DECISION MATHEMATICS 1, D1 (4771) AS

Objectives

To give students experience of modelling and of the use of algorithms in a variety of situations.

To develop modelling skills.

The problems presented are diverse and require flexibility of approach. Students are expected to consider the success of their modelling, and to appreciate the limitations of their solutions.

Assessment

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

Section A:	three questions, each worth 8 marks Section Total: 24 marks
Section B:	three questions each worth 16 marks Section Total: 48 marks

Assumed Knowledge

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

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.

DECISION MATHEMATICS 1, D1		
Specification	**Ref.**	**Competence Statements**
MODELLING		
The three units in Decision Mathematics are based on the use of the modelling cycle in solving problems		
The modelling cycle applied to real-world problems.	D1p1	Be able to abstract from a real world problem to a mathematical model.
	2	Be able to analyse the model appropriately.
	3	Be able to interpret and communicate results.
	4	Be able progressively to refine a model as appropriate.
ALGORITHMS		
Background and definition.	D1A1	Be able to interpret and apply algorithms presented in a variety of formats.
	2	Be able to develop and adapt simple algorithms.
Basic ideas of complexity.	3	Understand the basic ideas of algorithmic complexity.
	4	Be able to analyse the complexity of some of the algorithms covered in this specification.
GRAPHS		
Background and definitions.	D1g1	Understand notation and terminology.
Use in problem solving.	2	Be able to model appropriate problems by using graphs.
NETWORKS		
Definition.	D1N1	Understand that a network is a graph with weighted arcs
Use in problem solving.	2	Be able to model appropriate problems by using networks
The minimum connector problem.	3	Know and be able to use Kruskal's and Prim's algorithms
The shortest path from a given node to other nodes.	4	Know and be able to apply Dijkstra's algorithm

DECISION MATHEMATICS 1, D1		
Specification	**Ref.**	**Competence Statements**
LINEAR PROGRAMMING		
Linear inequalities in two or more variables.	D1L1	Be able to manipulate inequalities algebraically.
	2	Be able to illustrate linear inequalities in two variables graphically.
Formulation of constrained optimisation problems.	3	Be able to formulate simple maximisation of profit and minimisation of cost problems.
Solution of constrained optimisation problems.	4	Be able to use graphs to solve 2-D problems, including integer valued problems.
Algebraic interpretation of the graphical solution in 2 dimensions.	5	Be able to interpret solutions, including spare capacities.
CRITICAL PATH ANALYSIS		
Using networks in project management.	D1X1	Be able to construct and use a precedence network.
	2	Be able to construct and interpret a cascade chart.
	3	Be able to construct and interpret a resource histogram.
	4	Understand the use of alternative criteria in project optimisation.
	5	Be able to crash a network.

DECISION MATHEMATICS 1, D1		
Specification	**Ref.**	**Competence Statements**
SIMULATION		
Random variables.	D1Z1	Know how to generate realisations of a discrete uniformly distributed random variable.
	2	Be able to use random variables to model discrete non-uniform random variables.
Simulation modelling.	3	Be able to build and use simple models.
	4	Be able to interpret results.
	5	Understand the need for repetition.