Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2023

Pearson Edexcel International GCSE
Mathematics A (4MA1)
Paper 2H

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November 2023
Publications Code 4MA1_2H_ER_2311

International GCSE Mathematics
4MA1 2H
Principal Examiner's Report

This paper catered well for the full range of ability of students sitting the paper.
The early part of the paper was accessible to all with questions near the end of the paper providing stretch for the more able students. It was good to see several students picking up some marks on the harder questions, even though they could not fully complete them.

Students should read questions very carefully, and for instance, if asked to show their working clearly must do this or be prepared to lose marks. This is necessary on 4MA1 as we do not have a non-calculator paper but inevitably want to test some aspects of Mathematics in a non-calculator context. This was the case in the fraction question (6) and the surd question (15b) It is also commonplace for us to ask for algebraic working on algebra questions with several stages and without this full marks will very rarely be scored, eg question 4a and question 24.

Comments on individual questions

Question 1
In part (a) the majority of students were able to correctly give the modal class interval.
For part (b) over 40% of the students gained full marks, but some students lost a mark by not reading the question correctly and continuing to find the mean. Some students used the upper bound multiplied by the frequencies and were able to gain 1 mark. Incorrect methods included multiplying each frequency by 5, the size of the class interval.

Question 2
This was reasonably well attempted with around 70% of students gaining full marks. Unfortunately some students started by using Pythagoras incorrectly, by adding rather than subtracting the square of the shorter length from the square of the hypotenuse. Follow through marks were awarded here if they went on to use Pythagoras correctly on triangle *ECD*.
A few students just tried to work with 14 cm and 5 cm from triangle *ECD* as if it were a right angled triangle and others forgot to add the length of 5 cm to their found value of *BC*. Some students attempted to use trigonometry as it is a completely viable method, but few were fully successful.

Question 3
Reflecting in a diagonal line in (a) was difficult for some number of students but about half gained full marks. Many were able to gain just B1 for the correct line of symmetry drawn or a shape of the correct size and orientation drawn on the grid.
Describing an enlargement in part (b) often did not gain full marks. Students often said Enlargement to gain B1 but if they also gave another transformation this mark was withheld as a single transformation was requested. Scale factor 3 often gained a mark, but the mark for finding the centre of enlargement was only scored by the more able students.

Question 4
We saw many good performances on part (a) where students could make the equation look very simple to solve; around 70% scored full marks. Others tried various things and some only multiplied one of the terms on the right-hand side by 6 or multiplied $2x + 5$ on the left

hand side by 6. Many of these gained one method mark for correctly rearranging their equation if it was in the correct form.
Part (b) was generally correct with less than 10% incorrect.
Many students scored full marks for part (c) but some only gained 1 mark because they multiplied the numerical term by 4 instead of raising it to the power 4
For those students who can manipulate indices, 2 marks were easily scored on part (d). Others tried to multiply and divide the indices. One mark was awarded for sight of a correct law of indices calculation, but this was rarely given – students either knew what to do or they did not.

Question 5
There were many instances of a correct answer here with full marks awarded. However, some students misread the question, thinking they had to divide 120 in a ratio. Some did not realise that all the ingredients were linked, indeed, the main issue in the question was combining the two ratios. Some managed to combine the ratios to give 18:15:10 but they were not always able to proceed further. If full marks was not awarded, M1 was the most popular mark for 120/2 = 60. Many of these gained no further credit because they used the 60 g as 1 part flour and simply multiplied by 6 to gain the answer of 360 for the weight of flour.

Question 6
This style of 'show that' question appears on a paper on most examination series, so students should be very well used to them if they have prepared by writing past papers.
There were many instances of full marks being awarded, but several students failed to get the final mark because they missed out a final stage of cancelling, usually failing to show the value 72/56 before giving 9/7. This could have been through inappropriate use of the calculator. Zero marks was rarely scored.

Question 7
Another question where students should be well used to the topic of compound interest and depreciation. This time it was depreciation. We saw many instances of full marks being scored, but M1 or SCB1 was also scored fairly frequently for those who saw the depreciation as being the same amount per year. A few students treated the depreciation as if it was simple interest but were often able to pick up a mark for the value at the end of the first year. Others misread the question and calculated the value as if it were compound interest rather than depreciation. Numerical errors were more common when students wrote out the calculations for each year separately, but these students generally picked up the 2 method marks if their working was clear.

Question 8
This question was generally well answered. Some students did forget to divide 22 by 2 to give the correct answer of 11 but gained 2 marks for this response. Others (around one-third of the cohort) had no idea of combined mean and tried to work with the figures given by rearranging and summing them in various ways.

Question 9
This was generally very well done with about 50% getting full marks. It was interesting that on paper 2F, we saw many diagrams and correct answers being gained from the use of a diagram. On paper 2H there seemed to be less use of diagrams. We would suggest that a simple diagram could enable the student to gain a correct answer. 1 mark rather than 2 was often awarded for students giving their answer as $y = 1.5x + c$ (where c was incorrect) or for $y = mx - 3$ (where m was incorrect) or for $1.5x - 3$ (where the student got the gradient and intercept,

but forgot y =). Many students calculated the gradient incorrectly, either gaining the value -1.5 or the value 2/3 by dividing change in x by change in y.

Question 10
For around 40% of the students this question was very straightforward and they gained 5 marks, either for setting up a correct equation and solving it or for showing a complete numerical method eg 258 – 20 – 28 = 210 then 210 ÷ 25 = 8.4 then 8.4 – 2 = 6.4

Other students were able to gain marks for finding a missing length and finding expressions for 2 parts of the shape. A common mistake was to use the area $8(x + 2)$ and then treat the remaining shape as a trapezium. The area formulae for rectangles, triangles and trapezia were usually correctly stated but many mistakes arose, especially from missed brackets. Mistakes in lengths were also common, such as $(x + 6) – (x + 4) = x + 2$ or 10. Many students still have difficulty calculating the area of a trapezium and many others calculated the difference between $x + 6$ and $x + 2$ incorrectly, the most common incorrect answer for this being $x + 4$.
Some students failed to consider area and were using perimeter calculations.

Question 11
In part (a) we had around 75% of students gaining full marks. Those that only gained 1 mark out of 2 generally completed the first branch for 'not red'. Mistakes were made by some who thought both boxes had the same number of red counters in.
In part (b), over 50% gained full marks, but others often only gained 1 mark for a correct product. Adding rather than multiplying products was frequently seen by students gaining no marks; as was multiplying the 2 products as opposed to adding them.

Question 12
For part (a) we found that around 50% of the cohort were unable to deal with powers of 2 and 4 and make them a uniform number to powers. This was disappointing as we frequently have this sort of question. It was quite common to see the LHS evaluated and 8.5 found by trial and improvement (or very occasionally using logarithms), but some who tried this approach failed to find a correct value for x. Probably the most common error was to add the given indices regardless of the base numbers to give an answer of 12. A few attempts thought that $2^7=4^6$ or $4^5=2^6$.
Part (b) fared much better than part (a) with over 60% gaining full marks for this simplification of an expression with a fractional power. Those not gaining full marks often picked up a mark for 2 out of the 3 terms correct, the numerical term usually being given incorrectly. The most likely error was treating 125 in the same way as the powers and giving the numerical part as 2/3 × 125.

Question 13
A high proportion of correct answers were seen for this question requiring students to find the interquartile range from a list. There were a few mistakes finding the quartiles, sometimes by looking at n/4 and 3n/4, which is not appropriate for a small, discrete set of values, and either subtracting 33/4 – 11/4 or incorrect quartile values found from these fractions. Some students were unclear on what the interquartile range meant and for those who scored zero were finding the range or the mean.

Question 14
We rarely examine H2.6B Use of graphs to solve simultaneous equations, but it is expected that students have this knowledge. A correct solution without a graph gained no marks because

students were clearly asked to draw another straight line on the grid. Algebraic solutions were often seen, but the question clearly stated they needed to draw a straight line on the grid.

Question 15

In (a), around 45% of students were able to use algebra to show that the given recurring decimal was equal to the given fraction. This is now a standard sort of question which many students are familiar with, and they were able to give clear and correct answers. The most common errors included an incorrect interpretation of the recurring notation, usually 0.372372…, and trying to subtract multiples of the original that didn't lead to an integer or terminating decimal result. Occasionally, students subtracted correctly but failed to create a fraction from their result, hence not showing how their working led to $\frac{41}{110}$. Students who removed the 3 and worked with $x = 0.07272\ldots$ were much less likely to be successful in showing their method fully. Some other approaches were also seen but they needed to be algebraic, as instructed by the question, to score both marks.

Part (b) was a question that differentiated very well. Students needed to show us the stages they took to express the given surd into the surd required. Many students used calculators and showed us what the calculator showed. Many missed the final step to convert to a single integer surd. We wanted to see all the working necessary.

Question 16

Nearly 60% of students were able to expand and simplify the product of 3 linear expressions. Nearly everyone used the 'FOIL' approach. A few used grids successfully. Simple mistakes were quite common, but the mark scheme made some allowance for these, helping many students to score 1 or 2 marks. Most errors involved signs or powers, though poor use of brackets may have contributed to some mistakes. Just a few attempts were seen to complete the whole expansion in one step but these very rarely scored any marks.

We would suggest a simple check of their work could help prevent mistakes in this sort of question.

Question 17

This is another question that differentiated well with about 30% gaining zero marks and 30% gaining full marks. This question seemed quite straightforward but students were weak on finding the upper bound of 15 when written to the nearest 5 with values like 20, 15.5 and 10 often being used.

Some students just worked with the given numbers; we would suggest that a simple substitution at this stage in the paper would not be asked. Some who worked with the given numbers tried to find a bound of their result and should revise that the bounds need to be used within the substitution.

Question 18

Over 30% of the students were able to get this question fully correct and just under 50% did not know where to start. Some students did not realise they needed to differentiate, but for those that did it was fairly easy to gain some marks here. Differentiating just once and putting the velocity equal to 5 was seen fairly frequently. Those who differentiated twice often scored full marks.

Question 19

Around 45% of students knew which number should be excluded from the domain of g

For part (b) the percentage gaining full marks was higher than in (a) with nearly 55% being able to correctly work out this composite function. Mistakes on this part included working out

f(4) × g(4). A few worked out gf(4) and scored zero. Some lost the negative sign, giving 18 as their final answer rather than –18. A few also tried to solve f(x) = g(x)
Part (c) was set at the top grade, so it was pleasing to see students making an attempt and in some cases picking up some marks. Around 15% of students scored full marks. Those not working at this grade often did not know what was required. Even those who did made mistakes such as taking out $3x$ as a factor rather than just 3. Numerical errors and incorrect signs often spoilt attempts to rearrange equations. It was pleasing to see that most students who achieved the correct rearrangement also exchanged x and y correctly as well as realising that only the positive solution was suitable for the final solution, though some did include the negative square root thus losing the final accuracy mark.

Question 20
This was a demanding problem-solving question and around 50% of students could not make a start. 25% of students scored 1 mark for finding the area of the triangle. A small number gained 2 or 3 marks, but for those that got beyond 1 mark it was more likely that they scored full marks. Common mistakes were assuming $r = 2.5$ or $r = 5$ and calculating ½ × 10 × 10 for the area of the triangle. It was disappointing that many students did not recognise that the angles of the equilateral triangle are 60°, sometimes going to great length to try to calculate this angle.
The most successful students used trigonometry to find the radius, ½ × 10 × 10 × sin 60° to find the area of the triangle, and then worked with surds to retain the accuracy required for the final result. Where rounded figures are used in working, it is good practice to use the calculator memory functions to carry through accuracy to the final solution.
It was apparent that some students had experience of this type of question and knew that the radius of the inscribed circle was $\frac{1}{3}$ × perpendicular height of the triangle. These students often achieved the correct solution concisely.

Question 21
This was a quadratic equation where one is quadratic and one linear. However, it was disguised slightly in that the linear equation was described as a line and the quadratic as a curve. On the whole, this topic tended to be one that students could do or could not do and while students did scores marks of 1, 2, 3 and 4, the majority scored either 0 or 5. Quite a common error when solving a quadratic in y was to label the roots x and then to treat them as x values for the final substitution.

Question 22
The performance on part (a) was extremely pleasing with well over half of the students getting the vectors correct.
Part (b) was very demanding but with the hints from part (a), a pleasing number of students were able to gain full marks.

The vector $\overrightarrow{OC}$ was usually correct, but some wrote $\overrightarrow{CO}$ instead or simplified their working incorrectly. Similarly, a few students gave a vector for $\overrightarrow{BA}$ instead of $\overrightarrow{AB}$. A very small number of students mixed up their answers for $\overrightarrow{OC}$ and $\overrightarrow{AB}$.
Those who attempted part (b) did not always recognise the need to work with two variables, nor that they needed to find two independent expressions for the same vector, though the expressions found in part (a) for $\overrightarrow{OC}$ and $\overrightarrow{AB}$ provided a hint to some students. Those who knew the correct method to use generally worked with confidence, usually creating two distinct, correct expressions for $\overrightarrow{AP}$, $\overrightarrow{BP}$, $\overrightarrow{OP}$, or other vectors, equating coefficients to form

and solve simultaneous equations. There were inevitable numerical errors seen in completing this working but those who worked neatly and concisely generally found correct values for their variables. The final step of writing down the required ratio defeated some students.

Question 23

Gaining 1 mark for finding an expression for the volume of the large cone was fairly common. An equal number gained 2 marks for additionally working with the scale factor or finding a formula for the volume of the small cone.

After that few gained 3 or 4 marks but those that continued tended to gain all 5 marks. This question had a pleasing response as it was set at the top grade.

Common errors included: using the volume formula for a cone for the frustum; assuming the height of the small cone to be 7.5 cm and its radius to be 3 cm; dividing the volume of the frustum by the volume of the large cone to calculate the scale factor; and using the incorrect formula for the volume of a cone.

Question 24

This is a question that differentiated well at the top end with a good spread of marks being gained. There were various approaches, but the most successful solutions started by adding the two fractions in brackets and this was usually done quite well. Some became muddled after this and made no further progress. Others started to factorise the first fraction. Mistakes were made doing this, of course, and sometimes factors of 5 and x were lost, but those who managed to complete these stages fully and correctly usually went on to cancel accurately and obtain a correct answer. It was quite common to see the denominator factorised but not the numerator. Without complete factorisation, solutions tended to resort to clearing fractions, which led to lengthy algebra, and that rarely had a happy conclusion.

There were also attempts to multiply the original brackets instead of adding the fractions. These attempts usually proceeded with attempts to clear fractions, again leading to unmanageable algebra. Some did try factorisation after this start and they tended to make more progress, occasionally reaching the correct answer.

Summary

Based on their performance in this paper, students should:

- Read questions carefully, following instructions such as to show your working or to draw a straight line.
- Make sure they are using basic skills such as Pythagoras the correct way around.
- Know the difference between area and perimeter.
- Learn how to describe transformations using a ‘single’ transformation.
- Use handwriting which is clear to read.
- Set out their working neatly and orderly.