AQA

AS
FURTHER MATHEMATICS

Paper 2 – Discrete
Report on the Examination

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General

On the whole students were well prepared for this examination, with many students producing clear and concise solutions to the problems.

There was a very good range of marks from 2 to 37, with the mean mark being 24.2. Students tended to lose marks in the depth of their explanations, especially in the less routine parts of question 7 that did not feature as prominently on the previous specification.

Question 1

The vast majority of students selected the correct answer in this question.

Question 2

When compared with question 1, this multiple choice question was answered less well with under two thirds of students selecting the correct answer.

Question 3

Nearly 90% of students scored at least one mark in part (a). Of these students, many scored 2 marks but failed to score the third mark due to a lack of depth in their explanation of why the value of the game was 2. Many did not refer to, or were not clear enough about, the max(row minima) and min(col maxima) both being equal to 2 and therefore being equal to each other, and many did not then relate this back to the value of the game.

Interesting correct solutions included the use of dominance to reduce the size of the pay-off matrix to 1 × 1. Of the errors that students made, the most prevalent was determining the row maxima and column minima, which lead to an incorrect conclusion and often impacted the answer to (b).

Question 4

The majority of students determined the value of the cut correctly, with the most common errors being numerical slips. Only 51% of students correctly interpreted their value of the cut, with many stating generic comments about the maximum-flow minimum-cut theorem but not making the connection between the value of any cut and the implications for the maximum flow.

Most students spotted the sources and sinks of the network, the most common error being to include a third node which was not a source or sink. However, less than half of the students correctly added arcs to the diagram, with common mistakes being the lack of arrows or correct capacities on each arc.

Question 5

Nearly all students correctly completed the precedence table. Just under two thirds of students completed the activity network with no errors, with the most common error being simple numerical slips that were then carried forward through the network. Some students had values for the latest finish time lower than the earliest start time.

Many students correctly identified the first activity on the critical path and explained why this activity could not be delayed. A minority of students did not find the time at which the making of the

meal would need to commence, instead just stating the minimum completion time of their activity network.

Part (c) was answered well, with the majority of students scoring 1 mark on (c)(i) and at least 1 mark on (c)(ii). The most common mistake was for students not to relate the minimum completion time of the second project to the time that the second project should start.

Question 6

Over 75% of students were able to score 3 or more marks for this question, which is very positive for this type of unscaffolded, new-style question. Marks were lost through numerical errors, selecting incorrect edges in the minimum spanning tree and not being explicit about which algorithm was being used to solve the problem.

Question 7

This was a question which allowed students to demonstrate their understanding and application of mathematics in an unfamiliar situation, which is a key feature of the new specification.

The majority of students scored 2/2 in part (a)(i). The most common error was to select an incorrect region as the feasible region. Some students did not draw the line $y = x$. Less than half of the students scored 2/2 in (a)(ii), with the most common mistakes being selecting the wrong vertex. The best solutions included an objective line which made the selection of the optimal vertex easier.

Nearly three quarters of students were able to explain the term ‘connected’ and relate it to the inequalities in (b)(i). However, less than half of students were able to correctly explain how the graph being simple related to the inequalities. Errors that were made included no direct reference to the degree of the vertices or the particular property of the graph that was being used.

Only 6% on students scored both marks in (b)(iii), with many students erroneously restating what they had written in (b)(ii). There were a significant number of no responses on this part. 10% of students scored the mark in part (b)(iv), with common errors being the adding together of two inequalities or the stating of a previous inequality.

Only a third of students scored any marks in (c)(i), with the vast majority not using the sum of the degrees being equal to twice the number of edges in the graph. Many answers did not write the values of x and y as pairs, and some solutions included pairs of x and y values that did not satisfy all of the inequalities.

More than half of students were able to score at least one mark in (c)(ii), with many students scoring 2/2 having not scored full marks on (c)(i). The better solutions included writing down the degree of each vertex next to the respective vertex. The loss of marks was most commonly due to having too few or too many edges on the graph.

Mark Ranges and Award of Grades

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