

2022 revision support for learners: Advanced Higher Mathematics

Guidance for the 2022 exam

The following tables list key areas that **will not** be covered in the 2022 Advanced Higher Mathematics exam. The topic and sub-topic areas are taken from the course content in the Advanced Higher Mathematics Course Specification.

You should use this information to help you plan your revision and prepare for the exam.

Calculus	
Skill	Explanation
Finding the derivative where relationships are defined implicitly	<ul style="list-style-type: none"> ◆ using differentiation to find the second derivative of a relationship defined implicitly ◆ using logarithmic differentiation; recognising when it is appropriate in extended products, quotients, and in functions where the variable occurs in an index
Finding the derivative where relationships are defined parametrically	<ul style="list-style-type: none"> ◆ applying parametric differentiation to motion in a plane, including instantaneous speed ◆ using differentiation to find the second derivative of a relationship defined parametrically
Applying differentiation to problems in context	<ul style="list-style-type: none"> ◆ applying differentiation to optimisation
Integrating expressions using standard results	<ul style="list-style-type: none"> ◆ using partial fractions to integrate proper or improper rational functions
Solving first-order differential equations with variables separable	<ul style="list-style-type: none"> ◆ finding general and particular solutions to equations that can be written in the form $\frac{dy}{dx} = g(x)h(y) \text{ or } \frac{dy}{dx} = \frac{g(x)}{h(y)}$

Algebra, proof and number theory	
Skill	Explanation
Finding the asymptotes to the graphs of rational functions	<ul style="list-style-type: none"> ◆ finding the vertical asymptote(s) to the graph of a rational function ◆ finding the non-vertical asymptote to the graph of a rational function
Investigating features of graphs and sketching graphs of functions	<ul style="list-style-type: none"> ◆ investigating points of inflection ◆ investigating features of graphs: <ul style="list-style-type: none"> ▪ points of inflection ▪ stationary points ▪ domain and range ▪ odd, even, or neither ▪ continuous or discontinuous ▪ extrema of functions: the maximum and minimum values of a continuous function f defined on a closed interval $[a, b]$ can occur at stationary points, end points, or points where f' is not defined ◆ sketching graphs using features given or obtained ◆ sketching related functions: <ul style="list-style-type: none"> ▪ modulus functions ▪ inverse functions ▪ functions differentiated ▪ translations and reflections
Expanding expressions using the binomial theorem	<ul style="list-style-type: none"> ◆ using the general term for a binomial expansion, finding a specific term in an expression
Finding the general term and summing arithmetic and geometric progressions	<ul style="list-style-type: none"> ◆ determining the sum to infinity of geometric series ◆ determining the condition for a geometric series to converge
Applying summation formulae	<ul style="list-style-type: none"> ◆ knowing and using sums of certain series, and other straightforward results and combinations of these
Disproving a conjecture by providing a counterexample	<ul style="list-style-type: none"> ◆ knowing and using the symbols \exists (there exists) and \forall (for all) ◆ giving the negation of a statement
Using indirect or direct proof in straightforward examples	<ul style="list-style-type: none"> ◆ proving a statement by contradiction ◆ using proof by contrapositive
Using Euclid's algorithm to find the greatest common divisor of two positive integers	<ul style="list-style-type: none"> ◆ expressing integers in bases other than 10 ◆ knowing and using the fundamental theorem of arithmetic

Matrices, vectors, and complex numbers	
Skill	Explanation
Using Gaussian elimination to solve a 3×3 system of linear equations	<ul style="list-style-type: none"> ◆ showing that a system of equations has no solutions (inconsistency) ◆ showing that a system of equations has an infinite number of solutions (redundancy) ◆ comparing the solutions of related systems of two equations in two unknowns and recognising ill-conditioning
Understanding and using matrix algebra	<ul style="list-style-type: none"> ◆ knowing and applying the properties of matrix addition and multiplication: <ul style="list-style-type: none"> ▪ $A + B = B + A$ (addition is commutative) ▪ $AB \neq BA$ (multiplication is not commutative in general) ▪ $(A + B) + C = A + (B + C)$ (associativity) ▪ $(AB)C = A(BC)$ (associativity) ▪ $A(B + C) = AB + AC$ (addition is distributive over multiplication) ◆ knowing and applying key properties of the transpose, the identity matrix, and inverse
Calculating the determinant of a matrix	◆ knowing and applying $\det(AB) = \det A \det B$
Finding the inverse of a matrix	<ul style="list-style-type: none"> ◆ knowing and using the inverse of a 2×2 matrix ◆ finding the inverse of a 3×3 matrix
Using transformation matrices	<ul style="list-style-type: none"> ◆ using 2×2 matrices to carry out geometric transformations in the plane — the transformations should include rotations, reflections, and dilatations ◆ applying combinations of transformations
Calculating a vector product	<ul style="list-style-type: none"> ◆ using a vector product method in three dimensions ◆ evaluating the scalar triple product $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$
Working with lines in three dimensions	<ul style="list-style-type: none"> ◆ finding the equation of a line in parametric, symmetric, or vector form, given suitable defining information ◆ finding the angle between the two lines in three dimensions ◆ determining whether or not two lines intersect, and, where possible, finding the point of intersection

Matrices, vectors, and complex numbers	
Skill	Explanation
Working with planes	<ul style="list-style-type: none"> ◆ finding the equation of a plane in vector, parametric, or Cartesian form ◆ finding the point of intersection of a plane with a line that is not parallel to the plane ◆ determining the intersection of two or three planes ◆ finding the angle between a line and a plane, or between two planes
Performing algebraic operations on complex numbers	<ul style="list-style-type: none"> ◆ finding the square root ◆ solving equations involving complex numbers
Performing geometric operations on complex numbers	<ul style="list-style-type: none"> ◆ plotting complex numbers in the complex plane (an Argand diagram) ◆ knowing the definition of modulus and argument of a complex number ◆ converting a given complex number from Cartesian to polar form and vice-versa ◆ applying de Moivre's theorem to find the nth roots of a complex number ◆ interpreting geometrically certain equations or inequalities in the complex plane by sketching or describing a straight line or circle that represents the locus of points that satisfy a given equation or inequality

Remember to look out for *Your Exams*. This guide contains essential information and rules that you need to know about SQA exams.