PART 1: The set of real numbers and its main subsets

• Sets, relations and functions.
• Axioms of real numbers.
• Elementary properties of ordered fields.
• Symmetric sets and functions. Absolute value and distance.
• Natural numbers. Subtraction in N; principle of well-ordering and its consequences.
• Sequences and recursion theorem (optional proof). Recursive definition of sums, products and powers.
• N^th powers, geometric sum and formula for a^n-b^n. Newton's binomial formula.
• Finite and infinite sets.
• Rational numbers. The rationals are countable. Gauss lemma.
• Least upper bound and greatest lower bound. Elementary consequences of the completeness axiom on integers.
• Roots. Powers with rational exponent.
• Monotone functions.

PART 2: Theory of limits
• The extended real system R*. Intervals and neighbourhoods.
• Internal, isolated, accumulation points. General definition of limit. Uniqueness of the limit.
• Sign permanence theorem. Comparison theorems.
• Side limits and monotone functions.
• Algebra of finite limits. Extended limit algebra.
• Some notable limits of sequences.
• The number of Nepero.
• Bridge theorem and characterisation of the sup / inf by sequences.
• Continuity: general considerations; theorem of existence of zeros. Intermediate value theorem.
• Classification of discontinuities.
• Limits for compound functions.
• Limits for inverse functions.
• A continuous and strictly monotone function on an interval admits a continuous inverse.
• Logarithms.

• Notable limits (exponential and logarithms).

PART 3: Series

• Numerical series: Elementary properties of series. Comparison criteria.
• Decimal expansions.
• Convergence criteria for series with positive terms.
• Criteria for series with real terms (Abel-Dirichlet, Leibniz).
• Exponential series. Irrationality of e. Speed of divergence of the harmonic series.
• Properties of trigonometric functions (in particular proof of the cosine addition theorem).
• Periodic functions. Monotonic properties of trigonometric functions.
• Inverse trigonometric functions.