A-LEVEL
MATHEMATICS

MD01

Report on the Examination

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General

The vast majority of candidates were well prepared for this paper, particularly the first six questions on which most candidates scored well. For a variety of reasons the last three questions were found much more difficult by the majority of candidates.

The general standard of presentation was quite good with a significant minority being excellent. However, there was again a disquieting number of scripts that were poorly presented. In some cases answers were not only disorganised but, also, were written in a near illegible hand. Decision Maths is a subject which demands not only mathematical precision but also clarity in the presentation of results. A casual approach to the latter can lead to students unnecessarily losing marks. In particular candidates are advised to cross out and totally replace work rather than trying to alter values. They should also look carefully at the numbers in both their working and answers, asking themselves whether it is crystal clear what these numbers represent.

It was again disappointing to note that when asked to present a clear, logical answer or description that the response, even from a considerable proportion of otherwise quite able candidates, was often very difficult to decode.

Question 1

This was usually well answered. Marks were lost either by not using an algorithm and merely writing a correct complete matching down or, more frequently, by not writing their final answer in a list or in words but leaving it represented in a diagram.

A few candidates used methods of writing their paths that were so idiosyncratic that credit could not justifiably be awarded. Centres are strongly recommended to study previous mark schemes and warn students that this is not an area where ingenuity will be welcomed.

Question 2

This was generally well done.

(a)(i) This part was answered very competently in contrast to the response last year when candidates were asked to apply Prims to a table. It was very rare to see a script that did not earn at least the method mark. Those that subsequently failed to win full marks usually erred by promoting the edge *AB* in the order.

In parts **(ii)** and **(iii)** there were few unlabelled spanning trees or money sums without units.

(b) Errors did start to appear here. The majority arose from choosing *BE* rather than *DG* to replace *CE*. Another relatively common error was to find the new distance rather than the new cost. This often happened even when cost had been correctly found in the previous part.

Question 3

This was another question where maximum marks were not rare. Whether aware or not of the accepted difference between the words ‘state and ‘find’ most candidates only offered any semblance of working for part (d).

(a) was almost universally correct. Later errors included the reversing of the answers to parts **(b)** and **(c)**, an answer of 136 for part **(d)** and the insistence of a few in adding one to the correct answers “to allow for checking”.

Question 4

This was a very high scoring question with many scoring full marks.

(a)(i) Most marks were lost due to errors of detail – failure to include *A*, or omission of a crossing out of a box. Candidates are advised to check their working carefully. Errors of method were usually the inclusion of two values at either *G* or *H* – but rarely both.

(a) (ii) was usually answered correctly**.**

(b) The two common errors were either to stop after calculating the 34 minute delay or to omit the 3 minutes for luggage handling. It is important not only to check working but to re-read the question to ensure that the actual question has been answered.

Question 5

(a) The majority of candidates can apply the Chinese Postman algorithm correctly, including the requirement to evaluate three totals. The correct 4 vertices were universally identified. As in past years it was the compound distances that caused the problems – the distance *CG* was often given erroneously as 250. Omission of units in the final answer wasn’t common but was sometimes an unnecessary loss of a mark.

(b) The majority of candidates scored full marks. For part **(ii)** an answer of 2 was not uncommon and there were rare sightings of 2.5.

Question 6

This question started to help differentiate between a C grade candidate and an A grade candidate.

(a) was usually correct. The common error was the distance *BE* being given as 15 rather than 14. The diagram illustrates the need to consider all the data in any situation.

(b) (i) was almost never wrong but **(ii)** did cause some problems. The majority of candidates appeared to have a general idea of the correct answer but were hampered by their inability to express this in sufficiently clear and precise form. “It is a cycle” was more common than “it is a Hamiltonian cycle”. “It may/can be improved” was more common than “It is a solution to the problem which …”.

(c) was quite well answered. Arithmetic errors were rare; much rarer than a failure to complete an otherwise correct cycle or to have a complete but incorrect cycle.

(d) The method required for this part is becoming increasingly well-known but has not yet been accompanied by a widespread ability to present the results in a clear enough manner. For full marks it was not sufficient to produce the correct final numerical value at the end of what was too often an arithmetical exercise devoid of clear explanation. Clear and explicit information as to which edges are involved at each stage is required to earn full marks.

(e) was usually correctly answered by those who had sufficient earlier answers.

Question 7

This was not answered well, revealing an area of the syllabus where precise meanings of technical terms and definitions were not widely known and understood. It was noticeable that a significant number of candidates answered both of the first two parts without any apparent recourse to diagrams.
(a) was the best answered part. Common errors were to offer just one of the two values required or to add an extra value, usually 3.
(b) defeated many candidates with the most common error being to offer only the first two correct values.
(c) did produce some working diagrams. The most popular final choice was a pentagon. Of the two fully correct diagrams the one with one vertex of degree 4 was the more common occurrence of the two.

Question 8

The number of lines required for the presentation of the answer to part (a) was often more than the number of lines on a full booklet page. This led to added difficulty in moving from one page to another or problems for both candidate and examiner when a more concise presentation was adopted. Examiners were quickly aware of the problem and this was taken into account.

(a) Virtually all candidates understood the process and succeed in carrying it out and stopping at the appropriate place. There were two quite common problems preventing the earning of full marks. One was a failure to maintain accuracy of calculation which often faltered during the fourth loop. The other was either a lack of simple identification of the printed numbers or absence of a systematic presentation which made these numbers clearly identifiable.

(b) Most had the idea of simply counting *N* or ensuring that the process stopped (or printed C instead of *A*). Candidates were fairly evenly divided in their choice and there was a third, smaller, faction for whom it was very difficult to judge precisely which they did actually mean. Decision Maths may be ‘mathematics’ but there will always be occasions in the use of it where the ability to express oneself clearly in words is of paramount importance.

Question 9

This was a comparatively long and sustained question, generally increasing in difficulty as it progressed. The majority of candidates made a mostly successful start but only those destined for higher grades possessed the understanding and accuracy to maintain this throughout.

(a) Almost all candidates are well-prepared for this type of exercise and full marks were very common. A few were caught out by the different units and some made problems for themselves by unnecessarily introducing decimals. Inequalities were used however with almost universal accuracy.

(b) was the first of the parts of this question found difficult by many and revealed the better candidates. Most were able to find the necessary substitution but weaker candidates were unable to show properly its use in moving from their answers to the previous part to the required, and given, inequalities. The majority of candidates do now recognise that they need to spend time producing two or three lines of coherent algebra for each inequality to earn full marks.

(c) was found relatively easy. Graph drawing has improved over the years and, apart from the weakest candidates, errors were restricted to inaccuracy in drawing the lines. Wholly successful candidates realised the need for adequate instruments and careful drawing, especially of those lines whose gradient differed a lot from +/- 1.

(d) was found difficulty by most. An expression for profit in terms x, y and z was noted by most (and often found by examiners in the response to part (a)). However the majority failed either to eliminate z from this or to eliminate it correctly, including many who had already found the required link in part (b). The lesson still to be learned by many is that long questions like this often consist of linked parts. To answer one part often requires a search through information gained in previous parts as well as that in the original question.

(e) (i) produced from most candidates who had a profit expression involving only x and y a correct objective line or a line with gradient the reciprocal of the correct version. From this most appeared to just take a guess at the required point. Better candidates chose correctly the lines that would meet at the required point and solved these equations simultaneously. But there was never a word or diagrammatic argument as to why these particular lines had been chosen and the algebraic work was not always accurate. The use of an objective line does appear to be an area of syllabus worth a little more attention in the classroom.
Few candidates took the 'otherwise route' – to calculate the profit arising from each vertex of the feasible region – and very few of these managed to both examine all vertices and manage all calculations accurately.

(e) (ii), a comparatively easy finish for those still standing, was marred by much omission of units especially when defining the amount of each product to be made.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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UMS conversion calculator