Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel International GCSE

In Mathematics A (4MA1) Paper 2H

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Principal Examiner's Report

The paper differentiated well with those who were well prepared made a good attempt at all questions. It was good to see some students having a go at the harder questions near the end of the paper and gaining some marks for these, even if they could not see the question all the way through.

Students tended to show working, but there are still those who fail to do so and it often costs them valuable marks. The questions that specifically ask for working or algebraic working will not score marks unless sufficient working is seen because we need to assess some work without the use of the calculator. This lack of working was very common on question 15b where a method had to be shown to get any marks.

Comments on individual questions

Question 1

This question provided an ideal start to the paper for most students, with most achieving full marks or 2 out of 3 marks. Errors made included getting mixed up with the statistical terms of mode, median and range and sometimes confusing it with mean; we know this because we sometimes saw a calculation for the mean. Also some students thought that the median actually had to be the value for j, so they give answers or 5, 10, 18 rather than 5, 12, 18. A small number of students transposed the values for h and k, ignoring that the values were in ascending order

Question 2

Higher tier students tended to do quite well on this question and often gain full marks. Mistakes made included being unable to draw $y = x + 1$, mixing it up with $y = x – 1$ and $y = x$ as well as other lines. $y = x + 1$ was also drawn inaccurately starting by at (0, 1) but ending at (8, 8). Sometimes students drew $x = 2$ rather than $y = 2$ and $y = 6$ rather than $x = 6$. A follow through mark for shading was given dependent on 2 correct lines and several students were able to benefit from this.

Question 3

This question was done quite well as it is a familiar type of question seen frequently on our papers. Common mistakes were to think that 9 hours 36 minutes is 9.36 hours and also to use the incorrect formula of distance = speed ÷ time. A lot of students scored one mark for initially converting the time into minutes, but then often multiplied 576 minutes by 820 without dividing by 60.

A significant minority of students wrote $9\frac{36}{60}$ (or equivalent) but then their final solution suggests that they did not use the mixed number button on their calculator to enter it correctly when carrying out their calculations. A small number of students tried to convert into seconds.

Question 4

This was the first 'show that' question on the paper and many students on this tier were able to successfully pick up full marks. It is important that students practice 'show that' questions and do, indeed, show all the stages in their working as without this, full marks cannot be obtained. The stages of a correct solution is to convert to improper fractions and then multiplication of numerators and denominators and to finally show their values gave the given answer. Cancellation when used made the multiplication easier; but multiplying without cancelling first is the most popular method. There were very few errors in the multiplication. Some students unnecessarily found a common denominator of 63 which could have led to them scoring full marks if they multiplied the numerators and denominators correctly.

Question 5

A very well done question. The biggest mistake seen was to see use of cosine rather than sine and also to find the sine of 6.5 and multiply it by 34 rather than find the sine of 34 and multiply by 6.5. Incorrect use of cosine and tan was sometimes due to incorrect labelling of the triangle. Incorrect rearranging of the formula led to candidates dividing instead of multiplying**.** Some students used the sine rule, often correctly.

Question 6

This question produced a mixed response with many students gaining one mark for either dividing by 1000 or multiplying by 3600. Some who gave the correct calculation failed to read the instruction 'in its simplest form'. On exam day we had a couple of queries asking if the *w* was meant to be a number, but this was as intended to involve some algebra along with number and give a question which could not instantly be converted on a calculator. Some students replaced *w* with a numerical value thus simplifying the question. Those who used this correctly were awarded 1 mark unless they subsequently found a correct expression involving *w*. A notable portion of students only provided the conversion factors for kilometres to meters and/or seconds to hours (eg 1 km = 1000 m) without establishing a connection to *w*. It was common to see conversions the wrong way round, eg $1000w$, $w/3600$ or $5w/18$ were frequently seen. There was evidence that some candidates did not know correct conversions from m to km or secs to hours, as shown by $100w$ or $360h$.

Question 7

This question differentiated well. The most popular way to get 1 mark was to find the area of rectangle *ABEF*. Students were able to gain 2 marks for finding the area of trapezium *BCDE*.

3 marks were gained for students who gave a correct equation for *h* or the height of the trapezium, but more often for the value of 6.5 which is the height of the trapezium; several failed to add this value to 13 to give the final correct answer of 19.5. Some students appeared to treat the whole shape as a trapezium rather than a rectangle and a trapezium. A response scoring full marks was the most common response on higher tier.

Question 8

The students on this paper tended to very much like this straightforward problem solving question involving ratio, fraction of an amount and percentage of an amount. Many gained full marks. A few showed full and clear working but added 80 + 100 + 162 to be 340.

A few worked with 55% of tulip bulbs rather than 45% and perhaps were confused with "45% of…" and thought it meant "45% off…" Misreads of their own figures was also common

The few who did not work with the ratio were able to gain 1 mark for finding 45% of 600 or 5/8 of 600

Students who initially calculated the total number of each flower were more successful than those who attempted to identify the proportions that were yellow first. Those who made an error with their method to find the number of one of the types of bulbs often still gained 3 marks.

Question 9

It is very common on our papers to have a compound interest question and if ample revision is done one would think that full marks would be gained. However, as usual, many students used a simple interest method and were only able to get a maximum of 1 mark out of 3

Some students used an incorrect multiplier, 1.24 being a notable example. Some found the interest earned, which was condoned if the amount of money in the savings account was also evaluated. Other errors included treating the question as a depreciation problem as well as finding the amount of money in the savings account at the end of 3 years, rather than 4. Some evaluated the amount of money after each year, often successfully.

However, this was well answered by the majority.

Question 10

This simultaneous equation required the students to 'show clear algebraic working' and most obliged and gained at least 2 marks out of 3. There was the occasional student who gave the correct answer but with no working and so they were awarded no marks.

A small number used the elimination incorrectly by adding the equations while others didn't show their operation to eliminate. Although the elimination method was preferred by most students, some used substitution. However, the latter method was more challenging and generally solved with less accuracy.

Question 11

This factorise and then solve question had many correct responses. Students were able to gain a method mark for $(x - 11)(x + 2)$ or a factorisation that when expanded gave 2 of the 3 terms correct. Even with correct factorisation, some were unable to give the correct solutions in (ii). A small number used the quadratic formula in (a), scoring no marks. Others used the formula in (ii) to check their answers, which was condoned as long as they had also factorised.

Question 12

A well answered question on combined mean with many fully correct responses seen.

Some students, however, did not know where to start and presented a solution that involved adding the two means and dividing by 2 or even dividing the mean for 4 days by 4 and the mean for 3 days by 3. These incorrect methods of course gained no marks.

Question 13

A cumulative frequency graph is commonplace on our papers and this one was well attempted by the majority. We still see a few bar charts and lines of best fit and also plotting at the midpoints of the associated frequency table. Parts (c) and (d) where students had to use their graph to find the interquartile range and the number of teachers who travel more than 46 km, were generally well attempted. Some students still get mixed up with the interquartile range and we saw those who thought this simply meant giving the lower quartile, or those who used 15 and 45 from the horizontal axis and took readings going up to the graph and reading across to the vertical axis. The graphs needed to be read at cf 52.5 and cf 17.5 Those that did this normally read the scale accurately.

Part d was often answered better than part c, with a line drawn from the horizontal scale to the curve and then reading the horizontal scale. Most subtracted this reading from 70 to give a correct answer but this answer did need to be a whole number as it was 'number of teachers'.

Question 14a

Generally well attempted and by asking students to write the answer in a given form, we avoided students re-factorising; a few however, divided each value by 3 and lost the final accuracy mark.

Most students started by multiplying $3y$ by $(2y + 5)$ which often led to the correct answer. Some multiplied the two brackets first but didn't simplify their expression before multiplying by $3y$. A small number of students tried to do an 'all in one' method which rarely led to success. Several students made a single arithmetic error and received a score of 2 out of 3 for their expansion. Those who scored 0 marks typically multiplied 3y by both of the provided factors

The modal mark was 3 out of 3

Question 14b

Another question where working was requested and the majority of students provided this.

Some students got into quite a muddle with their fractions, being unable to combine them accurately; we did allow one error in expanding for the first two method marks which helped some students. Some students got into a bit of a mess with the 163/100 on the right hand side and sometimes changed this to just 163. The most successful approach was to start by finding a common denominator, rather than clearing the fractions. Clearing the fractions proved challenging to some; this may have been exacerbated when both sides of their equation had fractions. Some tried to multiply by four and then by five but often failed to multiply all terms by these values, scoring zero marks. A common error for those who gained M2 was subtracting 13 instead of adding eg "$8x + 30x = 32.6 – 13$". Some forgot to use the 163/100 and tried to solve with LHS = 0

Question 15a

This was very typical of the changing the subject questions on this award but still many students seem to struggle to gain more than 1 mark for squaring both sides. When students gathered the terms in g on one side of the equation, they often included the 5 and then gained an incorrect result.
There were many students who failed to expand after multiplying by the denominator but went straight into gathering terms in g. Some students squared both sides, cleared the fraction and then divided by e^2. A number of students tried to extract g immediately, thus missing out the second mark for multiplying and expanding the brackets. A small number of students made mistakes with signs in an otherwise correct method.

Question 15b

Algebraic working was required here and while in many cases we clearly saw this, many just wrote down the critical values, seemingly from their calculators and gained no marks. If students showed their working, they generally gained 2 marks for getting to the stage of the correct critical values; however, the final mark was only gained by very few who understood the inequality and often drew a graph to help them see the regions required. Writing their final answer as $-4 > y > 8/3$, was the main cause of losing the final accuracy mark.

Question 16

The Venn diagram was challenging to a fair number who did not understand what they needed to do, for instance to take away 9 from the 17 who chose knitting and photography. Even without the Venn diagram it was possible to use the information in the text to answer parts (b), (c) and (d) or to follow through from an incorrect Venn diagram. 17/60 was a common incorrect answer in (b), scoring one mark. Many students were awarded follow through marks, particularly in (b) following an incorrect Venn diagram. In (c) and (d), some misinterpreted the meaning of n(...), viewing the values in the Venn diagram as individual elements rather than the number of elements. Consequently, they provided answers such as 2 (for 2 elements) or {4, 7} in part (b), and similarly 3 or {8, 9, 11} in part (d).

Question 17

Many students were well versed in a direct proportion problem and gained full marks. Others struggled with 'the square root of d' and others left out a constant of proportionality from their equations. Some showed the correct method but then wrote Q = 0.25d on the answer line while others confused square root with square. A small number approached the question as if Q is inversely proportional to d. Some used the proportion sign instead of the equal sign, losing the final mark.

Question 18

This seemed like a very straightforward question for the grade at which it was targeted however we are now of the very strong opinion from the evidence from a great number of students that many do not actually know what the gradient is. We were very surprised that most students seem to think that a gradient is a value with an x or an equation. $2.5x$ or $5/2x$ were commonly seen as the gradient as was an equation with the gradient of 2.5

We would strongly recommend that students are taught that the gradient is a numerical term and not a number with an x attached.

For this reason many students only gained 1 mark because we wanted to see the gradient stated correctly as a numerical value.

Question 19

This was fairly well done by those who had revised upper and lower bounds carefully. Students must be careful to read formulae carefully as some read the denominator as $f - h$ and this lost them the accuracy mark. Others used the given numbers and then tried to find a lower bound of their result.

Question 20

A good range of marks was achieved on this question making it a good discriminator.

There were several who gave it a go and gained 1 mark for substituting to the stage of only having *y* terms in their expression. Others gained this 1 mark for being able to deal correctly with the denominator. Only the best students worked accurately to give a fully correct expression in the form required. A common error was to re-write $\frac{1}{4y}$ as $\frac{1}{4}$y or $4y^{-1}$. Many students struggled with the fractions within fractions, however those that found the most success realised they could multiply the numerator and denominator by 4y

Question 21

A challenging question for many, we saw some just work with a few numbers but who were unable to get an expression or equation for the shaded region in terms of just one variable. Others were able to give an expression but were not good with working correctly with brackets; they were able to pick up 1 mark.

Others used one of the various ways to find the radius or diameter of the circle and some stopped at this point presumably thinking they had finished. Students must remember to read any question thoroughly as after finding the radius or diameter it was a fairly easy calculation to find the required length of *AC*

Almost all successful candidates started with a correct single variable equation. Those who used x for the length and r for a radius very rarely were successful. Some dealt with a quarter of the shape and found the correct value for their r while others used a trial and improvement to find, for example, the radius of the circle; for this sort of question trial and improvement either gave full marks or no marks.

Question 22

As usual, students struggled with this simultaneous equation where one equation was a quadratic. Some students were correctly able to subsitutie $x = 5 - y$ or $y = 5 - x$ but then thought that $(5 - x)^2 = 25 - x^2$ Other incorrect working included taking the given $x + y = 5$ and trying to square it and giving $x^2 + y^2 = 25$ and then trying a method similar to that used with linear simultaneous equations.

Some students solved a quadratic equation in *y* but gave answers to it in terms of *x*, preventing them from gaining the final two marks. Others did not show a substitution to find the second variable, which often lost unnecessarily the fourth mark. Students who didn't simplify the quadratic equation (e.g. $5y^2-20y-160=0$ by dividing by 5) were more likely to make errors when solving this quadratic equation. A very small number of students attempted to draw a graph to help them.

If a student showed their working they could make a small error and still gain 4 of the 5 marks available.

Question 23

This question was very challenging with several students not knowing where to start and trying to combine numbers with numbers with indices eg $30 \times 25^{2x+7}$ was frequently written as 750^{2x+7}

For some students who made a start to working with the numerical terms or using powers of 5 a mark could be gained, but only the most able student was able to give the correct result; this was to be expected with this high grade question.

Many were not able to deal with 25^{2x+7} and $\sqrt{5}^{4x+9}$; for example, they were unaware that $\sqrt{5}$ could be represented as $5^{\frac{1}{2}}$. Those who scored one mark often did so for 6root5 and 6x5. Only a small proportion of students were awarded the second mark but those who did usually go on to gain full marks.

Question 24

Part (a) of this vector question was very well done and it was encouraging to see many students attempt part (b) as well with varying levels of success. This question was set at the highest grade so it was pleasing to see a range of marks, often just 1 for finding OP, but some good attempts often saw another mark for finding one way of writing *OQ*. In (a), some students divided 4**b** – 2**a** by 2 to get 2**b** – **a**. In (b), those who found a correct expression for *OP* often found an expression for *OQ*. Some were not able to use a parameter at all (or not correctly) but instead wrote *OQ* = 2.8**a** + 2.4**b** + *k* or *OQ* = 2.8**a** + 2.4**b** + *PQ*. Some students made incorrect assumptions, such as *OQ* = 2*OP*.

Those that could write *OQ* in two different ways often resulted in a correct outcome.

Question 25

A difficult question for most with students often giving the coordinates based on the number of squares eg A was often given as (1, 4) as it was 1 square along the x-axis and 4 squares up the *y*-axis. Other frequently appearing incorrect answers for (i) were (30, 120), (60, 2) and (1, 1.75) and for (ii) (10, 0), (90, 0) and (0, 0).

Summary

Based on their performance on this paper, students should:

- show their working clearly
- learn what is meant by gradient
- be able to differentiate the statistical terms such as mode, median, range and mean
- realise that if a question requires an answer only in *y* then all terms in *x* must be replaced by terms in *y*

- draw a sketch graph in an inequality question to determine if the solution is a single region or 2 distinct region
- if an extra piece of paper is used indicate which of the solutions in the answer space or the additional response is the intended solution
- improve understanding of set notation especially with n(….)
- learn how to break down multi-step problems and be prepared to make a start of these as they often provide an important source of marks for students
- know how to use the trigonometric functions correctly and how to label triangles correctly with 'opp', 'adj' and 'hyp'
- know how to manipulate the speed, distance, time formula
- identify the difference between simple and compound interest and know how to apply each method

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