interpret the derivative of f($x$) as the rate of change (gradient) of $y$ = f($x$) | |
| Differentiation from first principles | |
| Differentiate functions of the form $x^n$, where $n$ is a positive integer | |
| Differentiate functions of the form $x^n$, where $n$ is negative or fractional | |
| Find the equations of tangents and normals | |
| Find maxima, minima and stationary points | |
| Identify increasing and decreasing functions | |
| Use modelling and differentiation in applied situations | |
| **Integration** | |
| Fundamental Theorem of Calculus | |
| Integrate functions of the form $x^n$ | |
| Evaluate definite integrals | |
| Use integration to find areas between curves and the $x$-axis | |
| Use vectors to find areas between curves and straight lines | |
| **Vectors** | |
| Use vectors in 2D | |
| Calculate the magnitude and direction of 2D vectors | |
| Vector addition and multiplication by a scalar | |
| Position vectors | |
| Convert between component form and magnitude/direction form | |
| Solving geometric problems using vectors | |

## Statistics

Throughout all of these topics, you should ensure you are familiar with the keywords relating to statistics.

| Topics | Revised |
|---|---|
| **Sampling** | |
| Understand and use sampling techniques | |
| Compare sampling techniques | |
| **Data presentation and interpretation** | |
| Draw and interpret histograms | |
| Draw and interpret box plots | |
| Draw and interpret scatter diagrams and regression lines | |
| Understand and interpret correlation | |
| Calculate measures of location (mean, median and mode) | |
| Calculate measures of spread (range and interquartile range) | |
| Calculate standard deviation | |
| Identify outliers and clean data | |
| **Probability** | |
| Venn diagrams | |
| Mutually exclusive and independent events | |
| Discrete and continuous distributions | |
| **Statistical distributions** | |
| Simple, discrete probability distributions | |
| Binomial distributions | |
| **Statistical hypothesis testing** | |
| Conduct 1- and 2-tail binomial hypothesis tests | |
| Evaluate critical regions and values | |
| Understand significance levels | |

## Mechanics

Throughout all of these topics, you should ensure you are familiar with the keywords and units relating to mechanics.

| Topics | Revised |
|---|---|
| **Kinematics** | |
| Displacement-time graphs | |
| Velocity-time graphs | |
| Constant acceleration equations (SUVAT) | |
| Motion due to gravity | |
| Variable acceleration formulae | |
| **Forces and Newton's laws** | |
| Force diagrams | |
| Newton's first law | |
| Newton's second law | |
| Newton's third law | |
| Connected particles | |
| Smooth pulleys | |