Elementary logic and Algebra

- Quantifiers, propositional calculus (sentential logic)
- Argumentum ab absurdum (argument to absurdity), recursion
- Set and function terminology
- Sets N (natural integers), Z (all integers), Q (rational numbers): arithmetic and combinatorics
- Polynomials: arithmetic, Euclidian division, functions, roots

Probability and statistics

- Basic probability models
- Independent and dependent events
- Combinatorics (permutations and combinations)
- Random variables
- Standard discrete and continuous probability distributions (binomial, Normal, Poisson…)
- Descriptive statistics: measures of central tendency and dispersion, mean, median, mode, variance and standard deviation, skewness, flatness
- Central limit theorem
- Statistical estimation and testing
- Confidence intervals
- Basics of linear regression

Properties of the set R (Real numbers)

- Interval, neighbourhood, lower/upper bound
- Sequences: limit (Cauchy criterion), convergence, rate of convergence, recursion ($u_{n+1}=f(u_n)$)
- Numerical function of the real variable: continuity, differentiability, monotony and variations, limits, inverse functions, Taylor formulas and inequality, finite increments formula, finite expansions, integrability, integral calculus (Riemann), definite and indefinite integrals
- Usual functions

Complex numbers

- Properties of the set C (complex numbers)
- Arithmetic of complex numbers
- Complex numbers and trigonometric functions
- Usual complex functions (exponentials, hyperbolic functions…)

Linear algebra / finite dimensional vector spaces

- Vector spaces, linear maps, vector basis and space dimensions,
- Matrices, determinant, rank, cofactors, trace, operations on matrices
- Linear systems of equations
- Endomorphisms
- Eigenvalues, Eigenvectors, characteristic polynomial of a system, Cayley-Hamilton theorem, diagonalization

Finite dimensional Euclidean spaces (mainly R^2 and R^3)

- Scalar products, norms, distance, Cauchy-Schwarz inequality, orthonormal basis and orthonormalization, cross product
- Orthogonal matrices, diagonalization of symmetric real matrices
- Definition of the space L^2 (space of square-integrable functions): orthonormal basis in L^2, Legendre polynomials, basis of trigonometric functions
- Notions about Fourier series and Fourier transformation

Analysis

- Rational functions and their decomposition, calculus of primitives, integral defined on a closed bounded interval, numerical methods, Taylor's formula with integral remainder, multiple integrals (functions of 2 or 3 variables), computation via successive integrations and change of variables formula
- Vector valued function of the real variable in R^2 and R^3: partial derivatives, differential, chain rule, and linear tangent application
- Taylor formula of order 2: application to local extrema
- Parametric curves in R^2 and R^3
- First and second order linear differential equations
- Path, surface and volume integral

Numerical series

- Series of real or complex numbers, simple and absolute convergence
- Power series, radius of convergence
- Functions expandable in a power series on an interval
- Taylor series expansion of usual functions
- Sequences and series of functions of the real variable, entire series, application to Fourier series
- Simple, absolute, uniform and normal convergence
- Integrals over a real interval, integrals depending on a parameter
- Cauchy-Schwarz inequality
- Fourier, Laplace