



Examiners' Report Principal Examiner Feedback

Summer 2024

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

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4MA1 1HR June 2024 Principal Examiner's Report

The majority of questions on this paper were well attempted by this cohort. It was usual to see full methods shown to enable students to gain as much credit as possible. Below is a detailed breakdown of the performance by students for each question, with a summary of points for improvement based on the performance for this paper given at the end of the document.

- 1 This question was answered very well by this cohort, with 90% of students gaining the correct answer of 21. Of those that didn't, some did not understand the context of the question and found the mean of the 5 given cards; division by 5, 6 and 7 was seen. On some occasions the correct answer was seen written on the blank card but an incorrect value such as 11 was on the answer line; students should be aware that the answer line takes precedence and should ensure they always write the correct answer there.
- 2 This question saw lots of success with two thirds of students able to gain the correct answer of 216. The most common method involved equating the probabilities in the table to 1 and solving to find x or alternatively some students used a numerical method and calculated $1 - (0.27 + 0.04 + 0.12)$ and went from there. Having found the value of x many were able to go on to gain full marks but some students worked out the probability of an odd number and stopped there without multiplying by 400. Some students decided to calculate estimates for the number of times the spinner would land on the numbers with given probabilities (2, 3 and 5) but many failed to realise they needed to do all three and only did 3 and 5, gaining no marks. A small number of students gave their answer as $\frac{216}{400}$, losing the accuracy mark.
- 3 This question saw the full range of marks awarded. Almost 80% of students were able to work their way through the method and successfully reach an answer of 156 for 5 marks. The students that were most successful laid out their working clearly, often with white on one side and brown on the other. Of those that didn't gain full marks, many were able to pick up at least the first 2 method marks for splitting the 200 loaves into the ratio 3:2, although occasionally white and brown were mixed up. A good number were also able to multiply the number of white and brown loaves by their costs to find the income from both. Of those that did not gain the correct answer, it was often the 4th method mark that proved problematic and many were unable to work with the percentages to find the profit or misunderstood the information given. Many students who did not gain full marks mixed up the information for white and brown at some stage in the method but there was a special case B4 available for those who still managed to work accurately with the values despite mixing up white and brown. Some students gained the 3rd method mark by finding the profit from a single white loaf and a single brown loaf.

- 4 This question was generally answered well. Many were able to gain two correct improper fractions and following this the most common step was to invert the second fraction and multiply which many students did successfully. The final step caught some students out as they needed to show the multiplication e.g. $\frac{28}{63}$, many went straight to $\frac{4}{9}$ and did not gain the A mark. Some students did not invert and instead found two fractions with a common denominator e.g. $\frac{28}{12} \div \frac{63}{12}$ and this often led to 3 marks. Cross cancelling was another method which was popular. For those that gained 0 marks, finding the correct improper fractions was not done correctly and therefore falling at the first hurdle; it should be noted that this can be done on a scientific calculator.
- 5 This question was answered well with more than 80% of students able to gain full marks for a correct answer in range. Of those that didn't, many were able to gain SCB1 for one of the examples in the mark scheme, which focus around the use of simple interest or depreciation instead of compound interest. With the number of years being 4, it was pleasing to see very few using the 'year-by-year' method and those that did choose this route saw varying degrees of success. It should be noted that using $(1 + 2.5\%)$ as a multiplier is not classed as a valid method and will be awarded 0 marks unless it leads to a correct answer which would be 3 marks. The students who scored 0 marks often had an incorrect decimal as their multiplier such as 1.25.
- 6 Part (a) saw many students able to gain 2 marks as they set up an equation for the volume of the cylinder and solved to find h . Of those that didn't, many were unable to correctly rearrange and others had an incorrect formula for volume, e.g. the formula for a cone was seen often, which is disappointing considering the formula sheet given on page 2 of the paper. Part (b) saw many students gain at least 1 mark for reaching 1510, many did correctly convert this into kg but others did this incorrectly (15.1 was seen often) or did not convert at all. Some students recalled an incorrect formula for density or had the correct formula but could not rearrange it correctly.
- 7 Part (a) was answered well with almost all students able to give a correct answer of g^7 . For those that didn't, the most common incorrect answer was g^{11} . Part (b) saw varied success. Of the two terms, finding $5k^5$ proved to be more problematic than $20k^2$, with the power often seen as 6 instead of 5. There were some issues with the second term as well with the power 2 or the k^2 sometimes missing. Some students achieved the correct answer but went on to do further incorrect working such as 'simplifying' to $25k^7$ and as such only awarded B1. Part (c)(i) was answered with many students able to factorise correctly for 2 marks. Some students had the correct factors with incorrect signs and some gained no marks as they were not familiar with the form their answer should be in and therefore did some incorrect algebra or completed the square. In (c)(ii) the solutions to the equation needed to follow through from the factorisation in (i) and many were able to do this. Some

students clearly did not understand the meaning of the word ‘hence’ in this context and used the quadratic formula (or their calculators) to reach -7 and 9 without a correct answer in (i) and therefore awarded B0 in (ii). Part (d) saw varied success with many students gaining at least 2 marks for rearranging the inequality to a simplified form with y terms on one side and numerical terms on the other. Of those that did not gain 3 marks, there was some confusion with both the inequality sign and eliminating any minus signs. Some students also gained the correct inequality but gave just 3.8 on the answer line, losing the A mark, and some gave their answer as $y = 3.8$

- 8 There were many ways in which students could gain marks in this 6 mark problem. It was pleasing to see two thirds of students show a complete correct method and answer and gain full marks. A good number gained the first 2 marks for working with the area of the trapezium or the rectangle and triangle. There were also plenty of Pythagoras methods seen to find the length of CB , these were still available even if the first two marks had not been gained. It was common to see students assuming that the triangle was half of the rectangle and using $MB = 14$ in their Pythagoras calculation. As long as this was clearly marked on their diagram then marks for a correct Pythagoras method were still awarded and some follow through marks could also be gained. There was some confusion with finding the perimeter and it was seen where students included all 4 sides of their rectangle in their calculation.
- 9 Many students gained full marks on this question. Of those that didn’t, a good number achieved 2 marks for an equation in the form of $y = mx + 1$, with incorrect gradients of $\frac{1}{2}$, -2 and 2 often seen.
- 10 The majority of students gained 0 or 2 marks on this question. For those that knew how to identify the upper and lower quartiles, almost all went on to gain 2 marks. Common incorrect methods were to identify the quartiles incorrectly, usually the upper quartile as 6, or to find the quartiles by finding $\frac{1}{4}$ and $\frac{3}{4}$ of 11. Occasionally students gained one mark by correctly finding the upper and lower quartile but then added these values rather than finding the difference.
- 11 Part (a) saw some success with 40% of students able to find a correct HCF for $5A$ and $2B$. Some students gained only one mark as they found the HCF of A and B or made an error with one of the powers. Very few Venn diagrams were seen to find HCF. Part (b) saw more success as many were able to deal with the method better than in part (a). The most common route was to multiply A and B first and then square the product once evaluated. Some students evaluated $(AB)^2$ but did not give their answer in standard form, gaining only 1 mark. In both parts answers were seen given as ‘ordinary numbers’, without the correct prime factorisation previously seen this was 1 mark only as the question asked for the answer as a product of prime factors.
- 12 This question was answered well with almost 80% of students able to give a full algebraic method and correct answers for 4 marks. Students are familiar with this type of question and the majority chose the elimination method. Common errors included an arithmetic error when multiplying one

of the equations or selecting the incorrect operation for their equations. There were still a good number who were unsure how to approach this question and a very small number gave correct answers without supporting algebraic working, presumably using the equation solver on their calculator.

- 13 This question saw the full range of marks awarded. A good number were able to work through the method to reach a correct value of 38 for the angle OBD . A fully correct set of reasons was rarely seen with students needing all the appropriate circle theorems and angle rules including the underlined words in the mark scheme. The most common reasons omitted were 'angles around a point' and 'angles in a triangle'. There were a good number of incorrect methods seen such as assuming $OBCD$ was a cyclic quadrilateral and that angle $OBC =$ angle ODC . It is also worth noting that there are two angles at BOD , a reflex and obtuse one, students should aim to identify which they are working out by using the correct notation e.g. 'reflex BOD ' or 'obtuse BOD ', as this was seldom seen.
- 14 In part (a), 65% of students were able to correctly expand and simplify the 3 brackets. The most common method was to expand two brackets and then multiply this result by the third bracket; the 'all-in-one' method was rarely seen – where students attempt to expand all three brackets in one step – and when it was seen it rarely led to marks being awarded. The incorrect method highlighted in the mark scheme in the notes for the first M1, where two brackets are expanded and then another two expanded and the results added together, was seen regularly and gained 0 marks. Part (b) saw varied success but there were many ways in which students could access marks. Many were able to pick up at least one mark for applying the power $\frac{1}{2}$ or the negative power or simplifying the fraction; it should be noted that the whole expression needed to be correct to gain credit e.g. a correct simplification in the bracket with an incorrect power gained 0 marks. Students were allowed an error with one of the four terms and if this was seen it was usually the b term, presumably as the power of one in the original expression is absent.
- 15 A good number of students were able to correctly set up an equation using the sine rule for area. This gained the first mark and it was pleasing to see many realise that ' a ' and ' b ' were equal and go to gain the correct answer from there. Some students rearranged incorrectly and divided 74 by 2 instead of multiplying, whereas others reached $ab = 193$ and then wrongly divided by 2. Some students started the question incorrectly, attempting to use $\frac{1}{2} \times \text{base} \times \text{height}$, usually leading to 0 marks although on rare occasions it was done correctly using right-angled triangle trigonometry.
- 16 It was clear many of this cohort did not know the difference between a histogram and cumulative frequency graph or grouped frequency table. There were many who clearly did not know how to find frequency density and dividing the frequencies by the upper class limit was often seen. Of those who did manage correct frequency densities this often led to a correct histogram as well. Some

students treated the histogram like a bar chart and drew bars with heights in proportion with the frequencies.

- 17 Part (a) saw mixed results; 60% of students were able to manipulate the indices successfully to reach an answer of 15. There many incorrect answers as well as blank responses. Part (b) saw the full range of marks awarded. Many students were able to recognise that the numerator and denominator needed to be multiplied by $(2 + \sqrt{3})$ to gain the first method mark. Many then did not gain the second mark as they did not show their expansion of the denominator; it should be noted that when working is asked for students should show all steps, even if the outcome of their expansion is 1. The third step proved to be a step too far for most students with less than 30% reaching the answer in the correct form.
- 18 A large proportion of this cohort were able to gain the first method mark for finding a linear scale factor or finding a ratio for the lengths. The next part of the method proved to be the stumbling block for most as setting up an equation proved challenging. That being said, more than a third of students were able to do so and go on to gain full marks. Some students found the surface area of **B** but were then unable to progress further, gaining 2 marks.
- 19 This question saw the full range of marks awarded. A good proportion of the cohort were able to gain at least 1 mark for differentiating with at least 2 terms correct. Many were able to show that they understood that $dy/dx = 0$ for stationary points, even if they did not state this it was implied by a correct method to solve $dy/dx = 0$ so those that went on to solve for the third M mark also gained the second and many did this. A common error for the next part of the method was to substitute their greatest x -value into dy/dx rather than the equation for curve C . It was pleasing to see almost 40% of students able to gain full marks for correct coordinates but some students achieved the coordinates of both point A and point B and either selected the wrong one or did not select one at all, losing the A mark.
- 20 Part (a) saw many students make an incorrect start and gain 0 marks, in particular attempting to take out a factor of 2 and complete the square in one step. Those that successfully took out a factor of 2 first gained the first M mark and then could go on and complete the square. Some were able to gain the second mark but failed to go on to gain the third mark as there was a miscalculation with the constant term. Part (b) saw little success with many students failing to spot the link between (a) and (b); many expanded in (b) and attempted to simplify and complete the square, if done correctly full marks could be awarded but often it led to 0 marks. Some students attempted to differentiate to find the x -coordinate of the turning point but again this often led to 0 marks. Just less than 30% of students were able to spot the connection and gain 2 marks and there was a follow through available for those who did not complete the square correctly in (a).

- 21 To make any progress on this question, students needed to find a correct product for P(orange, pink); this was seen but many were unable to make any progress from there. Common errors were a failure to recognise that 2 of the products were needed to allow for (orange, pink) and (pink, orange) and gained 1 mark only, others did make progress and reached $x = 11$ and 8 but then did $8/25 \times 8/24$, losing the A mark. Some students reached correct values for x without showing any algebraic working and therefore gained 0 marks; others treated the situation ‘with replacement’ e.g. with denominators of 25 which also gained 0 marks.
- 22 It was rare to see a fully correct answer on this question. The first 3 method marks were for methods to find the lengths of MP , BM and BP and solutions finding 0, 1, 2 or 3 of these were seen often. To progress beyond 3 marks all three were needed and if students could then substitute these correctly into the Cosine Rule the 4th mark could be gained; some students attempted the Cosine Rule but made an error with the formula, despite it being given on page 2 of the exam, and some substituted the values into the correct formula but for the wrong letters. The rearrangement of the Cosine Rule was sometimes an issue.
- 23 At this stage of the paper it is not unusual to see many blank responses and this paper was no exception. Many students were unable to make a start on the question; of those that did many were able to set up a correct equation and solve for x , and go on to find a and d and achieve a correct answer. Some students had a correct equation but incorrect value of x ; the third mark could still be gained if their stated values of a and d were substituted into the correct formula for the sum of the first 40 terms of the arithmetic series.

Summary

Based on their performance in this paper, students should:

- be aware that the answer line takes precedence and should ensure they always write the correct answer there.
- lay out their working clearly for longer, higher mark questions.
- use their scientific calculator to convert between mixed numbers and improper fractions.
- understand when further algebraic simplification is not possible e.g. $5k^5 + 20k^2 \neq 25k^7$
- show all steps of working for their method, especially when working is asked for in the demand of the question.
- use algebraic working and methods if the question demands it.
- ensure formulae from page 2 of the exam are copied and used correctly.
- ‘show that’ questions require students to be encouraged to show all steps to be awarded full credit.
- know geometrical reasons for solving angles questions.
- Increase confidence of algebra in variety of topics e.g. probability, HCF/LCM.
- Handwriting – clear in writing digits and ensure decimal point is clear and index numbers written appropriately.

