Core Mathematics C1 Specification.

1. Algebra and functions

- Laws of indices for all rational exponents. The equivalence of $a^{m/n}$ and $\sqrt[m]{a^n}$ should be known.
- Use and manipulation of surds. Candidates should be able to rationalize denominators.
- Quadratic functions and their graphs.
- The discriminant of a quadratic function.
- Completing the square. Solution of quadratic equations. Solution of quadratic equations by factorisation, use of the formula and completing the square.
- Simultaneous equations: analytical solution by substitution. For example, where one equation is linear and one equation is quadratic.
- Solution of linear and quadratic inequalities. For example, $ax + b > cx + d$, $px^2 + qx + r \geq 0$, $px^2 + qx + r < ax + b$.
- Algebraic manipulation of polynomials, including expanding brackets and collecting like terms, factorisation. Candidates should be able to use brackets. Factorisation of polynomials of degree n, $n \leq 3$, eg $x^3 + 4x^2 + 3x$. The notation f(x) may be used. (Use of the factor theorem is *not* required.)
- Graphs of functions; sketching curves defined by simple equations. Geometrical interpretation of algebraic solution of equations. Use of intersection points of graphs of functions to solve equations. Functions to include simple cubic functions and the reciprocal function $y = k/x$ with $x \neq 0$. Knowledge of the term asymptote is expected.
- Knowledge of the effect of simple transformations on the graph of y = f(x) as represented by $y = af(x)$, y = f(x) + a, y = f($x + a$), y = f(ax). Candidates should be able to apply one of these transformations to any of the above functions [quadratics, cubics, reciprocal] and sketch the resulting graph. Given the graph of any function y = f(x) candidates should be able to sketch the graph resulting from one of these transformations.

2. Coordinate geometry in the (x, y) plane

- Equation of a straight line, including the forms $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$.
- Conditions for two straight lines to be parallel or perpendicular to each other. To include (i) the equation of a line through two given points, (ii) the equation of a line parallel (or perpendicular) to a given line through a given point. For example, the line perpendicular to the line $3x + 4y = 18$ through the point (2, 3) has equation $y - 3 = (4/3)(x - 2)$.

3. Sequences and series

- Sequences, including those given by a formula for the nth term and those generated by a simple relation of the form x_{n+1} = f(x_n).
- Arithmetic series, including the formula for the sum of the first n natural numbers. The general term and the sum to n terms of the series are required. The proof of the sum formula should be known. Understanding of Σ notation will be expected.

4. Differentiation

- The derivative of f(x) as the gradient of the tangent to the graph of y = f (x) at a point; the gradient of the tangent as a limit; interpretation as a rate of change; second order derivatives. For example, knowledge that dy/dx is the rate of change of y with respect to x. Knowledge of the chain rule is not required. The notation f'(x) may be used.
- Differentiation of x^n and related sums and differences. E.g., for $n \neq 1$, the ability to differentiate expressions such as $(2x + 5)(x - 1)$ and $(x^2 + 5x - 3)/(2x^{1/2})$ is expected.
- Applications of differentiation to gradients, tangents and normals. Use of differentiation to find equations of tangents and normals at specific points on a curve.

5. Integration

- Indefinite integration as the reverse of differentiation. Candidates should know that a constant of integration is required. Integration of x^n. For example, the ability to integrate expressions such as $\frac{1}{2}x^2 - 3x^{-1}$ and $(x+2)^2/x^{1/2}$ is expected.
- Given f(x) and a point on the curve, candidates should be able to find an equation of the curve in the form y = f(x).