Examiners' Report
Principal Examiner Feedback

Summer 2022

Pearson Edexcel International GCSE
In Mathematics A (4MA1) Paper 1HR

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International GCSE Mathematics
4MA1 Paper 1HR

The first time this paper has been sat during the summer in 3 years saw students well prepared and all questions were well-attempted. The majority of questions saw full methods shown although certain methods still saw calculators being used when the instructions in the question asked for otherwise such as the linear simultaneous equations in Question 14 and the surds in Question 21.

Question 1

Most students got off to a good start on this paper with this probability question. Part (a) was answered well with most able to gain 1 mark for 0.45 or equivalent. Several assumed the answer to part (a) was the missing value from the table above. Part (b) was also answered well with most able to find the probability for purple as 0.35 and then multiply by 300 to gain an answer of 105. Some students gave their final answer as 0.35, gaining 1 mark only and others reached 105 but then gave their answer as $\frac{105}{300}$, losing the final mark. A common incorrect answer was sight of the probability of purple = 0.25 in the table, assuming the spinner to be unbiased.

Question 2

Both parts of this question saw mixed results for these students. Part (a) saw around half the cohort able to interpret the information correctly and arrive at an answer of 31.9 for 2 marks. Many were not able to show a correct method; common incorrect methods were only to do 6 × 2.4 or to misinterpret the number of type S shelves needed by doing, for example, 4 instead of 5. Part (b) also caused problems with many unable to comprehend what was being asked. Of those that did understand, some left their answer unsimplified such as $5.9(n - 1) + 2.4$ or algebraically incorrect such as $2.4n + n - 1(3.5)$, both gaining the method mark. Some students did manage to expand and simplify for 2 marks.

Question 3

This question was answered well with most students gaining 3 marks for a correct answer of 17. Of those that didn't, some picked up 1 mark for working out the total of the 5 numbers but were unable to go any further. A small number of students gained 0 marks, generally by failing to set up an equation in x or starting by summing the 4 numbers they were given in the question and dividing by 4 or 5.

Question 4

This 4 mark percentages problem saw mixed results. Some students were able to progress through the method to find the final percentage of 87.5%. A range of different methods were seen as per the mark scheme. Of those that didn't gain 4 marks, many were able to pick up 1 or 2, generally for finding the number of students studying German and the number of students studying Italian/Spanish or French/German, both as a number and as a percentage of the total number of students.

Question 5

Part (a) was answered very well with most students gaining 2 marks. Of those that didn't, many gained 1 mark for one correct term or they gained the correct answer but went on to do some further incorrect algebra giving answers such as $15c^7$. Many students gained 2 marks in (b)(i) for a correct factorisation. Of those that didn't, some gained 1 mark for the correct numbers in the brackets but incorrect signs e.g. $(x - 9)(x + 1)$. A common incorrect answer was $(x - 8)(x - 1)$ and some completely incorrect attempts of factorisation were seen. For (b)(ii) a good number of students were able to solve the equation using their factorisation from (i), it is important to note that when a question says 'hence' it means the previous answer must be used.

Question 6

This question was answered well with most students able to gain 3 marks. The most common method was to convert to improper fractions, convert the fractions so the denominators were common (usually 12) and complete the method from there. Of those not gaining 3 marks, most missed out a step, usually going straight from $\frac{8}{3} + \frac{15}{4}$ to $\frac{77}{12}$, students who did this could only gain 1 mark.

Question 7

Students generally scored well on this density, mass, volume question. Most were able to make a correct start to work out the volume of the cylinder, although it was disappointing to see a number unaware that the formula was given to them on the Formulae sheet. Many were then able to go on and use the volume correctly in the density formula, although some students were unable to convert the mass into grams, losing the A mark but still gaining the second M mark if the formula was used correctly. A common error was to see the mass and volume to wrong way round in the formula. Several students gained a mark even if they had the initial volume incorrect for correctly using the formula for mass/volume, as long as they clearly stated what value they were using for volume.

Question 8

This question was answered well with most students able to gain 3 marks for a correct answer. Most used the ‘efficient’ method but some still went the ‘long way round’ by working out the percentage change year-after-year. Of those that did not gain 3 marks, many gained 1 mark, the most common methods seen being to find 15% of 18,000 or to treat the depreciation as ‘simple interest’ rather than compound. It should be noted that $18000 \times (1 - 15\%)^4$ does not constitute a written method – if it leads to the correct answer, full marks will be awarded, otherwise it will be awarded 0.

Question 9

This 2-mark inequalities question saw mixed results. Some students struggled to deal with the negative coefficient for the *x*-term; it was common to see answers of *x* with −2 with the incorrect inequality sign or with an equals sign or just −2 on the answer line. It was also common to see students rearrange incorrectly and end up with 4*x* and 14 or *x* and 2. That said, a significant number did manage to rearrange correctly to gain a correct answer for 2 marks.

Question 10

This equation of a straight line question saw the full range of marks awarded on a regular basis. A good number were able to interpret the gradient of the line correctly along with the *y*-intercept and input these into $y = mx + c$ for 3 marks. If the correct answer was not obtained, 2 marks were regularly gained for an answer in the form $y = mx - 1$ or for $1.5x - 1$ seen. Some students achieved 1 mark for this question, usually by just finding the gradient or for identifying the value of *c* as −1.

Question 11

The majority of students began the method to answer this question by using Pythagoras’ theorem to find the length of *AB*. Some used trigonometry to find one or both of the missing angles in triangle *ABC*. Most students then went on to find the area of triangles *ABC* and then *ADC* and from there it was a case of working in reverse with the area of triangle *ADC* to find the length of *AD*. A good number were able to gain the full 6 marks but of those that didn’t, many gained 2 marks for either finding the length of *AB* or for using their clearly labelled *AB* to find their area of triangle *ABC* and subtracting from 31.5.

Question 12

Part (a) was answered well with most students able to give the correct answer, either as a product of prime factors or as an integer. In (b) a fully correct answer was seen less often although many students were able to get at least one power correct. A good number of students did still manage to gain a fully correct answer for 2 marks. Some students tried to use their calculators and went on to gain 0 marks for answers that were not in the required form.

Question 13

Most students managed to gain 2 marks for this question for correctly working out the interquartile range. Of those that didn't, some gained 1 mark for unambiguously identifying 12 and 3. The most common incorrect response was calculation of the position of the quartiles at the 4th and 12th values. The subsequent subtraction of 12 – 4 gained no marks.

Question 14

The majority of students did well on this question, showing a full algebraic method and correct values for 4 marks. Elimination was more commonly seen than substitution. Some students made errors in their method, such as arithmetic errors, but could still gain 2 method marks if only one error was made. A very small number of students gave correct answers unsupported by workings, presumably using an equation solver on their calculator, gaining no marks.

Question 15

There were a variety of correct and incorrect methods for this circle theorems question. Some students were able to use opposite angles in a cyclic quadrilateral and angle in a semicircle and then go on to complete the method to find *RPS* as 46°. Incorrect methods included assuming triangle *PQR* was isosceles and quadrilateral *PQRS* was an isosceles trapezium. Some students gave the calculation 180 – 136 (= 44) but it should be noted that this needed to be labelled using either correct 3 letter notation or marked in the correct position on the diagram.

Question 16

Most students made a correct start to part (a) by multiplying just 2 factors only. Some students multiplied 2 of the factors and then a different 2 factors; this method was worth 0 marks. Of those that did manage to multiply just 2 factors, many went on to multiply their answer by the 3rd factor and simplify correctly for 3 marks. A significant number of candidates made things more difficult for themselves by failing to collect like terms in their first expansion. Part (b) proved challenging for many students in this cohort although marks could be gained in a variety of ways. Some were able to recognise that reciprocating or squaring or simplifying was needed and managed to gain 1 or 2 marks if they did not gain the correct answer. It was disappointing to see that many students left a number term and an x term in both numerator and denominator, not recognising that cancelling was required for simplification.

Question 17

The full range of marks were seen for this question. It was pleasing to see a good number work their way through the problem. There were two main methods seen; firstly, splitting the parallelogram into two triangles and working with trigonometry and secondly using the area of the parallelogram to find the perpendicular height and use Pythagoras' theorem from there. Some chose a combination of both methods, using the perpendicular height to work out the angle. Both methods were seen in equal measure. It should be noted (as per the instruction on the paper) that diagrams are not accurately drawn; some students incorrectly assumed that triangle *PSQ* was right-angled, gaining no marks.

Question 18

There were many ways in which the correct answer could be achieved in this question. It was pleasing to see many students gain the first 2 marks with a correct calculation for any length in the cube using Pythagoras; *BV*, *CT*, *DH* and *MV* were the most common seen. The third and fourth marks proved more challenging to achieve as student struggled to interpret the length they had found, although a good number managed to reach $3\sqrt{6}$ which gained 3 marks. It should be noted that it was relatively common for very good responses to be spoiled by the omission of brackets and poor understanding of calculator use. Dealing poorly with e.g. $(3\sqrt{2})^2$ was condoned for the method mark but did lead to loss of the accuracy mark. Only a very few candidates recognised that this could be solved as a 3D Pythagoras' Theorem problem. Many who did, very efficiently gained full marks.

Question 19

This histograms question proved a challenge for the majority of this cohort. Most were unable to interpret the information given in the question correctly and make any progress at all. For the few who did succeed, the most common method seen was to work out that 1 large square represented 2 trees and go on from there. A very few calculated a multiple of frequency density and were able to calculate the correct answer from this. Others struggled with what to do with their figure.

Question 20

There were several different methods seen for this similar solids question. Some worked with a volume scale factor of 0.8, others with 1.25, others worked with ratio. A good number were able to gain 2 marks for a correct area scale factor but could not make any more progress towards finding the percentage reduction. A significant number of students used the incorrect approach of working with 20% rather than 80%, gaining no marks.

Question 21

Students began this surds question in one of two ways. Those who expanded the denominator first generally did it correctly and picked up the first method mark, unless they failed to show the full expansion. For many of these students they were then unable to continue as it involved rationalising the denominator. Those who began by rationalising, multiplying numerator and denominator by $(\sqrt{2}+1)^2$, generally picked up the first mark and then had the lower-level task of expanding. This led to varied success, depending on whether the instruction to 'show each stage of your working clearly' was adhered to – students should note that it is not acceptable to type expansions into the calculator, the expansion must be seen. Many failed to understand the significance of 'the form $p + \sqrt{q}$' thus losing the accuracy mark, or were just over reliant on their calculators, gaining no marks despite having an accurate final answer.

Question 22

A small number of students were able to make progress on part (a) by correctly differentiating one or both of the terms. For those that managed to differentiate correctly, the next stage was generally done well by setting the derivative equal to zero and solving for p. Many incorrect methods were seen such as substituting $x = -3$ into the original expression for y. Part (b) also saw little success with very few students able to differentiate, or realising that it had to be differentiated, and set equal to zero to find the x-coordinate and therefore the value of k.

Question 23

Some students recognised that a factor of 2 needed to be taken out and managed to pick up the first mark in part (a). The next two marks were rarely gained although a small number of students were able to correctly complete the square for 3 marks. Most students did not make the connection between part (a) and (b) and it was common to see students attempt to expand the expression for curve C and try to either complete the square or differentiate and set equal to zero and solve. If these methods were done correctly then the marks could be awarded but it was much more efficient to use their answer to (a) by identifying the translation of the original function.

Question 24

It was rare to see a fully correct solution on this probability question. A good number recognised that an equation needed to be set up and it was common to see a probability tree diagram drawn. Many, however, thought that the denominator would decrease by one for the second pick. This incorrect method was worth no marks apart from the fourth method mark which could be gained for a correct method to solve their 3-term quadratic and this was awarded on a regular basis.

Question 25

The final question on the paper saw students awarded the range of marks available. A good number were able to pick up a mark for a correct expression for either the sum of the first 10 terms or 5 terms or the 8^{th} term. Progressing from there was a challenge although some were able to set up an equation for the second method mark and go on from there. It should be noted that if a question asks for clear algebraic working this must be provided for the marks to be awarded; some students obtained the correct answer but from numerical methods or by simply guessing. It was a pity that marks were lost by students on this question by incorrectly copying the formula from the formula sheet.

Summary

Based on their performance in this paper, students should:

- practise expressing one number as a percentage of another
- learn what constitutes a written method for percentages, e.g., $18000 \times (1 - 0.15)^4$ is okay but $18000 \times (1 - 15\%)^4$ is not
- ensure that they fully understand instructions such as 'hence', show all working, express in the form etc
- know and understand the information given in a formulae sheet
- know and be able to use the equation of a straight line
- have practice at solving problems in reverse e.g., finding the length of a line from the area of a triangle

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