CONCEPTS FOR ADVANCED MATHEMATICS, C2 (4752) AS

Objectives

To introduce students to a number of topics which are fundamental to the advanced study of mathematics.

Assessment

Examination   (72 marks)
1 hour 30 minutes.
The examination paper has two sections.

Section A: 8-10 questions, each worth no more than 5 marks.
Section Total: 36 marks

Section B: three questions, each worth about 12 marks.
Section Total: 36 marks

Assumed Knowledge

Candidates are expected to know the content of Intermediate Tier GCSE and *C1*.

Subject Criteria

The Units *C1* and *C2* are required for Advanced Subsidiary GCE Mathematics in order to ensure coverage of the subject criteria.

The Units *C1, C2, C3* and *C4* are required for Advanced GCE Mathematics in order to ensure coverage of the subject criteria.

Calculators

In the MEI Structured Mathematics specification, no calculator is allowed in the examination for *C1*. For all other units, including this one, a graphical calculator is allowed.

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CONCEPTS FOR ADVANCED MATHEMATICS, C2		
Specification	**Ref.**	**Competence Statements**

		ALGEBRA
Logarithms.	C2a1	Understand the meaning of the word logarithm.
	2	Understand the laws of logarithms and how to apply them.
	3	Know the values of $\log_a a$ and $\log_a 1$.
	4	Know how to convert from an index to a logarithmic form and vice versa.
	5	Know the function $y = a^x$ and its graph.
	6	Be able to solve an equation of the form $a^x = b$.
	7	Know how to reduce the equations $y = ax^n$ and $y = ab^x$ to linear form and, using experimental data, to draw a graph to find values of a, n and a, b.

			SEQUENCES AND SERIES

Definitions of sequences.	C2s1		Know what a sequence of numbers is and the meaning of finite and infinite sequences.
	2		Know that a sequence can be generated using a formula for the kth term, or a recurrence relation of the form $a_{k+1} = \mathrm{f}(a_k)$.
	3		Know what a series is.
	4		Be familiar with $\sum$ notation.
	5		Know and be able to recognise the periodicity of sequences.
	6		Know the difference between convergent and divergent sequences.
Arithmetic series.	7		Know what is meant by arithmetic series and sequences.
	8		Be able to use the standard formulae associated with arithmetic series and sequences.
Geometric series.	9		Know what is meant by geometric series and sequences.
	10		Be able to use the standard formulae associated with geometric series and sequences.
	11		Know the condition for a geometric series to be convergent and be able to find its sum to infinity.
	12		Be able to solve problems involving arithmetic and geometric series and sequences.

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TRIGONOMETRY		
Basic trigonometry.	C2t1	* Know how to solve right-angled triangles using trigonometry.
The sine, cosine and tangent functions.	2	Be able to use the definitions of sin θ and cos θ for any angle.
	3	Know the graphs of sin θ, cos θ and tan θ for all values of θ, their symmetries and periodicities.
	4	Know the values of sin θ, cos θ and tan θ when θ is 0°, 30°, 45°, 60°, 90° and 180°.
Identities.	5	Be able to use $\tan \theta = \dfrac{\sin \theta}{\cos \theta}$ (for any angle).
	6	Be able to use the identity $\sin^2 \theta + \cos^2 \theta = 1$.
	7	Be able to solve simple trigonometric equations in given intervals.
Area of a triangle.	8	Know and be able to use the fact that the area of a triangle is given by $\frac{1}{2} ab \sin C$.
The sine and cosine rules.	9	Know and be able to use the sine and cosine rules.
Radians.	10	Understand the definition of a radian and be able to convert between radians and degrees.
	11	Know and be able to find the arc length and area of a sector of a circle, when the angle is given in radians.

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CONCEPTS FOR ADVANCED MATHEMATICS, C2		
Specification	**Ref.**	**Competence Statements**

		CALCULUS
The basic process of differentiation.	C2c1	Know that the gradient of a curve at a point is given by the gradient of the tangent at the point.
	2	Know that the gradient of the tangent is given by the limit of the gradient of a chord.
	3	Know that the gradient function $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ gives the gradient of the curve and measures the rate of change of y with respect to x.
Applications of differentiation to the graphs of functions.	4	Be able to differentiate $y = kx^n$ where k is a constant, and the sum of such functions.
	5	Be able to find second derivatives.
	6	Be able to use differentiation to find stationary points on a curve: maxima, minima and points of inflection.
	7	Understand the terms increasing function and decreasing function.
	8	Be able to find the equation of a tangent and normal at any point on a curve.
Integration as the inverse of differentiation.	9	Know that integration is the inverse of differentiation.
	10	Be able to integrate functions of the form kx^n where k is a constant and $n \neq -1$, and the sum of such functions.
	11	Know what are meant by indefinite and definite integrals.
	12	Be able to evaluate definite integrals.
	13	Be able to find a constant of integration given relevant information.
Integration to find the area under a curve.	14	Know that the area under a graph can be found as the limit of a sum of areas of rectangles.
	15	Be able to use integration to find the area between a graph and the x-axis.
	16	Be able to find an approximate value of a definite integral using the trapezium rule, and comment sensibly on its accuracy.

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		CURVE SKETCHING

Stationary points.	C2C1	Be able to use stationary points when curve sketching.
Stretches.	2	Know how to sketch curves of the form $y = a\,\mathrm{f}(x)$ and $y = \mathrm{f}(ax)$, given the curve of: $y = \mathrm{f}(x)$.