Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel GCE
Further Mathematics (8FM0)
Paper 27 Decision Mathematics 1

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Introduction

This paper proved accessible to most candidates although examiners noted that a significant number of candidates are still struggling to cope with the new content not previous seen in the legacy module 6689/01, and some had difficulty with the problem-solving nature of some of the questions (which forms part of the assessment objectives for this qualification). However, the questions differentiated well, with most giving rise to a good spread of marks. All questions contained marks available to the E grade candidates and there also seemed to be sufficient material to challenge the A grade candidates.

Candidates should be reminded of the importance of displaying their method clearly. Decision Mathematics is a methods-based examination and spotting the correct answer, with no working, rarely gains any credit. The space provided in the answer book and the marks allotted to each section should assist candidates in determining the amount of working they need to show. Some very poorly presented work was seen and some of the writing, particularly numbers, was very difficult to decipher. Candidates should ensure that they use technical language correctly. This was a problem in questions Q2(b), Q3(a) and Q3(b).

Question 1

Examiners commented on the fact that many fully complete and correct responses were seen to this question. In (a), for the quick sort, most candidates used middle right pivots, rather than middle left. A few lost marks for using both middle left and right pivots during the sort. In rare cases candidates lost three of the four marks due to using only one pivot per iteration, after the first pass. Some lost the final mark for failing to pivot on the 47 (or the 44, for left middle) in the sub-list '44 47'. Candidates need to look out for correctly ordered two item sub-lists like this and pivot accordingly. Incorrectly sorting into descending order, followed by reversing the resulting list, was penalised with the loss of two marks (as the question specifically asked for the sort to be completed in ascending order). In (b) (applying Kruskal's algorithm) full marks was the modal score, though occasionally incorrect arcs were seen (or correct arcs seen but stated in the wrong order). A small minority failed to mention/show any rejections, therefore scoring no marks, as this is the key process when applying Kruskal's algorithm. Some candidates wasted time writing our "reject, forms a cycle" several times, which is better abbreviated as simply 'reject'. Occasionally Prim's algorithm was used. In (c) those who had answered (b) correctly almost always scored both marks for the correct diagram and the correct total weight of the minimum spanning tree.

Question 2

Most candidates were able to make a good attempt, using activity on arc, gaining at least three of the five marks available in (a). One mark was commonly lost for arrows omitted from one or more activity arcs, or for including superfluous dummy activities. Candidates should be reminded that an arrow is an essential part of each arc. A good proportion of candidates scored the mark in (b). However, some lost the mark in this part for failing to mention sufficient relevant activities, which were E, F, A, plus B and/or C. As expected, (c) differentiated well with very few candidates scoring both marks. Of those who realised that activity D could not be critical only a few were able to explain why.

Question 3

Although "Path" is defined in the glossary, very few candidates were able to reproduce the definition in full for both marks. A minority just correctly stated that no vertex appears more than once (or equivalent), gaining only one mark. Many more candidates did score the next mark in (b) for stating either that there were 'six odd nodes', or, 'more than two odd nodes', so the graph was neither Eulerian nor semi-Eulerian. Many candidates gained all five marks for correctly using Dijkstra's algorithm in (c), though errors were often seen in the order of labelling. There were a few isolated scripts with just one working value at every vertex, which scored no marks. In (d) some candidates did recognise that it was necessary to use the route inspection algorithm twice, though few scored full marks due to errors in the calculation of the six resulting pairings.

Question 4

A surprising number of candidates failed to gain the three marks in (a), for listing the three inequalities shown on the graph. Many candidates attempted to write down the equations of the three lines, but many had difficulties at this stage. The inequality $x + y \leqslant 14$ was mostly stated correctly, though some candidates struggled to arrive at the corresponding equation for this inequality. Algebraic errors sometimes produced $2y - x \leqslant 6$ rather than $2y - x \leqslant 12,$ or similar. A good number of candidates, in (b), went on to solve the correct pair of simultaneous equations and found the coordinates of the optimal vertex. However, very few used the given value of 216 successfully to derive the objective function. In (c), the optimal solution (in context) was rarely found, though a few candidates made the correct deduction without prior working.