Subject: A-Level Further Mathematics	Exam Board: AQA 7367 (for this exam it is 7366)

For this exam https://www.aqa.org.uk/subjects/mathematics/as-and-a-level/further-mathematics-7366
For the A-Level exam in 2025 https://www.aqa.org.uk/subjects/mathematics/as-and-a-level/further-mathematics-7367

Revision List

Two 90-minute papers – Paper 1 is on Pure; Paper 2 is Mechanics and Statistics – Two 45-minute papers
Attached is the AS Specification – this is the revision list. It can be linked to the AS Guidance Document, coming soon

Useful revision resources

Websites

- TLMaths (tlmaths.com)
- MathsGenie (www.mathsgenie.co.uk)

Recommended Revision Guides

CGP A-Level Mathematics Revision Guide and Workbook (Edexcel version is suitable for AQA also)
CGP Textbook for Mathematics that you have
Kerboodle Textbook for AQA Further Mathematics

Recommended Calculators

Casio Classwiz EX-991 CW - available on Wisepay, CG-50 also available

Maths Sets

We have a Maths Sets available on Wisepay and are priced at £2, these come in an exam-friendly transparent pencil case

Revision Tips

Revision for Mathematics is based upon practice (and more practice). You need to be confident at the skills and concepts that make up the course in order to be able to work through the more challenging problems. Revision should be interactive, not just reading notes

Students can work through guidance document to identify areas that they are good at, alongside areas they are struggling with and need to work on

A potential plan of action would be

- Work through the guidance document – RAG the topics to indicate your level of understanding
- Work through maths problems and past papers.
- Do not just read your notes/revision guides as you need to practice your Maths skills.

3 Subject content

The subject content in sections A to H is compulsory for all students. Students must study two of the optional applications. The optional applications are mechanics (MA to MD), statistics (SA to SH) and discrete (DA to DG).

3.1 Overarching themes

AS specifications in further mathematics must require students to demonstrate the overarching knowledge and skills contained in sections **OT1**, **OT2** and **OT3**. These must be applied, along with associated mathematical thinking and understanding, across the whole of the detailed content set out in sections **A** to **DG**.

Appendix A sets out the mathematical notation that students are required to understand for this qualification. Appendix B sets out the mathematical formulae and identities students are required to use in this qualification. Further information is provided in the appendices.

3.1.1 OT1: Mathematical argument, language and proof

	Content
OT1.1	Construct and present mathematical arguments through appropriate use of diagrams; sketching graphs; logical deduction; precise statements involving correct use of symbols and connecting language, including: constant, coefficient, expression, equation, function, identity, index, term, variable.
OT1.2	Understand and use mathematical language and syntax as set out in the content.
OT1.3	Understand and use language and symbols associated with set theory, as set out in the content.
OT1.5	Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics.

3.1.2 OT2: Mathematical problem solving

	Content
OT2.1	Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved.
OT2.2	Construct extended arguments to solve problems presented in an unstructured form, including problems in context.
OT2.3	Interpret and communicate solutions in the context of the original problem.

	Content
OT2.6	Understand the concept of a mathematical problem solving cycle, including specifying the problem, collecting information, processing and representing information and interpreting results, which may identify the need to repeat the cycle.
OT2.7	Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics.

3.1.3 OT3: Mathematical modelling

	Knowledge/skill
OT3.1	Translate a situation in context into a mathematical model, making simplifying assumptions.
OT3.2	Use a mathematical model with suitable inputs to engage with and explore situations (for a given model or a model constructed or selected by the student).
OT3.3	Interpret the outputs of a mathematical model in the context of the original situation (for a given model or a model constructed or selected by the student).
OT3.4	Understand that a mathematical model can be refined by considering its outputs and simplifying assumptions; evaluate whether the model is appropriate.
OT3.5	Understand and use modelling assumptions.

3.2 Compulsory content

3.2.1 A: Proof

	Content
A1	Construct proofs using mathematical induction; contexts include sums of series, divisibility, and powers of matrices.

3.2.2 B: Complex numbers

	Content
B1	Solve any quadratic equation with real coefficients; solve cubic or quartic equations with real coefficients (given sufficient information to deduce at least one root for cubics or at least one complex root or quadratic factor for quartics).

	Content
B2	Add, subtract, multiply and divide complex numbers in the form $x + \mathrm{i}y$ with x and y real; understand and use the terms ‘real part’ and ‘imaginary part’.

	Content
B3	Understand and use the complex conjugate; know that non-real roots of polynomial equations with real coefficients occur in conjugate pairs.

	Knowledge/skill
B4	Use and interpret Argand diagrams.

	Content
B5	Convert between the Cartesian form and the modulus-argument form of a complex number (knowledge of radians is assumed).

	Content
B6	Multiply and divide complex numbers in modulus-argument form (knowledge of radians and compound angle formulae is assumed).

	Content
B7	Construct and interpret simple loci in the Argand diagram such as $\|z - a\| > r$ and $\arg(z - a) = \theta$ (knowledge of radians is assumed).

3.2.3 C: Matrices

	Content
C1	Add, subtract and multiply conformable matrices; multiply a matrix by a scalar.

	Content
C2	Understand and use zero and identity matrices.

	Content
C3	Use matrices to represent linear transformations in 2D; successive transformations; single transformations in 3D (3D transformations confined to reflection in one of $x = 0$, $y = 0$, $z = 0$ or rotation about one of the coordinate axes) (knowledge of 3D vectors is assumed).

	Content
C4	Find invariant points and lines for a linear transformation.

	Content
C5	Calculate determinants of 2 × 2 matrices.

	Content
C6	Understand and use singular and non-singular matrices; properties of inverse matrices. Calculate and use the inverse of non-singular 2 × 2 matrices.

3.2.4 D: Further algebra and functions

	Content
D1	Understand and use the relationship between roots and coefficients of polynomial equations up to quartic equations.

	Content
D2	Form a polynomial equation whose roots are a linear transformation of the roots of a given polynomial equation (of at least cubic degree).

	Content
D3	Understand and use formulae for the sums of integers, squares and cubes and use these to sum other series.

	Content
D4	Understand and use the method of differences for summation of series.

	Content
D6	Recognise and use the Maclaurin series for e^x, $\ln(1+x)$, $\sin x$, $\cos x$, and $(1+x)^n$, and be aware of the range of values of x for which they are valid (proof not required).

	Content
D8	Inequalities involving polynomial equations (cubic and quartic).

	Content
D9	Solving inequalities such as $\frac{ax+b}{cx+d} < ex+f$ algebraically.

	Content
D12	Graphs of rational functions of form $\frac{ax+b}{cx+d}$; asymptotes, points of intersection with coordinate axes or other straight lines; associated inequalities.

	Content
D13	Graphs of rational functions of form $\frac{ax^2+bx+c}{dx^2+ex+f}$, including cases when some of these coefficients are zero; asymptotes parallel to coordinate axes.

	Content
D14	Using quadratic theory (not calculus) to find the possible values of the function and coordinates of the stationary points of the graph for rational functions of form $\frac{ax^2+bx+c}{dx^2+ex+f}$

	Content
D15	Sketching graphs of curves with equation $y^2 = 4ax$, $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$, $xy = c^2$ including intercepts with axes and equations of asymptotes of hyperbolas.

	Content
D16	Single transformations of curves involving translations, stretches parallel to coordinate axes and reflections in the coordinate axes and the lines $y = \pm x$.

3.2.5 E: Further calculus

	Content
E2	Derive formulae for and calculate volumes of revolution.

	Content
E3	Understand and evaluate the mean value of a function.

3.2.6 F: Further vectors

	Content
F1	Understand and use the vector and Cartesian forms of an equation of a straight line in 3D.

	Content
F3	Calculate the scalar product and use it to calculate the angle between two lines.

	Content
F4	Check whether vectors are perpendicular by using the scalar product.

	Content
F6	Find the intersection of two lines. Calculate the perpendicular distance between two lines and from a point to a line.

3.2.7 G: Polar coordinates

	Content
G1	Understand and use polar coordinates and be able to convert between polar and Cartesian coordinates.

	Content
G2	Sketch curves with r given as a function of θ, including use of trigonometric functions.

3.2.8 H: Hyperbolic functions

	Content
H1	Understand the definitions of hyperbolic functions sinh x, cosh x and tanh x, and be able to sketch their graphs.

	Content
H3	Understand and be able to use the definitions of the inverse hyperbolic functions.

	Content
H4	Derive and use the logarithmic forms of the inverse hyperbolic functions.

	Content
H6	Understand and use $\tanh x \equiv \frac{\sinh x}{\cosh x}$ Understand and use $\cosh^2 x - \sinh^2 x \equiv 1$

3.3 Optional application 1 – mechanics

3.3.1 MA: Dimensional analysis

	Content
MA1	Finding dimensions of quantities; checking for dimensional consistency.

	Content
MA2	Prediction of formulae; finding powers in potential formulae.

3.3.2 MB: Momentum and collisions

	Content
MB1	Conservation of momentum for linear motion and cases where velocities are given as one or two dimensional vectors (resolving will not be required).

	Content
MB2	Coefficient of restitution and Newton's Experimental Law. Use in direct collisions and impacts with a fixed smooth surface (resolving will not be required).

	Content
MB3	Impulse and its relation to momentum (in one- or two-dimensions) (resolving will not be required). Use of $Ft = mv - mu$

	Content
MB4	Impulse for variable forces. One dimension only. Use of $I = \int F \mathrm{d}t$.

3.3.3 MC: Work, energy and power

	Content
MC1	Work done by a force acting in the direction of motion or directly opposing the motion.

	Content
MC2	Gravitational potential energy. Use in conservation of energy problems.

	Content
MC3	Kinetic energy. Use in conservation of energy problems.

	Content
MC4	Hooke's Law including using modulus of elasticity. Use of $T = kx$ or $T = \frac{\lambda}{l}x$

	Content
MC5	Work done by a variable force. Use of $WD = \int F \mathrm{d}x$. Use in conservation of energy problems.

	Content
MC6	Elastic potential energy using modulus of elasticity. Use of $EPE = \frac{kx^2}{2}$ and $EPE = \frac{\lambda x^2}{2l}$. Use in conservation of energy problems.

	Content
MC7	Power (resolving will not be required). Use of $P = Fv$

3.3.4 MD: Circular motion

	Content
MD1	Motion of a particle moving in a circle with constant speed (knowledge of radians assumed).

	Content
MD2	Understand the definition of angular speed. Use both radians and revolutions per unit time.

	Content
MD3	Relationships between speed, angular speed, radius and acceleration. Use of $v = r\omega$, $a = r\omega^2$ and $a = \frac{v^2}{r}$

3.4 Optional application 2 – statistics

3.4.1 SA: Discrete random variables (DRVs) and expectation

	Content
SA1	Understand DRVs with distributions given in the form of a table or function.

	Content
SA2	Evaluate probabilities for a DRV.

	Content
SA3	Evaluate measures of average and spread for a DRV to include mean, variance, standard deviation, mode and median.

	Content
SA4	Understand expectation and know the formulae: $\mathrm{E}(X) = \sum x_i p_i$; $\mathrm{E}\left(X^2\right) = \sum x_i^2 p_i$; $\mathrm{Var}(X) = \mathrm{E}\left(X^2\right) - (\mathrm{E}(X))^2$

	Content
SA5	Understand expectation of linear functions of DRVs and know the formulae: $\mathrm{E}(aX + b) = a\mathrm{E}(X) + b$ and $\mathrm{Var}(aX + b) = a^2\mathrm{Var}\left(X\right)$

	Content
SA6	Know the discrete uniform distribution defined on the set $\{1,2,\ldots,n\}$. Understand when this distribution can be used as a model.

	Content
SA7	Proof of mean and variance of discrete uniform distribution.

3.4.2 SB: Poisson distribution

	Content
SB1	Understand conditions for a Poisson distribution to model a situation. Understand terminology X~Po(λ) .

	Content
SB2	Know the Poisson formula and calculate Poisson probabilities using the formula or equivalent calculator function.

	Content
SB3	Know mean, variance and standard deviation of a Poisson distribution. Use the result that, if X~Po(λ) then the mean and variance of X are equal.

	Content
SB4	Understand the distribution of the sum of independent Poisson distributions.

	Content
SB5	Formulate hypotheses and carry out a hypothesis test of a population mean from a single observation from a Poisson distribution using direct evaluation of Poisson probabilities.

3.4.3 SC: Type I and Type II errors

	Content
SC1	Understand Type I and Type II errors and define in context. Calculate the probability of making a Type I error from tests based on a Poisson or Binomial distribution.

3.4.4 SD: Continuous random variables (CRVs)

	Content
SD1	Understand and use a probability density function, $\mathrm{f}(x)$, for a continuous distribution and understand the differences between discrete and continuous distributions.

	Content
SD2	Find the probability of an observation lying in a specified interval.

	Content
SD3	Find the median and quartiles for a given probability density function, $\mathrm{f}(x)$.

	Content
SD4	Find the mean, variance and standard deviation for a given pdf, $\mathrm{f}(x)$. Know the formulae $\mathrm{E}(X) = \int x\mathrm{f}(x)\mathrm{d}x$, $\mathrm{E}\left(X^2\right) = \int x^2\mathrm{f}(x)\mathrm{d}x$, $\mathrm{Var}(X) = \mathrm{E}\left(X^2\right) - \left(\mathrm{E}(X)\right)^2$

	Content
SD5	Understand the expectation and variance of linear functions of CRVs and know the formulae: $\mathrm{E}(aX + b) = a\mathrm{E}(X) + b$ and $\mathrm{Var}(aX + b) = a^2\mathrm{Var}\left(X\right)$ Know the formula $\mathrm{E}\left(\mathrm{g}(X)\right) = \int \mathrm{g}(x)\mathrm{f}\left(x\right)\mathrm{d}x$ Find the mean, variance and standard deviation of functions of a continuous random variable such as $\mathrm{E}\left(5X^3\right), \mathrm{E}\left(18X^{-3}\right), \mathrm{Var}\left(6X^{-1}\right)$

	Content
SD8	Know that if X and Y are independent (discrete or continuous) random variables then $\mathrm{E}(X + Y) = \mathrm{E}(X) + \mathrm{E}(Y)$ and $\mathrm{Var}(X + Y) = \mathrm{Var}(X) + \mathrm{Var}(Y)$

3.4.5 SE: Chi squared tests for association

	Content
SE1	Construction of $n \times m$ contingency tables.

	Content
SE2	Use of $\sum \frac{(O_i - E_i)^2}{E_i}$ as an approximate χ^2 statistic with appropriate degrees of freedom.

	Content
SE3	Know and use the convention that all E_i should be greater than 5.

	Content
SE4	Identification of sources of association in the context of a question.

3.4.6 SH: Confidence intervals

	Content
SH1	Construct symmetric confidence intervals for the mean of a normal distribution with known variance.

	Content
SH2	Construct symmetric confidence intervals from large samples, for the mean of a normal distribution with unknown variance.

	Content
SH3	Make inferences from constructed or given confidence intervals.