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Examiners' Report

January 2010

GCE

Decision Mathematics D1 (6689)

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Decision Mathematics Unit D1
Specification 6689

Introduction

It was rare to see any questions where no attempt at all was made to answer them and it appeared that there was sufficient time to complete.

This paper proved very accessible to the candidates. All questions contained marks available to the E grade candidate. There seemed to be sufficient time to complete the paper.

Almost all the candidates tackled all the questions, but a few blank responses were seen, most often to Q5 and Q6(f).

Candidates are reminded that they should not use methods of presentation that depend on colour. This remains a particular problem in the questions on matchings (Q1 on this paper).

Candidates are advised to complete diagrams, such as in Q3(a) and Q6(c), in (dark) pencil.

Candidates are also reminded that this is a 'methods' paper. They need to make their method clear, 'spotting' the correct answer, with no working, rarely gains credit.

There was some evidence of weak or careless arithmetic, particularly in Q3(b) (e.g. 15 + 25 = 30) and poor use of calculators.

As always, some candidates are using methods of presentation that are too time-consuming. The space provided in the answer booklet and the marks allotted to each section should assist candidates in determining the amount of working they need to show.

Report on individual questions

Question 1

This proved a good starter, the mean score being 5 out of 6 marks. Almost all candidates were able to complete part (a) correctly but candidates are reminded that colour should not be used: Neither to distinguish arcs in a matching, nor when listing an alternating path. In part (b) most candidates were able to gain at least 4 of the 5 marks, a few losing one mark for not explicitly changing status. A few candidates tried to start an alternating path at an already matched node (often A), and some only found one alternating path. Some candidates showed a tree of possible paths but then did not make it clear which path they had chosen to use.

Question 2

The definitions in part (a) challenged many, particularly that of a 'connected graph' which challenged even the better candidates, with some defining a complete graph and others being unclear about the nature of the connection between nodes. There were the usual confusions of technical terms, 'nodes connected by vertices' etc. Part (b) was often correct, although often misspelled, but Prim and Dijkstra were also popular incorrect answers. Most candidates were able to make progress with part (c), but many lost marks because they did not list the **edges** in order of selection, or did not start at L as demanded in the question. The correct tree and its weight were often seen.

Question 3

This was generally well done, with most candidates using the boxes sensibly to make their working clear, however some candidates listed their working values in the wrong order and others did not state the correct order of labeling, with F and G often incorrectly ordered. The correct shortest path and its length were frequently seen. The method was usually correct, in part (b), with three pairs being found. However, only the better candidates got all three values correct. Few seemed to make use of the result found in part (a) with 37 frequently stated as the value of AH. This part also saw a proliferation of basic arithmetical errors. Values seen were AB+CH = 43, 44, 45, 46, 59; AC+BH = 42; AH+BC = 55, 59, 61, 62, 63, 64. Some went to the trouble of listing a possible route but then sometimes did not state its length.

Question 4

Many candidates scored at least 8 marks here. In part (a) a minority produced an ascending list and failed to reverse it. Some candidates did not choose their pivots consistently, swapping between middle right and middle left pivots. The decimals here caused some problems and even though the original list was printed in the answer booklet, a surprising number of candidates initially lost one item or changed one, most commonly 1.0 became 0.1. Some candidates found only one pivot per row, with some not explicitly choosing pivots when sublists of length 2 happened to be in order – most frequently the two 4.0s and the 1.0, 0.6 at the end. Good presentation, with a list spread evenly, in columns, across the page, helps here. (Vertical listing is rarely successful). Part (b) was generally well done, the two most popular errors being to put 0.6 in bin 5 or 0.4 in bin 5. A significant number who had sorted the numbers into increasing order in part (a) proceeded to use a "first fit increasing" method here. In part (c) most candidates calculated the lower bound correctly. Other candidates correctly stated that since the five largest items were over half a bin in size they could not share a bin, so at least 5 bins would be needed. A few simply stated 'yes' without justification, gaining no credit.

Question 5

This question proved accessible to almost all, with very many perfect solutions seen, an improvement in performance compared with previous examinations. There were only a handful of arithmetic errors here. Most candidates successfully completed the first few steps of the algorithm. The majority of errors arose from writing down the incorrect (size of) answer, e.g. -500 instead of -5000. There were some who inserted too many entries in the output column. Quite a few inserted an expression rather than an amount in then T column (e.g. 0.2R). Despite errors in the output, most realised that this was the amount they had to show for the amount of income tax paid, earning a follow through mark in part (b). In part (c) many stated that the maximum was £7999.99 rather than the £8000.

Question 6

Many scored 12 out of 15 marks demonstrating good knowledge and understanding here. Part (a) discriminated well between the many who gained 1 mark and the few who communicated full understanding clearly, to score 2. The majority of candidates achieved at least a mark for 'dummy' or the fact that E was dependent on A and B. The 2nd B mark was often lost because there was no reference to C and D being dependent upon A only. In part (b) most correctly completed the precedence table, with the most frequent errors at G. Almost all filled in all the early times correctly in (c), but there were many errors in the late times, usually a 5 at event 2 and a 9 at event 4 due to a failure to deal correctly with the dummy activities. The cascade charts in part (e) were generally good, with most frequent errors in the floats on A and C arising from (d). Only a few incorrectly attempted schedules, an improvement on previous examinations.

Question 7

Most candidates were able to score at least 12 out of 17 marks on this question. Parts (a), (b) and (c) were usually correct, with only a very few making slips with the inequality in (a) or muddling 'small' with 'large' in part (c). The units in part (b) caused difficulty for some candidates, but most changed all lengths into cm and proceeded correctly. Many candidates struggled with part (d). When the answer is printed on the paper candidates must ensure that their reasoning is both clear and convincing, disappointingly, many candidates were not able to derive the given result and in particular many 'derivations' attempted to start with $1.4y = x$. There were many fully correct graphs, helped by widespread use of rulers, a big improvement from past papers. Three correct lines almost always invariably led to the correct region. As always, some lost a mark because they did not label their lines and/or R. In (f) both the vertex testing and profit line methods were often successful. As always it is vital that the method is clearly seen, some lost all 4 marks in (f) because they merely described the use of a profit line but failed to draw it. Others drew a very short profit line – candidates should use sufficiently large values for the axes intercepts to ensure an accurate gradient. Those using the vertex method should be reminded that all vertices should be tested, a number of candidates only tested one or two vertices.

Grade Boundaries

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

Module	80	70	60	50	40
6663 Core Mathematics C1	63	54	46	38	30
6664 Core Mathematics C2	54	47	40	33	27
6665 Core Mathematics C3	59	52	45	39	33
6666 Core Mathematics C4	61	53	46	39	32
6667 Further Pure Mathematics FP1	64	56	49	42	35
6674 Further Pure Mathematics FP1 (legacy)	62	54	46	39	32
6675 Further Pure Mathematics FP2 (legacy)	52	46	40	35	30
6676 Further Pure Mathematics FP3 (legacy)	59	52	45	38	32
6677 Mechanics M1	61	53	45	38	31
6678 Mechanics M2	53	46	39	33	27
6679 Mechanics M3	57	51	45	40	35
6683 Statistics S1	65	58	51	45	39
6684 Statistics S2	65	57	50	43	36
6689 Decision Maths D1	67	61	55	49	44

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