A Level Maths Checklist (Year 2)

Core Maths

- ❏ Algebra:
  - ❏ Proof - including exhaustion, contradiction, algebraic etc (include 'prove that $\sqrt{2}$ is an irrational number' etc)
  - ❏ Algebraic fractions -multiply, divide, add, subtract
  - ❏ Partial fractions - including repeated factors
  - ❏ Algebraic long division
- ❏ Functions:
  - ❏ Understanding function notation
  - ❏ Composite and inverse functions
  - ❏ The modulus function, including $y=|f(x)|$ and $y=f(|x|)$
  - ❏ Harder graph transformations - including composite transformations
- ❏ Sequences and Series:
  - ❏ Arithmetic sequences/series
  - ❏ Geometric sequences/series, including the sum to infinity (and when it is applicable)
  - ❏ Recurrence relations (sequences where each subsequent term is defined as a function of the previous term)
- ❏ Binomial Expansion:
  - ❏ Expanding $(1+x)^n$ - n may be fractional or negative
  - ❏ Expanding $(a+bx)^n$ - factorising out correctly
  - ❏ Combine binomial expansion with partial fractions to allow expansion of more complicated functions
- ❏ Radians and Circles:
  - ❏ Definition of a radian and converting between degrees and radians
  - ❏ Calculating arc length and areas of sectors and segments in radians
  - ❏ Solving trigonometric equations in radians
  - ❏ Small angle approximations
- ❏ Trigonometry:
  - ❏ Definitions and graphs of sec x, cosec x, and cot x
  - ❏ Trigonometric identities - including how to use $\sin^2 x + \cos^2 x = 1$ to derive equations in $\csc^2 x$, $\cot^2 x$, $\tan^2 x$ and $\sec^2 x$
  - ❏ Addition formulae (in formula booklet)
  - ❏ Double angle formulae - including how to derive them from the addition formulae
  - ❏ Using the given identities to prove further trigonometric identities and solve trigonometric equations
  - ❏ Simplifying $a \cos x \pm b \sin x$
- ❏ Parametric Equations:
  - ❏ Understanding what parametric equations are and how to convert to cartesian equations, including trigonometric parametric equations
  - ❏ Sketching curves
  - ❏ Finding points of intersection

- ❏ Differentiation:
  - ❏ Differentiating sin x, cos x, exponentials and ln
  - ❏ The product rule
  - ❏ The quotient rule (in formula book)
  - ❏ The chain rule
  - ❏ Differentiating parametric functions
  - ❏ Implicit differentiation
  - ❏ Rates of change
- ❏ Integration:
  - ❏ Integrating a standard functions (reverse of differentiating)
  - ❏ Integrating f(ax + b)
  - ❏ Using trigonometric identities to help integrate $\sin^2 x$, $\cos^2 x$ etc
  - ❏ Integrating $\frac{f'(x)}{f(x)}$ and reverse chain rule
  - ❏ Integration by substitution
  - ❏ Integration by parts (in formula book)
  - ❏ Integrating with partial fractions
  - ❏ Trapezium rule
  - ❏ Differential equations
- ❏ Numerical Methods:
  - ❏ Locating roots
  - ❏ Iteration
  - ❏ The Newton-Raphson method
- ❏ Vectors:
  - ❏ Vectors in 3D
  - ❏ Solving 3D vector questions
  - ❏ Finding the modulus of a 3D vector (extension of the modulus in 2D)

Statistics

- ❏ Correlation and Regression:
  - ❏ Exponential models and using logs
  - ❏ Measuring correlation
  - ❏ Hypothesis testing for zero correlation
- ❏ Conditional probability:
  - ❏ Set notation
  - ❏ Conditional probability including Venn diagrams
- ❏ Normal Distribution:
  - ❏ Understanding the concept of the normal distribution
  - ❏ Finding probabilities from the normal distribution
  - ❏ Inverse normal function
  - ❏ The standard normal distribution
  - ❏ How to find μ and σ
  - ❏ Using the normal distribution to approximate a binomial distribution - including continuity correction
  - ❏ Hypothesis testing with the normal distribution

Mechanics

- ❏ Forces and Friction:
    - ❏ Resolving forces - horizontally and vertically but also along the plane and perpendicular to the plane for inclined plane questions
    - ❏ Friction and incorporating it into F=ma questions (sometimes easiest to remember ΣF=ma to remember that it is the resultant force we are using in F=ma questions)
    - ❏ Harder questions on static particles
    - ❏ Friction for static particles
    - ❏ Harder connected particles questions including friction and resolving along a plane
- ❏ Moments:
    - ❏ Understanding what a moment is, including the resultant moment and how to resolve if the force isn't perpendicular to lever
    - ❏ Moments for objects in equilibrium (including harder questions such as ladder against a wall type questions where resultant forces are 0 and resultant moment is 0)
    - ❏ Centre of mass
    - ❏ Tilting and 'on the point of tilting' questions
- ❏ Further Kinematics:
    - ❏ Using vectors in kinematics questions (and in F=ma questions), including differentiating and integrating
    - ❏ Projectiles - link to first year kinematics - SUVAT
        - ❏ Considering the horizontal and vertical components - remember to resolve the initial velocity into horizontal and vertical components
        - ❏ Remember, horizontally a=0, so horizontally it is possible to apply speed=dist/time but SUVAT also fine
        - ❏ Using a vector method to solve projectiles questions