Changes to AS/A level Mathematics – first teaching September 2017

AS Pure: In
- $y = e^x$ and $y = \ln x$ including (informally) differentiating $y = e^{kx}$;
- use of exponential growth and decay in modelling
- use of logarithmic graphs to estimate parameters in relationships of the form $y = ax^n$ and $y = kb^x$
- differentiation from first principles
- vectors in 2D, not including scalar product

AS Pure: Out
- no series work except binomial expansion (all in full A level only)
- no radian measure (now in full A level only)
- no trapezium rule (now in full A level only)
- no remainder theorem

Full A level Pure: In
- proof by contradiction (including specific examples of irrationality of √2 and infinity of primes)
- use of functions in modelling, including consideration of limitations and refinements of models
- all work on series is now in full A level only
- small angle approximations for sin, cos and tan
- exact values for sin, cos and tan
- proofs of addition formulae
- find your own substitutions for integration (simple)
- Newton-Raphson method
- trapezium rule

Full A level Pure: Out
- no volumes of revolution (now in FM)
- no vector equations of lines
- no scalar product

Statistics (AS)
- sampling techniques
- interpreting diagrams
- interpreting (but not calculating) regression lines
- measures of central tendency and variation, including calculating standard deviation
- binomial distribution as a model
- hypothesis testing using binomial model
- use of large data sets (may be provided by exam boards); use of technology to explore/interpret them

Statistics (Full A level only)
- conditional probability, Venn diagrams
- modelling with probability
- the normal distribution
- hypothesis testing with correlation coefficients (not including calculating them)
- hypothesis tests for the mean of a Normal distribution with known, given or assumed variance
- interpretation in context

Mechanics (AS)
- vectors in 2D
- suvat equations
- displacement/time and Velocity/time graphs, gradients and areas
- use calculus in kinematics
- Newton's laws
- motion in a straight line, including motion under gravity
- equilibrium (simple cases)

Mechanics (Full A level only)
- projectile motion
- resolving forces
- dynamics for motion in a plane
- friction
- moments in simple static contexts

For more detail see: www.gov.uk/government/publications/gce-as-and-a-level-mathematics

Changes to AS/A level Further Mathematics – first teaching September 2017

A level Further Mathematics must contain all the material below and this should comprise approximately 50% of its content. At least 30% of the content of any AS Further Mathematics specification must be taken from the material below including all the compulsory content for AS Further Mathematics and some additional material from the full A level compulsory content (selected by awarding bodies).

AS Further Mathematics: Compulsory content
- Complex Numbers
    - Solving any quadratic
    - Four operations: $+$, $-$, $\times$, $\div$
    - Polynomial equations – roots in conjugate pairs
    - Argand diagrams
    - Modulus-argument form and conversion
    - $\times$ and $\div$ in mod-arg form, including use of radians and compound angle formulae
    - Simple loci
- Matrices
    - Operations: $+$, $-$, $\times$
    - Linear transformations in 2D and some 3D (3D vectors assumed)
    - Successive transformations in 2D
    - Invariant points and lines
    - Determinants and inverses of 2×2 matrices
    - Roots and coefficients of polynomial equations up to quartics

A level Further Mathematics: Compulsory content
- Proof by induction (series, divisibility tests, matrices)
- Complex Numbers
    - De Moivre
    - $e^{i\theta}$
    - Complex roots
    - Geometrical problems
- Matrices
    - Determinants and inverses of 3×3 matrices
    - 3 linear simultaneous equations and geometrical interpretations
- Standard formulae for sums of series
- Method of differences including partial fractions
- Maclaurin series including awareness of validity
- Vectors
    - Equation of line in 3D and plane in vector and Cartesian forms
    - Scalar product and applications
    - Intersection of line and plane
    - Perpendicular distance between 2 lines, point to line, point to plane
- Calculus
    - Integration where integrand extends to infinity
    - Volumes of revolution
    - Mean value of a function
    - Integration using partial fractions with quadratic factors
    - Integration inverse trigonometric functions
    - Integration using trigonometric substitutions
    - Polar coordinates including area enclosed by polar curve
- Hyperbolic functions
    - Definitions of $\sinh x$, $\cosh x$ and $\tanh x$
    - Graphs
    - Differentiation and Integration
    - Inverse hyperbolic functions including logarithm forms
    - Integration with hyperbolic substitutions
- Differential equations
    - Integrating factor
    - General and particular solutions
    - Modelling
    - Second order equations (auxiliary equation for homogeneous equations; non-homogeneous equations using complementary function and particular integrals)
    - Simple harmonic motion equation (circular motion is not mentioned)
    - Model damped oscillations
    - Model situations with 1 independent and 2 dependent variables as a pair of coupled 1st order simultaneous equations: e.g. predator/prey

For more detail see: www.gov.uk/government/publications/gce-as-and-a-level-further-mathematics