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Unit M1: Methods in Mathematics (Algebra and Probability) - Higher

Report on the Examination

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Unit 1: Higher Tier

Section A

General

This was the second paper for this module of Methods in Mathematics, and nearly all candidates were able to score marks on a range of questions. Whilst there was a reasonable level of consistency on marks across topics and assessment objectives, the questions on probability and questions set at AO2 proved to be more challenging. Some candidates found the multi-step questions on Section A (2 and 4) difficult to cope with, with little evidence of a logical progression of method in their answers.

Topics that were done well included:

- The link between ratio and fractions
- Coordinates of the y-intercept of a straight line
- Completing a tree diagram
- Solving linear equations without a fractional element

Topics which candidates found difficult included:

- Set notation
- Equation of a straight line
- Algebraic proof
- Problem solving with ratio
- Surd manipulation and simplification

Question 1

Nearly half of all candidates scored both marks in part (a). However, almost the same number correctly divided 24 by 5, but failed to give the correct answer. Some candidates got the wrong answer to the calculation, despite the availability of a calculator. Some failed to then multiply by four for the other amount, and many gave the answer as £19.2 and £4.8, which was not allowed as it was not in correct money notation.

The majority of candidates achieved the mark in (b), with $\frac{5}{3}$ being the most common wrong answer.

Most candidates worked out the answer to part (c) correctly, although £5 was seen fairly regularly.

Question 2

Whilst many candidates scored full marks in this question others struggled to work through it sequentially. Some thought that they could average the percentages, so added 55 to 100 and then halved the sum. Others worked out that the mark in Section A was 44, but did not know how to proceed from there. It was noticeable that a few candidates left an answer of more than 100%, indicating that they had not considered the viability of their answer.

Question 3

It was clear that many candidates were not familiar with set notation as well under half of the marks available on parts (a) and (b) of the question were attained.

In part (a) the most common answer was to shade all of the diagram except the part exclusive to A. In part (b), many candidates realised that the answer involved A’ and B’, but gave the answer as the union of the two sets or used incorrect notation such as A’ + B’ or A’, B’.

Part (c) was well done, with most candidates scoring marks. Some used letters twice, putting six in set A only and 7 in set B only.

Question 4

This question was generally well answered, with the majority of candidates who achieved the correct answer also scoring the QWC mark for a clear and organised approach. Some candidates incorrectly calculated $\frac{1}{3} + \frac{3}{5}$ as $\frac{3}{8}$, and others started by finding a fraction of 44. A few candidates did a correct method to ascertain that 11 was $\frac{1}{15}$ of the total, but then multiplied by 5 (to find the number who chose rugby) or 2 (numerator of the fraction for football).

Question 5

Nearly all candidates attempted to equate one pair of coefficients, with arithmetic errors being the main stumbling block. The addition or subtraction of the equations then proved problematic, largely due to the subtraction in the second equation. Those candidates who found one unknown correctly almost invariably went on to find the other. A few candidates used the rearrangement and substitution method. This usually went well up to the substitution, when the algebraic manipulation required to solve the resulting equation proved too difficult for most.

Question 6

The majority of candidates correctly identified the y-intercept in part (a). Part (b) proved more challenging, however. Whilst over half of the candidates knew that the equation started $y = 2x$, relatively few knew how to find the rest of it. Several candidates simply repeated the equation given, for which there was no mark.

Question 7

Part (a) was very well done, with the vast majority of candidates scoring the mark. When an error was made it was usually to either reverse the 0.7 and 0.3 on the bottom probabilities or replace them with 0.9 and 0.1

Whilst most candidates scored some marks in part (b), many calculated the probability of exactly one student getting to school on time rather than at least one student.

Part (c) required simple mathematical logic, but was beyond more than half of the candidates. Some thought that the answer was the number of branches in the fifth column, rather than the total, but many counted up in twos rather than doubling each time.

Question 8

Despite being given a starting point in the question, most candidates failed to gain a simple mark for giving $(2n + 1)^2$, with some candidates omitting the brackets. Those who did get this far often expanded the brackets incorrectly, with $2n^2$ usually given as the first term. Of the candidates who correctly arrived $4n^2 + 4n + 1$, only half went on to correctly explain why $4n^2 + 4n$ must be a multiple of 4, either by factorisation or written explanation.

Question 9

Both parts of this question proved to be challenging to the majority of candidates. In part (a), a reasonable number of candidates identified $\frac{y}{d}$ as the probability of the first disc being yellow, but didn't know how to proceed from there. Very few candidates set up an equation for the numerator or denominator in part (b), but $\frac{7}{12}$ was found by a reasonable number of candidates as the probability of one blue. Most of those candidates went on to find the correct answer, although a few then calculated $\frac{3}{11} \times \frac{2}{10}$ for some reason.

Section B

Question 10

The majority of candidates gained marks on this question for a correct expansion. The most common error thereafter was to arrive at $3x + 24 = 3x + 3a$ and give the answer as 24. Most candidates who achieved the correct answer scored the QWC mark for showing logical algebraic steps leading to a solution.

Question 11

Over half of the candidates achieved at least one mark on this question, but there was clearly confusion over the order of the coordinates, despite the axes being clearly labelled. This orientation will always be the one used in examination questions.

Question 12

Multiplying or dividing a fraction by an integer is often poorly done by candidates, and this question was no exception. A very common error was to calculate $\frac{3}{5} \times 4$ as $\frac{12}{20}$. Several candidates gave the same answer to both initial calculations, thereby arriving at a final answer of 0. Those candidates who changed $\frac{3}{5}$ to 0.6 were often successful in finding the final answer, which was accepted in decimal form. This method would not, of course, be as easy to apply in a fraction which converted to a recurring decimal.

Question 13

The equation in part (a) was solved correctly by most candidates.

The majority of candidates were also successful in part (b), although about one quarter of the candidates were unable to arrive at an equation linking a and b by substituting 4 for x in the equation given.

Part (c) was not as well done. Whilst most candidates knew to use the technique of finding a common denominator and so multiply the numerators by 3 and 4, respectively, they were often lost as to what to do with the denominator, in order to solve the equation.

Question 14

The majority of candidates failed to gain marks on this question because they gave answers which relied upon being able to pour exact units into containers. For example, pouring one unit from D into B was extremely common, even though B had a volume of 2. Those candidates who did follow the rules correctly usually came up with the optimum solution.

Question 15

In part (a), roughly half of all candidates did not seem to know how to find the solutions to the equation from the graph. Of those who did, most gave the correct answer, although some misinterpreted the scaling on the axes and others also gave –2 as a solution, presumably from the y-intercept.

A significant number of candidates were able to solve part (b), although many (incorrectly) simply wrote

$\sqrt{7} - \sqrt{3} = \sqrt{4} = 2$.

Question 16

This question was quite well done with most candidates scoring some marks. The most common error was to subtract t from each side and arrive at $4x = 8t + 2$.

Question 17

Many candidates did not seem familiar with the concept or terminology of proportion and therefore failed to gain any marks, often giving the equation as G = H + 1. Those who did correctly set up $8 = \frac{k}{7}$ usually arrived at the correct answer, although a minority then evaluated k as $\frac{7}{8}$ or $\frac{8}{7}$.

Question 18

Again, the candidates were given a starting point in this question, but over half failed to score any marks, with many simply choosing some values and testing it in one situation. Some multiplied the wrong expressions and others could not expand brackets correctly. A few candidates averred that the equation given was not true, but candidates should be advised that a question would not be worded in this way if the equation or identity given was incorrect.

Question 19

Knowledge and manipulation techniques of surds were shown by many candidates, but most failed to follow through to a completely successful answer. As with other questions on the paper, an inability to expand brackets correctly was fundamental to most wrong answers. A basic failing remains to be the lack of awareness that, for example, $\sqrt{12} \times \sqrt{12} = 12$.

Mark Range and Award of Grades

Grade boundaries are available on the Results statistics page of the AQA Website.

UMS conversion calculator www.aqa.org.uk/umsconversion