Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2019

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 2H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 2

Introduction

Mathematical performance generally has improved on this paper since November last year, though was not always consistently good across the whole paper. Within a broad range of questions the paper was able to discriminate well. Weakest areas continue to be the application of ratios and bounds, but also algebraic manipulation and proof, iteration, working with histograms and problem solving. This was particularly the case where a question required skills from several areas of mathematics.

Approaches to questions that required some interpretation or explanation were inconsistent. Q1 and Q4 were answered well, but poor attempts were made in Q11 and Q21. On too many occasions students included contradictory or incorrect statements, which cannot be credited.

Questions which had a slightly unexpected approach, that is required more thought. caused immediate problems for many, even in the earlier part of the paper. This includes Q6, Q9 and Q16.
Q23 to Q25 were the more challenging questions for those striving to demonstrate ability at the highest grades available, and a significant proportion of students therefore failed to score on these questions.

There were far fewer attempts using trial and improvement approaches. These mainly occurred when students showed evidence of not understanding the process of getting to the answer. This was mostly evident in Q6, Q16 and Q23.

The inclusion of working out to support answers remains an issue for many; but not only does working out need to be shown, it needs to be shown legibly, demonstrating the processes of calculation that are used. This is most important in longer questions, and in "show that" questions. Examiners reported frequent difficulty in interpreting complex responses, poorly laid out, in Q9, Q16, and Q21.

Students need to read the questions carefully. There were too many cases where students misread the question but also where students mis-copied their own figures, copied down the wrong figures from the question, or rounded figures almost randomly. These many cases of premature rounding/truncating, either in their own figures or whilst in the process of taking them from the calculator, will usually result in lost accuracy marks and could also make questions more difficult than they were designed to be.

Report on individual questions

Question 1

This was generally well answered, with many gaining the two marks. Marks were usually lost for statements that were vague or ambiguous like "points incorrectly plotted" or "should not join all the dots up". There were a few who thought that they should not have used midpoints for plotting.

Question 2

There remains a lot of misunderstanding about the values used to state an error interval. The most common error was 128.4 as the top of the interval. Many who were unprepared for this topic gave 127 and 129 as their answers or writing the largest number first.

Question 3

The majority of students gained full marks. Where this was not the case, many students gained two marks for finding 168 and 72 using the first ratio, but then carried on using 24 with the second ratio, using 48, rather than starting again with 240. On a rare occasion a student would gain the correct values to make a decision but subtracted the wrong numbers. Other common errors included dividing by the individual numbers in the ratio, not the sum, or multiplying 240 × 10 and 240 × 8.

Question 4

This question was well answered. Those who lost marks in part (i) usually made an error in the calculation, or just failed to perform the correct calculation. In part (ii) there were many good answers which made reference to "representative", "proportional", or the "same ratio". The most common error was to explain the working in part (i), stating "others may not want that as a gift" or made reference to things that were of no relevance to the question.

Question 5

This was not well answered. B was a common incorrect answer for part (a).

Question 6

A significant minority of student left this question blank, seemingly unable to work out how to proceed with the question. Of those who started working out terms, many were able to gain two marks for generating at least 3 terms of each sequence, but often failing to go as low as the 4 on the second sequence. A common error was seen by many students who attempted to equate the two expressions and solve the equation, which led them nowhere.

Question 7

Many were awarded a single mark for 0.0456, since they were then unable to change this to a number in standard form. Common errors included 4.56×10^{-14} or 4.56×10^{2}.

Question 8

This was a well-answered question. Some incorrect answers showed all numbers multiplied together resulting in nonsensically large answers. The few students that did this thought nothing of giving an answer in thousands suggesting the context of the question had been missed. A common answer was to show 720 × 40 – 720 × 30 (leading to 7200).

Question 9

It was disappointing to find that so many students did not know how to find the surface area. Many only found volumes, which resulted in no marks being awarded. Of those who attempted to find the surface area, many found two of 6×8 and 4 of 6×18, but this still earned credit once they showed that they then wanted to add. Any remaining credit was only awarded for correctly processing their total surface area figure, usually by dividing their total surfaced area by 6 and then taking the square root to get their volume of the cube. Some students assumed that it was the volumes that were equal or that the cube was half the cuboid.

Question 10

There were some very confused attempts at doing this. Many tried to move items around without squaring first and got nowhere. Many made a good start getting to $y^2 = 2m-k$ then about half of these correctly rearranged to get full marks. Many were unprepared for manipulating the square root, often showing $2m^2$ as well as k.

Question 11

Students need to be made aware that just using the term “average” within the context of statistics is not enough; throughout correct statistical terms were needed such as “median” or “IQR”. Equally if figures were used, they had to be correct.

In part (a) those that recognised “half of” was associated with the median generally got the mark. Many responses quoted incorrect values or identified the incorrect parts of the box plot and a common misconception was that the box plot represented frequencies, so they would identify a "total" for the number of potatoes and then use it to try and find where the middle value was.

In part (b) a number of students did not understand what was being asked for or had not realised they needed to compare the median and (interquartile) range. Common was listing the values of each without a comparison or making an arithmetic error in calculation. Students often selected the wrong vocabulary, using mean instead of median and distribution or spread instead of the range. The IQR and range were often transposed. Students need to be reminded that they need to put their responses like this in context.

Question 12

This was not well done with many not attempting any trigonometry. Those that did often got the first mark for the process of making a correct start to trigonometry, but then spoilt their working. Others, having calculated 5.52… went on to use Pythagoras’s Theorem but then lost their way. It was not uncommon to see students using 5.52.. as the length of *ED*. Quite a few students over complicated the process of solution by using the sine rule or even cosine rule in an attempt to solve, with few of these showing any success due to error in manipulation. Some students, who showed a completely correct process, rounded or truncated their interim values to the extent that their final answer was outside the range required for the final mark.

Question 13

A common response was 3550×1.026^2 which gained both process marks. Some left it there, but a minority finished it off by writing 2.2 Premature rounding was all too prevalent in this question which frequently led to an answer outside the range allowed for the final mark. Weaker students used an incorrect multiplier which meant no marks could be awarded for example using 1.26 or 0.026 or even 10.26 Some trial and improvement methods were seen in this question, particularly when trying to find the final answer.

Question 14

Many students were unprepared for the requirements of this question. Some were able to get one mark for a correct first step. A very common incorrect response was $19 + 25 = 44$, then $3325 \div 44$.

Question 15

Many students could successfully find 3 out of 4 values of a correct expansion (more successfully if they used the positive brackets). A large number tried to do the multiplication in one step, which always led to an incorrect response as they could not keep track of all the multiplications necessary. Students who tackled the question in two steps often gained additional credit or the fully correct answer. Common misconceptions were errors in signs once the negative bracket was used, or when collecting the like terms such as $3x \times 2x = 6x$.

Question 16

Using a tree diagram was the most successful method seen which often led to at least one mark. A significant number of students chose to try to list all possibilities. This approach was largely unsuccessful, either because they failed to list various possibilities in the process, or because their work was not sufficiently organised to produce the necessary lists to enable them to see where they were going. A few used an incorrect replacement process.

Question 17

Students should be encouraged to mark the angles on the diagram. Many got one mark for identifying the 90˚ angle. It was disappointing to find errors were then made with basic geometry to find the angle *OAB*. Some students found the angle 58˚ at the top of the triangle, but failed to recognise the other triangle was isosceles, or incorrectly tried to apply the alternate segment theorem and made one of the angles in the triangle 32˚, which then led to an incorrect final answer.

Question 18

Only a few gained marks on this question. Some were able to find at least one frequency but then failed to proceed. In general, those who got to 32 were able to draw the bar at 3.2 Incorrect answers came from just adding the heights of the bars or misreading the scales when drawing the bar.

Question 19

Many students did not know the meaning of the word “hemisphere”, or failed to divide by 2 to find the volume of half the sphere. Too many substituted the figure for the diameter rather than the radius. Some cubed rather than squaring, even though the formula was given.

Question 20

Those who stated 10.85 and 10.95 often went on to get three marks. Of those that stated 160 very few gave a correct reason. The vast majority did not consider bounds, and used 10.9 A significant minority quoted 18.94 instead of 19.95 Of those who did arrive at two correct bounds the final mark was often lost due to no reason or a poor reason given for appropriate level of accuracy.

Question 21

There was a lot of misunderstanding of what was being asked for in this question, particularly confusion between speed and acceleration.

In part (a) some found the half way mark on the time axis and gave the answer as 50 or used distance/speed/time. Of those that realised they needed to work with the area under the graph a large number made an error with the vertical scale using 12.5 or 14 for the speed. Some made errors using the formula for the area of a triangle. However, many still gained the first make for starting to find an area.

In part (b) few students realised the first part was acceleration and the last part deceleration, though they did notice that the last part was greater than the first part because the gradient was steeper. Some responses gave no comparison.

Question 22

Part (a) was poorly attempted, but there were some who gained full marks. Those who understood that 200 should be substituted generally gained at least the first mark leading to 190. It was unfortunate that some calculated 163.6 but failed to associate this with whole rabbits.

Part (b) was poorly answered, with many students either assuming that the number of rabbits got bigger, irrespective of their answer to part (a).

Question 23

In part (a) very few responses gained any credit. Nearly all students failed to recognise the sine rule for area was needed and instead just multiplied the two sides of the parallelogram. Just expanding the two brackets was the most common strategy adopted or students did the work for part (b) and just tried to solve the quadratic.

Part (b) was more successfully attempted as students could either factorise, or more often use the quadratic formula to solve the equation. Once the two answers were found, all too often they were expressed as $x =$ or with an incorrect inequality, especially with 2.5. Students who gave the correct inequality often did so by sketching a curve and using it to assist them in interpreting their answer. Some students just used the brackets from the parallelogram, evaluating them to zero.

Question 24

A very challenging question for the vast majority. Many were able to gain one mark for stating a correct co-ordinate, the most popular of which were (-1,0) or (-1,2). There were many who left out the direction in their description and some confused their description by using enlargement, translation and vectors instead of co-ordinates.

Question 25

It was clear that many students knew what to do but lacked the skills to do what they wanted. As a result this question was rarely attempted at all. Where the question was attempted and credit was achieved it was usually for finding the gradient of line L, although several forgot to divide the whole expression by 2. Once a gradient had been established, it was common for students to then use $-1/m$ to find the gradient of the perpendicular, although -2/3 was seen. It was common to see the correct equation here, but then students did not know how to progress further, although some then sketched

the equation identifying the y coordinate of B. Even in the rare cases when the coordinate of C was established forming the correct triangle and then successfully calculating the area was infrequent.

Summary

Based on their performance on this paper, students should:

- ensure that figures taken from the question, and from their own work, are transcribed accurately.
- avoid rounding or truncating answers part way through a solution and use the most accurate values where possible.
- ensure that calculators are used correctly.
- remember to include working out to support their answers.
- spend time on topics such as algebraic manipulation and proof, and application of ratios, bounds, iteration and histograms when preparing for future examinations.
- spend time on practicing response type questions where a written explanation is required.

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