Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2023

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

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January 2023
Publications Code 4MA1_1HR_2301_ER

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Those who were well prepared for this paper made a good attempt at all questions. It was good to see several students having a go at the grade 8 and 9 questions and gaining a couple of marks for these, even if they could not see the question all the way through.
The paper differentiated well.

Students tended to mainly show good working but some need to be reminded that when working is requested, they are unlikely to score marks without every step in the working shown; this was especially true for Question 6 on simultaneous equations and Question 18 on surds.

In some of the longer trig questions, very premature rounding lost students the accuracy mark even though we gave a range of values for the answer.

We found that some higher tier students were more able to attempt the more challenging questions than some of the more straightforward ones. Students must be reminded to revise the easier topics as well as the more difficult ones set at higher grades.

Question 1

In part (a) about 70% of students were able to identify the modal class but students must be reminded that the modal frequency of 19 is not the correct answer; rather the class with this frequency.

Part (b) was generally very well answered with most students achieving full marks. Some candidates lost 2 marks for not using the midpoint within each interval or for dividing by 5 instead of 60. A small minority clearly had no idea how to approach the question and attempted to find the mean frequency or the average interval width leading to no marks at all.

Question 2

Many students scored full marks on this question. Most students were able to score the first mark by calculating the areas of a least two different faces but several went on to only add together 4 of the 5 faces. The most common error was to leave out one of the rectangular faces. A few candidates failed to halve 4.8 x 3.6 for the triangular faces and some calculated volume rather than area.

Question 3

This question was answered well by the majority of students who received full marks irrespective of the method used. The most common error was to give 8 as the value of y indicating a failure to realise that the median would be $(y+z)/2$.

Question 4

The majority of students completed this well and with efficiency in their method showing an excellent grasp of how percentages work. In most cases those that did not get the answer completely correct did at least pick up some marks for finding 16% of £1600 or for discounting this to find the price of the holiday. The main error in this question was a result of not reading the question carefully enough as several students thought that the discount in both cases was the same rather than the amount paid.

Question 5

This question was very hit and miss with many candidates. It was common to award full marks or one mark but rare to award two marks. This was because students who understood the question were able to follow through to completion. Whereas those that did not very often picked up a mark for "65" or one of the special case options. Reading the question here was vital.

Question 6

A healthy proportion of students got this question completely correct with most using elimination as a method but many also working with substitution. The most common error lay with subtracting $-6y$ from $8y$ and getting $2y$ rather than $14y$. There were some students that had the correct answer on the answer line but because they showed no method they were not awarded any marks. Where the question asks for the candidate to show clear algebraic working, the students need to ensure that they show all their steps in a clear logical fashion.

Question 7

Students on this award tend to do well on the standard form question and this session was no different. Well over 80% of students were able to gain the mark on part (a) and 80% gained full marks on part (b). Part (c) could not be done on the calculator – with an error message, if you tried – which of course, some students told us about. The point of the question was to test full understanding of standard form and over 50% of students were able to show this. Of those unable to gain 2 marks, 30% gained 1 mark for some correct working.

Question 8

In part (a), most students were scoring full mark. There was an assortment of answers that did not remove the full common factor and scored 1 mark and similarly had the correct common factor but made a mistake with the content of the brackets, again scoring 1 mark. The most common mistake was trying to do the subtraction and not factorising at all and ending up with $-3cd^2$ or something similar.

Most students completed part (b) well and picked up 3 marks. Errors, when they occurred, included partial factorisation into a single bracket with a constant remaining and a few attempts to complete the square. It should be noted that if the student gave an incorrect factorisation in part (i) they could still obtain the mark in part (ii) provided they solved their factorisation correctly.

Question 9

Many candidates fell at the first hurdle by failing to use a correct formula to find the height of the triangle - a common mistake was halving the base to 3.5 before substituting into an area formula. Despite this, it was common to award one mark for correctly substituting their "*h*" into a Pythagorean equation.

Question 10

There were many correct solutions seen in this question. Those who did not achieve any marks usually used cos 52 instead of cos 38 or sin 52, or found *MO* and used that as the radius. Some students found the radius, but it almost seemed as if they were not sure what that 7.614... was, because they were unable to use it in the formula for the area of a circle. In other cases, it was clear that students did not know the area of a circle because they substituted the correct *r* into *A*=pi × *r* (without squaring the radius)

Question 11

Most students attempted this question very well – as is often the case with cumulative frequency graphs.

Part (a) was generally correct and a good number of candidates plotted their point at end interval and correctly drew the cumulative frequency graph for part (b). The median for part (c) was often correctly read and the IQR in (d) was often within the range of acceptable values. Mistakes for this question involved drawing bar graphs, plotting at the wrong point (mid or lower end) within the interval and being completely confused with the concepts.

Question 12

This question was done very well by the majority of the students taking this paper, with only a few having difficulty working with the indices. It was true that algebra tended to be a particular strength of the cohort.

Question 13

Most students clearly knew how to approach this problem although not all managed to choose the correct multiples of *x* to begin with. Those that did not state their recurring decimals gained no marks, for this reason students need to be encouraged not to take short cuts and demonstrate the recurring nature of the quantities they are dealing with. Many students lost the final accuracy mark because they failed to state their initial fraction for *x*. For example we needed to see $x = 378/990 = 21/55$ to award the accuracy mark. A very few ignored the instruction to use algebra and attempted to show the fraction equalled the decimal using long division receiving no marks at all.

Question 14

Over half of the cohort gained full marks for this straightforward upper bound question. Those that did not often wanted to use the upper bound for both *p* and *r*, but given it was division this was incorrect.

Question 15

Parts (a) & (b) were well completed with the majority of students picking up some if not all the marks for finding the points and sketching a curve - a few losing the second mark on part (b) for connecting points with line segments or for plotting one of their points incorrectly. Part (c) however proved too much for most students and marks were few and far between. Some students attempted to differentiate in this part and went looking for stationary points. A few tried to factorise the second cubic and some tried to sketch another graph. As the question asked for a graphical method involving a straight line these attempts proved fruitless.

Question 16

In part (c) most students were able to start by removing a factor of 5 and begin earning marks although a few of those failed to remove the factor from the -20*x* term. For those that were able to begin, the most common mistake was in the subtractive term to complete the square - many forgetting that this also needed to be multiplied by the 5 and leading to the wrong constant; +23 rather than +3 being a common way to conclude. Those who had shown every step of their working were often able to make this mistake but still pick up 2 out of 3 marks, if they had a double pair of brackets, compared to others who had tried to be more efficient. There was still a very pleasing number of students who achieved all 3 marks.

Question 17

It was encouraging to see many students make it as far as calculating angle *ABC* correctly but many candidates struggled to move beyond this point. Where the Cosine Rule was used correctly, it was common to award 4 marks as many found *AC* but didn't go on to find the full perimeter.

Question 18

It was pleasing to see a lot of correct solution here but a lot of students lost the last 2 marks because even though they arrived at the correct solution they failed to show how they rationalised the denominator of their fraction. The question quite clearly asked students to show their working clearly. Students need to be reminded that if they are asked to show their working clearly a correct answer may score zero unless it is accompanied by a suitable method.

Question 19

Part (a) was much better completed than part (b) with most students showing an understanding of proportion, and most were able to at least get an expression for k if not all three marks. The majority of those that didn't get marks mistook the problem for a direct proportion one and tried to multiply k by y^2 rather than divide or failed to spot that the y was squared. Attempts at the higher grade part (b) were however much less successful. Many students simply didn't know where to start and those that did often tripped themselves up with small errors or got lost in the algebra.

Question 20

Only the very best students were able to recognise the transformation of the cosine curve and give the correct values for a and b. Finding the correct value of a was not surprisingly a lot easier than the finding the correct value of b

Question 21

Students often find 3D trig questions quite inaccessible but this one proved to be well done and almost 50% gained full marks.

Examiners did find that students prematurely rounded which is not to be encouraged – in this case we allowed a range of values for the answer, but premature rounding still cost some students to lose the accuracy mark. Some students only gained one or two marks for the first two correct steps but then they used the wrong combination of lengths or the wrong trig operation to find the required angle.

Question 22

Part (a) was well completed with the majority managing to at least make a start and most gaining both marks for a correctly simplified expression. In part (b) a lot of marks were still awarded and many students correctly managed to find expressions for ME, NE and MN. A lot of students then did not pick up the final mark as they were not able to show or explain why this meant that the lines were straight. Those that did get all 3 marks did so by either stating that one was a multiple of the other or by showing $(2\mathbf{a} - \mathbf{b})$ as a common factor.

Question 23

Only the best students scored full marks on this question and many failed to gain any marks at all. The question required the students to start by differentiating the given equation to obtain an equation for the gradient. Students who did no differentiation gained no marks. Several of these students tried to solve a quadratic equation obtained by setting the given equation equal to 0 often resulting in a page of unnecessary algebra. Those students who started correctly obtained the first mark for at least one correct term in two terms. Many of these students then equated $16x - 14$ to 0 rather than 10 and obtained no further marks. Most of the students who had the correct equation scored the first 3 marks, but many failed to use a gradient of -1/10 to get the remaining two marks. A number of students gave a final answer that, whilst correct, had a non-integer value for a, b or c and therefore lost the final mark. Another place where reading the question carefully is essential to benefit from maximum marks.

Question 24

This proved to be a challenging question for all but the most able students but it was set at the highest grade and in a problem solving situation. The best students used variations on the two methods given in the mark scheme to obtain their answer. Many students scored the first mark for either a correct substitution for $S(k)$ or $u(k)$, or for $S(20)$ with no value used for A. Only the best students went on to give correct expressions for $S(k - 20)$ or $u(k - 19)$ and therefore secure the second mark from the alternative method in the mark scheme. The most common errors here were to use $u(k - 20)$ rather than $u(k - 19)$ and equating $S(k)$ with 10170.

Students using the first method were more successful at gaining the second mark for $A = 404$. Few students scored any more marks with those that did usually obtaining the correct answer. Those students that used $n/2(A + L) = 10170$ for the sum of the last 20 terms were often confused about where the last 20 terms started and having obtained an answer of 37 added 20 rather than 19 to get their final answer.

Summary

Based on their performance on this paper, students should:

- Ensure they show working when requested eg Question 6 and Question 18
- Even when not requested to show working, please show it in as organised a manner as possible as valuable marks are often picked up if a student makes an arithmetic error or copies something incorrectly from their calculator
- Read questions carefully, eg the ratio question 5 and making sure that you read the form required for the answer eg Q23
- Remember that various formulae are written on page 2 of the paper
- Ensure other basic formulae are learned and not mixed up – eg the area & circumference of a circle and Pythagoras' theorem
- As higher level students, revision needs to cover the whole of the specification and not just the harder topics – students seem to forget how to do topics such as surface area and simple equation

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