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Examiners' Report
Principal Examiner Feedback

November 2019

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 3

Introduction

The paper was accessible to students who had been prepared for a higher GCSE Mathematics paper. There were some questions which were not well answered especially towards the end of the paper but this can be expected from the cohort sitting the November paper.

It was pleasing to see that many students showed their working out but it is worth noting that some students do not do this and where questions request working marks will be withheld if answers only are shown.

Report on Individual Questions.

Question 1

Part (a) of this question was answered well by the majority of students with a large proportion receiving full marks.

If full marks were not award then at least one mark was usually awarded. Of these students most were able to expand the brackets correctly but made errors when simplifying; for example, $x^2 - 9x + 4x - 45$ became $x^2 + 14x - 45$ or $x^2 - 4 - 45$ when simplified. The other main error was to add the –9 and 5 together for the constant term and obtain –4 rather than multiply to obtain –45.

Part (b) was also well answered with the majority of students gaining both marks for $3x(3x+2)$. Those who did not gain full marks often gained one mark for a correct partial factorisation. The most common incorrect answer seen was $3x(3+2)$.

Question 2

The modal score for this question was full marks.

In part (a) a few students made errors with the root sign by only rooting the number 35 rather than the whole denominator. However, when full marks were not achieved students often gained one mark for showing partial correct working.

Part (b) was really well answered. Irrespective of their answer to part (a) the students were able to give 'their' answer correct to the required degree of accuracy.

Question 3

This question was well answered and almost all students gained both marks. A few students drew a line at $x = 34$ but did not give a final answer or gave an answer outside of the range.

Question 4

This question was the first on the paper that some students found challenging. Many did not score at all as they were unable to start the question.

However, another large proportion of students were able to complete this question fully, obtain the correct solution and receive all the marks.

A few students did not use the mid-values for time but were still able to gain two marks for using values from within the inequalities and dividing the sum by 18.

Where working was shown and marks were often lost as a result of dividing the total by 4 or simply adding together the mid values (not considering the frequencies) and dividing this by 4.

Question 5

Unfortunately, metric conversions are challenging for students. This question was not answered well, with 370 and 3700 seen commonly as incorrect answers.

Question 6

Two marks was the modal mark for this question however full marks was also scored by a significant proportion of the cohort.

The vast majority of students were able to calculate the time difference as 1 hour 18 minutes or 78 minutes. However, they then thought that this was the time to use when using ‘speed = distance/time’. They were awarded a mark for 65/78 or 65/1.18 as this was an indication that they knew the relationship between the speed, distance and time. However, students found it challenging to convert the time from minutes to hours. It was acceptable to convert before or after the use of the speed, distance, time formula but many students failed to attempt this part of the question.

Time continues to be a challenge for many students and centres are encouraged to show students different time formats and practice converting between units.

Question 7

Part (a) and part (b) of this question was well answered. The vast majority of students gained both marks. Only occasional errors were seen with no common theme.

Part (c) was also very well answered and the modal score was full marks**.**

Many students appreciated that Asma was wrong and most were able to say why in an acceptable way, the most common of which was to write the numbers as ordinary numbers and then compare. A few others correctly referred to the number of digits in each number or compared the powers of 10.

However, the most common errors were to refer only to the number of zeros or include the poor use of terminology, e.g. ‘6.212 is to the power of 8’.

Question 8

The modal score for this question was full marks. When full marks was not obtained most students were able to obtain the first mark, but fewer could correctly identify the value of the interior or exterior angle of a pentagon without contradiction or error. Many either didn't know how to find the interior or exterior angle or divided 360 by the number of sides but thought that gave them the size of an interior angle, this was often shown by incorrect placement on the diagram.

A common incorrect response was $72 - 63 = 9^{o}$ Some students gave reasons for their calculations, even though not asked for. Students are reminded to carefully read the question being asked.

Question 9

This question was almost always attempted but the marks were reasonably evenly spread over the three options.

The most common incorrect responses seen were the incorrect placing of an image of correct size and orientation. A few students drew an enlargement using a different scale factor. The most common incorrect scale factor used was 3.5.

Question 10

Over a third of the students gained full marks for this question. Those that were successful usually carried out the same series of steps, multiplying by 7 for their first step rather than the use of fractions and then isolating x.

For those that were not fully successful the most common incorrect response was to only multiply one of 11 or $-x$ by 7. Another common error was to also multiply $9 + x$ by 7 as well as $11 - x$.

Part (b) was correctly answered by approximately half of the cohort. Incorrect answers were usually seen when students tried to multiply out the brackets or cancel terms within the brackets without considering the powers of 3 and 2.

Question 11

Most students attempted this question and it was common to see at least one correct product to gain the initial mark. It was pleasing to see that almost a third of the cohort went on to complete the question fully giving the correct answer

The most common incorrect responses involved adding the probabilities, e.g. $0.07 + 0.02 + 0.11 = 0.2$ or adding in the product 0.07×0.02. Although very few arithmetic errors were seen the most common one was $0.07 \times 0.98 = 0.686$ not 0.0686, using this often led to the student gaining two out of the three marks.

Question 12

The majority of students were able to interpret the stem and leaf diagram well, most were able to find the median but the quartiles were less well identified.

For the box plot, most plotted the end points accurately, but fewer plotted the box correctly. Frequently students obtained two marks by showing 3 correctly plotted values usually the minimum, maximum and median. The most common incorrect response involved misplacing the lower quartile.

It was rare to see a student state the median or quartiles and not successfully mark them on the scale.

Question 13

Many students gained the first process mark by showing a full substitution of the figures to calculate the volume of the cylinder C or showing the correct figure for the volume of the cylinder *C*. The most common approach was then to work with density and ratio together, rather than with ratio to find the volumes of A and B, however many were not able to show enough understanding for the second mark. Some students did score the second mark for getting as far as 15.68 but then failed to process fully for the final two marks.

The most successful way seen to gain full marks was to find the individual volumes of *A* and *B* and add.

Question 14

This question was found by many to be challenging and some did not know how to start. A number of students simply added the numbers in all three ratios together to obtain 8/19, showing no understanding of what was expected.

One of the approaches which gained marks was by choosing a starting number and dividing it in the correct ratios. An alternative approach seen was a tree diagram, often with the first process mark being awarded for use of fractions for either soup (2/5) or Prawns (3/5), however, many students did not know what to do next after this point. The most common incorrect answer for this question, when working with fractions was seen, was to work only using the curry part of each ratio ($3/8 \times 5/6$) and ignoring the relationship to the choice of starter.

Question 15

Some fully correct responses were seen although many students gained one or two method marks. However, there are still too many students who used numerical values but algebra is required for proof questions.

When students tried to use algebra, a number gave incorrect expressions for even numbers, typically n and $n+2$ or n and $n + 1$, note n is assumed to be an integer unless otherwise defined by the student.

Of those students who were able to state two consecutive even numbers algebraically many lost the second method mark as minor errors were made when expanding the expressions.

Question 16

Many mixed responses were seen here, it would be wise to remind students to read the question carefully as many stated the relationship incorrectly (e.g. using direct proportion, omitting the square, or using a square root instead).

Students who were able to state the correct relationship usually went on to find k successfully but then they found it much harder to substitute the fractional value of y into their formula. Some who managed to correctly find the value of x^2 did not give just the negative value of x as their final answer.

Students are reminded to always read questions carefully.

Question 17

This was a not well answered question. Many students left this question blank. Of those that made an attempt many ignored the statement 'Use the graph to find estimates …' and tried alternative methods, either using the quadratic formula, attempting to factorise, or drawing a graph using a table of values – neither of these scored any marks as they did not use the given graph as instructed to do so.

Some students completed the square and if done correctly this gained the first method mark. This was then followed up with a translation of the original graph being shown. Only a very few students rearranged the formula and plotted the correct straight line to look for the points of intersection.

Centres should note this is a specific assessment objective and so the graph must be used when the question states this.

Question 18

Many students found this question challenging and the modal score is zero. There were many blank responses.

Those who could use the cosine rule generally obtained the first two marks however, there was often confusion over the identity of angle BCA. Of those that correctly found angle BCA very few were able to apply the sine rule accurately and gain full marks for this question. A small number of students lost the final accuracy mark due to rounding earlier in their solution.

The most common errors seen involved using the trigonometry ratios for right-angled triangles.

Question 19

Some students drew a tangent to answer this question but the most common incorrect answer was from 10/6 = 1.666… this was when students read off values at $x = 6$ and just divided the raw figures.

Those students that did draw a tangent often went on to calculate the gradient and obtained an answer within the acceptable range. However, there were a number of students who drew a tangent, thus

gaining the first method mark, but then incorrectly read the scales, or ignored the scales altogether. At this level it is expected that students should be able to accurately a read and apply scales on axes to gain an appropriate estimation.

Question 20

Many students were able to score one mark with quite a few providing the full correct answer of $n^2 - 2n$. A number of students were able to identify a common second difference as 2 but were then unable to deduce that this meant the sequence was quadratic. Those that did either wrote final expression as $n^2 + 2n$, which was a very common incorrect answer or used the 'difference method' to try to find the nth term, as opposed to just finding it by inspection, which might have been easier with this sequence.

Question 21

This question with not well answered. The most common response by far was 65/81. Very few students were able to secure a mark indicating that they did not really understand what the question was asking. Subtraction or dividing by 4 was often seen rather than finding 4th root.

Question 22

Most students attempted this question and often gained one mark from multiplying by the reciprocal. Students could often factorise the numerator or the denominator of the first fraction, but they could not fully factorise the second fraction, often factorising $x^3 - 36x$ incorrectly or failing to notice the difference of two squares. Only a small minority managed to simplify to 7x, some went on to give their final answer as $a = 7$, this was not penalised.

Many students did not realise that they needed to factorise and cancel terms, a significant number of students spent a lot of time expanding the brackets for no gain and could not then simplify the complex expression generated.

Question 23

This question was not attempted by all students. Those who did attempt the question often gained the first two marks for substituting into the volume formula and rearranging to find the radius. Many of these students then failed to realise that the slant height of the cone had to be found, using Pythagoras. For those that did find the slant height, a good proportion did not use this slant height as the radius of the sector OACB.

A small number of students did gain full marks for this question.

Question 20

When answers were attempted students often gained three marks by finding correct vectors for ZP and ZR. Very few of these students were then able to show the full process to show ZP and ZR in an appropriate ratio.

Others only gained two marks for correct vectors using the given ratios and finding a vector for OZ or XY.

A noticeable error was when students had YX correct as $a - b$ they did not reverse the whole vector to get XY, they simply used $-a-b$.

Summary

Based on their performance on this paper, students should:

- read questions carefully
- practice questions involving time, in different notations and also converting between hours and minutes
- recognise right angled triangles and non right angled triangles and know which trigonometry relationships are appropriate for the different style of triangles.
- always attempt questions as part marks are available for suitable starting points.

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