AS/A2 Mathematics
D1: Achievement Indicators

Topic Area	Achievement Indicator
1: Algorithms	(a) understand the definition of an algorithm; (b) appreciate why an algorithmic approach to problem-solving is generally preferable to *ad hoc* methods, and understand the limitations of algorithmic methods; (c) understand the meaning of the order of an algorithm, and determine the order of a given algorithm in simple cases, including the algorithms for standard network problems; (d) interpret and apply simple algorithms defined by flow diagrams or given as a listing in words; (e) show familiarity with simple algorithms concerning sorting and packing, including (i) bubble and shuttle sorts, (ii) first-fit methods (first-fit and first-fit decreasing).
2: Graph Theory	(a) understand the meaning of the terms 'arc' (or 'edge'), 'node' (or 'vertex'), 'path', 'tree' and 'cycle'; (b) use the orders of the nodes in a graph to determine whether the graph is Eulerian or semi- Eulerian or neither; (c) solve simple problems involving planar graphs, both directed and undirected.
3: Networks	(a) recall that a network is a graph in which each arc is assigned a 'weight', and use networks as mathematical models; (b) apply Prim's and Kruskal's algorithms in solving the minimum connector problem to find a minimum spanning tree (including the use of a matrix representation for Prim's algorithm); (c) find a solution to the travelling salesperson problem in simple cases, and in other cases (i) determine an upper bound by using the nearest neighbour method, (ii) use short-cuts where possible to improve on an upper bound, (iii) use minimum connector methods on a reduced network to determine a lower bound; (d) use Dijkstra's algorithm to determine the shortest path between two nodes; (e) solve simple cases of the route inspection problem for at most six odd nodes by consideration of all possible pairings of the odd nodes.
4: Linear Programming	(a) formulate in algebraic terms a real-world problem posed in words, including the identification of relevant variables, constraints and objective function; (b) set up a linear programming formulation in the form 'maximise (or minimise) objective, subject to inequality constraints and trivial constraints of the form *variable*>0', and use slack variables to convert inequality constraints into equations together with trivial constraints; (c) carry out a graphical solution for 2-variable problems, including cases where integer solutions are required; (d) use the Simplex method for maximising an objective function, interpret the values of the variables and the objective function at any stage in the Simplex method.