OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL AS AND A-LEVEL MATHEMATICS

(9660)

Outline Schemes of Work

For teaching from September 2017 onwards
For AS exams in June 2018 onwards
For A2 exams in June 2019 onwards

Introduction

These outline schemes of work are intended to help teachers plan and implement the teaching of the Oxford AQA International A-level Mathematics specification. The purpose of these outline schemes is to provide advice and guidance to teachers, not to prescribe and restrict their approach to the specification. Each scheme has been produced by a practicing A-level Maths teacher. There are obviously many other ways of organising the work, and there is absolutely no requirement to use these schemes.

Scheme 1, International AS Maths with two teachers

It is assumed that there are a total for 4 to 4.5 hours per week of contact time and around 36 weeks in the academic year available for teaching. The scheme assumes equal contact time for the two teachers.

Date	Teacher A	Teacher B	Notes
Term 1 Year 12 First half term	Algebraic manipulation of polynomials (P1.1) Remainder theorem (P1.1) Factor theorem (P1.1) Factorisation of quadratic polynomials (P1.1) Completing the square (P1.1) Solution of quadratic equations (P1.1) Graphs of quadratic functions (P1.1) Effect of translations on quadratic graphs (P1.1) Geometrical interpretation of algebraic solutions (P1.1) Intersection of a straight line and a curve (P1.2) Simultaneous equations (P1.1) Discriminant of quadratic function (P1.1)	Probability (S1.1) Discrete random variables, variance and SD (S1.2) Laws of indices (P1.1) Surds (P1.1) Equation of a straight line (P1.2) Graphs of linear functions (P1.1) Parallel and perpendicular lines (P1.2) Motion in a straight line with constant acceleration (M1.1) Differentiation of polynomials (P1.3) Integration as anti-differentiation (P1.4) Motion in a straight line with variable acceleration (M1.2)	

Date	Teacher A	Teacher B	Notes
Second half term	Linear and quadratic inequalities (P1.1) Algebraic division (P1.1) Graphs of quadratic and cubic functions (P1.1) Geometrical interpretation of solutions of equations (P1.1) Sequences and series (P1.5) Applications of differentiation (P1.3) Area under curve and Trapezium Rule (P1.4)	Coordinate geometry of the circle (PP1.1) Equation of a circle (PP1.1) Effect of translations on circles (PP1.1) Equation of the tangent and normal (PP1.1) Discrete random variables (S1.2)	
Term 2	Sine and cosine rules (PP1.2) Area of a triangle (PP1.2) Degree and radian measure (PP1.2) Arc length, area of sector (PP1.2) $y = a^x$ and its graph (PP1.3) Logs and laws of logs (PP1.3) Solution of equations of the form $a^x = b$ (PP1.3) Sine, cosine and tangent functions (PP1.2) Use of tan $\theta = \frac{\sin\theta}{\cos\theta}$ and $\sin^2\theta + \cos^2\theta$, (PP1.2) Solution of trig equations (PP1.2) Effect of transformations on the graph of $y = f(x)$ (P1.5)	Binomial expansion (P1.5) Bernoulli and binomial distributions (S1.3) Forces and Newton's Laws (M1.3) Momentum and Impulse (M1.4)	Binomial: for weaker students, focus on the use of Pascal's triangle as a method of expansion
Term 3	Revision and working through International AS papers	Revision and working through International AS papers	

Scheme 2, International A-level Maths with two teachers

It is assumed that there are a total for 4 to 4.5 hours per week of contact time and around 36 weeks in the academic year available for teaching. It is also assumed that there is some teaching time after the International AS exams in year 12, though it is acknowledged that not all centres have this luxury. The scheme assumes equal contact time for the two teachers.

Date	Teacher A	Teacher B	Notes
After the International AS exams are finished	Numerical methods, iterative methods (P2.9) e^x and $\ln x$ (P2.5)	Definition of a function (P2.1) Domain and range (P2.1) Composition of functions (P2.1) Inverse functions and their graphs (P2.1) Modulus (P2.1)	Maximise the use of graphical packages in these areas.
Term 1 Year 13 First half term	Numerical Integration (P2.9) Integration - substitution, parts etc. (P2.7)	Partial Fractions (P2.1) Binomial series (P2.2) Differentiation - implicit, parametric etc. (P2.6) Combinations of transformations (P2.1)	
Second half term	Use of formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ (P2.4) Double angle formulae (P2.4) sec, cosec and cot (P2.4) Understanding of their domains and graphs (P2.4) Knowledge of $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$ functions (P2.4) Understanding of their domains and graphs (P2.4)	Applications module Statistics 2 or Mechanics 2	

Date	Teacher A	Teacher B	Notes
Term 2	Exponential growth and decay (P2.5) Differential equations (P2.8) Vectors (P2.10) Start revision for June entry	Continue with Statistics 2 or Mechanics 2	It is worth considering bringing Vectors (P2.10) into the Autumn term for those students who will be taking Mechanics 2 as their second application module. Suggest that in this situation Vectors would be taught by Teacher 2.
Term 3	Continue with revision programme	Revision for examinations in June	

Scheme 3, for International AS Pure Maths with two teachers

Teacher A

The number of hours is only a general indication. The specification gives more detail about the topics.

Topic	Notes	Hours
Use and manipulation of surds.	See specification for level of difficulty	2
Equation of a straight line. Conditions for lines to be parallel or perpendicular to each other. Midpoint of a line. Distance between two points.	$y = mx + c$, $y - y_1 = m(x - x_1)$, $ax + by + c = 0$ and graph of a straight line. Knowledge that the product of the gradients of perpendicular lines is -1 Problems using this knowledge. Graphical illustration.	3
Graphs of quadratic functions. Include use of f(x) notation. Factorisation of quadratic polynomials – use in solving quadratic equations. Completing the square. Use in solving quadratic equations and in finding maximum and minimum values of a quadratic polynomial. The graph of $y = (x - a)^2 + b$ as a translation of the graph $y = x^2$ Solving quadratic equations by formula. The discriminant of a quadratic function.	As the other techniques in this section are covered, they can be illustrated by reference to the graph. Note terms 'vertex' and 'line of symmetry' need to be known. See specification for level of difficulty. Include negative coefficients of x^2 and rearrangement of equations. See specification for level of difficulty. Include surd manipulation in solving equations. Formula needs to be learnt. Use in determining the number of real roots.	7
Solution of linear and quadratic inequalities.	Include surds in linear inequalities and in associated roots of the quadratic. Graphical illustration. Cover applications involving the discriminant eg determine the range of values of k for which $x^2 + (k + 2)x + (2k + 1) = 0$ has distinct real or non- real or equal roots.	3

Topic	Notes	Hours
Simultaneous equations including one linear and one quadratic. Intersection of two straight lines and of a straight line and the graph of a quadratic function.	Revise two linear equations by elimination and by substitution. Linear and quadratic mostly by substitution but cover cases when elimination is possible. Including the cases when the straight line is a tangent to the quadratic, intersects it at two distinct points and does not intersect it. Links with quadratic functions and quadratic inequalities.	3
Coordinate geometry of the circle $(x + a)^2 + (y + b)^2 = r^2$ as a translation of $x^2 + y^2 = r^2$ Graphs of circles. The equation of the tangent and normal at a given point to a circle. The intersection of a straight line and a circle.	Including the form $(x + a)^2 + (y + b)^2 = r^2$ using the distance formula and using completing the square to put the equation in this form to determine the coordinates of the centre and the radius. Calculus not required. Use of the coordinates of appropriate points to find gradients. Problems involving the use of: (i) the angle in a semicircle is a right angle; (ii) the perpendicular from the centre to a chord bisects the chord (iii) the tangent to a circle is perpendicular to the radius at the point of contact. Algebraic methods. Geometrical interpretation of equal roots, distinct real roots and no real roots. Links with quadratic functions and quadratic inequalities.	4
		22

Teacher B

The number of hours is only a general indication. The specification gives more detail about the topics.

Topic	Notes	Hours
Algebraic manipulation of polynomials, including expanding brackets and collecting like terms.	Include use of f(x) notation.	1
Simple algebraic division. Use of the factor theorem. Use of the remainder theorem	See specification for level of difficulty. Use in solving cubic equations. See specification for level of difficulty. Including questions such as eg find the values of p and q in f(x) = $x^3 + px^2 + qx + 8$ given ($x + 1$) is a factor and the remainder when f(x) is divided by 2 is 24.	4
Graphs of cubic functions.	Using the factor theorem.	1
Differentiation – general introduction to gradient of a curve. Differentiation of polynomials. Gradient of a curve.	Introduction to $\frac{dy}{dx}$ graphics calculator, zooming to illustrate linearity of graphs, although **not** tested on specification. Formula needs to be learnt.	3
Equations of tangents and normal.	Problems based on these and on coordinate geometry of a straight line.	2
Stationary points, maxima and minima. Use of second order derivatives.	Related to graphs and to optimising a single variable in a practical problem, eg maximizing volume of a cuboid etc. Refer back to sketching quadratics and extend sketching cubics to include max and min points. $\frac{d^2y}{dx^2} = \frac{dg}{dx}$ where g is the gradient function. Graphical illustration.	4

Topic	Notes	Hours
Increasing and decreasing functions.	Might be more logically covered before stationary points but need to be sure inequalities securely covered. Including general discussion of derivative as a rate of change and graphical illustration. Finding ranges of values for which a function is increasing/decreasing including for a cubic leading to a quadratic inequality.	2
Integration as the reverse of differentiation. Integration of polynomials.	Indefinite integration. Formula needs to be learnt. Include finding the equation of a curve given the gradient function and a point on the curve.	1
Area under a curve. Definite integration.	Including areas below the x-axis. Problems including composite areas and intersection of a straight line and a quadratic curve.	4
		22

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