Advanced Subsidiary Mathematics
Module: Core Mathematics 1
Scheme of Work

1   Algebra and functions

What students need to learn:

Laws of indices for all rational exponents.	The equivalence of $a^{m/n}$ and $\sqrt[n]{a^m}$ should be known.
Use and manipulation of surds.	Students should be able to rationalise denominators.
Quadratic functions and their graphs.	
The discriminant of a quadratic function.	
Completing the square. Solution of quadratic equations.	Solution of quadratic equations by factorisation, use of the formula and completing the square.
Simultaneous equations: analytical solution by substitution.	For example, where one equation is linear and one equation is quadratic.
Solution of linear and quadratic inequalities.	For example, $ax + b > cx + d$, $px^2 + qx + r \geq 0$, $px^2 + qx + r < ax + b$.

Resources
- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 1 Ex 1A – 1N
- Additional exercises from other textbooks as required
- Autograph software for curve sketching/graph investigations etc
- MEI website
- Past examination papers/Solomon practice papers

Time allocated
2-4 weeks (3 hours per week)
dependent on strength of students' prior knowledge/skills

1   Algebra and functions (cont)

What students need to learn:

Algebraic manipulation of polynomials, including expanding brackets and collecting like terms, factorisation.	Students should be able to use brackets. Factorisation of polynomials of degree n, $n \leq 3$, eg $x^3 + 4x^2 + 3x$. The notation $f(x)$ may be used. (Use of the factor theorem is *not* required.)
Graphs of functions; sketching curves defined by simple equations. Geometrical interpretation of algebraic solution of equations. Use of intersection points of graphs of functions to solve equations.	Functions to include simple cubic functions and the reciprocal function $y = \dfrac{k}{x}$ with $x \neq 0$. Knowledge of the term asymptote is expected.
Knowledge of the effect of simple transformations on the graph of $y = f(x)$ as represented by $y = af(x)$, $y = f(x) + a$, $y = f(x + a)$, $y = f(ax)$.	Students should be able to apply one of these transformations to any of the above functions (quadratics, cubics, reciprocal) and sketch the resulting graph. Given the graph of any function $y = f(x)$ students should be able to sketch the graph resulting from one of these transformations.

Resources
- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 1 Ex 1O – 1T
- Additional exercises from other textbooks as required
- Autograph software for curve sketching and transformations of graphs
- MEI website
- PowerpointMaths: Graphs of related functions
- Past examination papers/Solomon practice papers

Time allocated
2 weeks

2   Coordinate geometry in the (x, y) plane

What students need to learn:

Equation of a straight line, including the forms $y - y_1 = m(x - x_1)$ and $ax + by + c = 0$.

To include:

(i) the equation of a line through two given points

(ii) the equation of a line parallel (or perpendicular) to a given line through a given point. For example, the line perpendicular to the line $3x + 4y = 18$ through the point $(2, 3)$ has equation $y - 3 = \dfrac{4}{3}(x - 2)$.

Conditions for two straight lines to be parallel or perpendicular to each other.

Resources
- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 2 Ex 2A – 2D
- Additional exercises from other textbooks as required
- Autograph software for revising straight line graphs and solving problems graphically
- MEI website
- Past examination papers/Solomon practice papers

Time allocated
1 - 2 weeks

3   Sequences and series

What students need to learn:

Sequences, including those given by a formula for the nth term and those generated by a simple relation of the form $x_{n+1} = f(x_n)$.

Arithmetic series, including the formula for the sum of the first n natural numbers.

The general term and the sum to n terms of the series are required. The proof of the sum formula should be known.

Understanding of Σ notation will be expected.

Resources
- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 3 Ex 3A – 3D
- Additional exercises from other textbooks as required
- MEI website
- Past examination papers/Solomon practice papers

Time allocated
1 - 2 weeks

4   Differentiation

What students need to learn:

The derivative of $f(x)$ as the gradient of the tangent to the graph of $y = f(x)$ at a point; the gradient of the tangent as a limit; interpretation as a rate of change; second order derivatives.

For example, knowledge that $\dfrac{dy}{dx}$ is the rate of change of y with respect to x. Knowledge of the chain rule is not required.

The notation $f'(x)$ may be used.

Differentiation of x^n, and related sums and differences.

For example, for $n \neq 1$, the ability to differentiate expressions such as $(2x + 5)(x - 1)$ and $\dfrac{x^2 + 5x - 3}{3x^{1/2}}$ is expected.

Applications of differentiation to gradients, tangents and normals.

Use of differentiation to find equations of tangents and normals at specific points on a curve.

Resources
- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 4 Ex 4A – 4F
- Additional exercises from other textbooks as required
- MEI website
- Past examination papers/Solomon practice papers

Time allocated
2 weeks

5   Integration

What students need to learn:

Indefinite integration as the reverse of differentiation.	Students should know that a constant of integration is required.
Integration of x^n.	For example, the ability to integrate expressions such as $\frac{1}{2}x^2 - 3x^{-\frac{1}{2}}$ and $\dfrac{(x+2)^2}{x^{\frac{1}{2}}}$ is expected.
	Given $f'(x)$ and a point on the curve, students should be able to find an equation of the curve in the form $y = f(x)$.

Resources

- Modular Mathematics for Edexcel: AS Pure Mathematics by John Sykes - Chapter 5 Ex 5A – 5D
- Additional exercises from other textbooks as required
- MEI website
- Past examination papers/Solomon practice papers

Time allocated
   1 - 2 weeks