Examiners' Report
Principal Examiner Feedback

November 2024

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

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GCSE Mathematics 1MA1
Principal Examiner Feedback – Higher Paper 3

Introduction

There were some very good scripts from higher attaining learners taking this paper and the paper provided the opportunity for lower attaining learners to demonstrate positive achievement mainly in the first nine questions. It appeared that most learners had been entered appropriately for the higher tier. Learners' work was generally clearly and logically presented and examiners were encouraged by the small number of careless errors and misreads seen. Where fully correct answers were not seen, examiners could often award partial credit for correct methods and processes shown in working.

All questions were accessible to some learners. Questions 1, 2, 4, 5, 8 and 9 were found to be accessible to most learners whereas questions 16, 19 and 23 attracted fully correct solutions from only a small proportion of learners.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

A standard question with the majority of learners scoring at least one mark for making at most one error in their diagram. The main single error was correct points being plotted but were either joined with a curve or the first and last point were also directly joined. Learners who did not plot the points correctly often gained a mark for plotting the points consistently at either the beginning or end of the interval and joining them with straight line segments.

Question 2

A high percentage of candidates showed a good understanding of standard form. In part (a) nearly all candidates were able to convert from the numbers in standard form to ordinary numbers, although it will be of no surprise that (b) was answered less well than (a). In part (b) the most common incorrect answer seen was 8026×10^{-4}

Question 3

A significant number of learners were not familiar with the method required to accurately construct an angle bisector using compasses. Those who knew how to draw the relevant arcs usually gained full marks for completing the bisector accurately. There were many responses with arcs in places that were not required. In some cases, constructions such as a perpendicular bisector of one of the lines was seen. There were responses where one mark was awarded for an angle bisector within the guidelines, presumably from measuring the angle and halving it. To gain full marks on a construction's question all relevant construction lines must be seen.

Question 4

A standard question for which most learners gained a good number of marks. Part (a) was well answered although there were a small number of learners who didn't correctly place the probabilities for Game 2. Of those that gained 0 marks for part (b) it was usually because the probabilities were added instead of being multiplied. A significant number of candidates gained no marks for part (b) as although they calculated 0.7×0.7 they spoilt their method by multiplying or dividing this by 2 or by subtracting it from 1 or adding to another product. All of these resulted in 0 marks being awarded as M1 was for 0.7×0.7 as a standalone product. A number of learners scored 2 marks through the follow through mark from their diagram.

Question 5

Overall, this question was fairly well answered, though many did not achieve full marks. Most learners were able to begin a correct solution through effective use of ratio to obtain the number of pens and pencils. Those who struggled to use the ratio to get going, doing 240 ÷ 3 = 80 pens and 240 ÷ 5 = 48 pencils; often benefitted from the mark scheme using square brackets, as they could still access subsequent process marks despite not having a correct start. The lack of a systematic approach to solving the problem seemed to be an issue for some as they lost their way when calculating a value for the profit or the total bought or sold. A number of students calculated the percentage profit for each item and then added the profits to get a final answer (66.6..% + 22.2..% = 88.8..%). Some learners who successfully obtained the values 1710 and 2490 struggled to find the percentage profit correctly, performing calculations such as $\frac{780}{2490}$ or $\frac{1710}{2490}$

Question 6

Learners gained full marks for correctly stating the median and range for school A and making a correct comparison such as "the median for School A is greater than School B" and "School A has a greater range". There were some who did not find the median correctly, working it out as 56 or 56.5, these learners often gained the mark for a correct comparison following through their value for the median. It should be noted that to gain the mark for a median of 57 this needed to be clearly stated, only indicating the 7 in the stem and leaf diagram through circling or crossing out was not sufficient. Similarly, when making a comparison it is not sufficient just to state the difference in the values, it needs to be clear which is greater.

Question 7

This question was attempted by most but rarely resulted in full marks being awarded. Many were unable to appreciate that the question focused on truncation, rather than rounding and treated the question as if they had been told 10.2 was the result of a rounding process. As a result, they gave bounds of 10.15 and 10.25 which could not be given any credit. Where only 1 mark was scored, it was usually for the lower bound of 10.2(0); as an upper bound of 10.29 did not gain any credit.

Question 8

Of those who scored 0, they usually chose the cosine ratio instead of the tan ratio or used the tan ratio incorrectly, writing $\tan 62 = \frac{7.6}{AB}$. A number of learners opted for the sine rule to successfully get their answer.

Question 9

A well answered question with common errors being that learners either didn't simplify the 2×7 or added rather than multiplied them. There were some who gave their final answer as a sum and hence scored B0 and the retention of multiplication signs in a final answer scored a maximum of B1.

Question 10

Those that recognised that this was a reverse percentage question were often successful in gaining both marks. However, there were some who calculated with 75% instead of 85%, of which those who wrote 100 – 15 = 75 could gain a mark. Many incorrect methods were seen, most commonly increasing or decreasing £46.75 by 15%.

Question 11

Responses on this question showed quite a lot of confusion between area and perimeter as it was not uncommon for learners to equate the area of the sector to 34.3 or even 24.9. Of the learners that were most successful in answering this question, most started with a complete equation.

Question 12

In part (a), learners generally showed a good understanding of percentage multipliers and could apply these to gain the investment value after one year. Many of these could then correctly interpret the change in the percentage for year 2 and 3 and would multiply by 1.018^2 to gain the correct solution. It is worth noting that marks were lost through an incorrect presentation of the answer, for example, not rounding to two decimal places. Learners would benefit on working on appropriate rounding, especially with monetary questions. Commonly seen errors included adding the percentages together in the first instance and then using this multiplier to the power of 3. Some worked with simple interest which allowed a maximum of 1 mark. The most successful solutions were when percentage multipliers were used, when they weren't methods often fell apart when trying to find accurate percentages of amounts prior to adding. Unsurprisingly, part (b) was found to be more challenging. A correct first step of dividing 4107 by 7500 gained the first mark. Some then struggled with correctly interpreting the sequence of steps required to obtain 74% and then subtracting this from 100%, with many learners leaving their answer as 0.74.

Question 13

The majority of those who identified that the triangles were similar proceeded efficiently with answering this question and gained full marks. However, many incorrectly assumed that the lengths of AB and BC or the lengths of BC and BE were equal. Of those who didn't initially recognise that the triangles were similar, some did successfully navigate to a correct answer using trigonometry. The majority of learners appeared confident in using the formula for area of a trapezium, with only a small number choosing to split it into a rectangle and triangle.

Question 14

A pleasing number of learners were familiar with the requirement of proving algebraically that the given recurring decimal was equal to the given fraction. Most chose to find the value of 10x and 1000x and subtract these. Where full marks were not awarded, this was invariably due to not showing the recurring nature of the given decimal and using terminating decimals throughout the working.

Question 15

Many learners knew that the first step was to multiply both sides of the equation by the denominator, however too often this was not always carried out correctly. When the first mark was awarded this was often the only mark gained due to errors in the method of isolating the terms in p on one side of the equation and factorising the expression. Those who did not know the correct first step often incorrectly cancelled terms in the fraction or attempted to add or subtract terms in p from the fraction.

Question 16

Few fully correct solutions were seen to this question. Those who attempted the question but gained no marks often found the gradient between the given points (2, -4) and (12, -6.5) which gained no credit. Several attempts at using Pythagoras' Theorem to find the lengths of sides were also seen. The most commonly, awarded mark was for finding the gradient of OB. Of those who realised that the gradient of OB was necessary to proceed, some of these were able to find the equation of DE and/or OD, with many correct equations leading to a correct solution. Those who just guessed at a co-ordinate gained no marks since the command that "you must show all your working" means that a correct answer with no supportive working gains 0 marks.

Question 17

Of those who correctly recognised the need to use $0.5ab\sin C,$ some were unsure on how to calculate an angle. In some responses the learners simply substituted in all 3 given sides into the formula gaining 0 marks. Those who realised that they needed to use the cosine rule substituted correctly into the formula but often made errors in the rearrangement to find the angle. Those who were more successful at finding an angle had more often substituted straight into $\cos A = \dfrac{b^2+c^2-a^2}{2bc}$ rather than substituting into $a^2 = b^2 + c^2 - 2bc\cos A$ and having to rearrange. Some benefitted from the use of square brackets being used in this question, gaining a mark for correctly substituting into $0.5ab\sin C,$ even if the angle had not been found correctly, provided it was clearly identified on the diagram or stated in the working.

Question 18

In part (a), the most successful learners went straight to $\frac{11}{55}=\frac{40}{x}$ and solved this to find x. Common errors included adding the tagged and the untagged frogs, giving an answer of 84. A greater understanding of equivalent proportion in capture-recapture would benefit many candidates in this question. Of those who had some understanding but didn't achieve a correct answer, the ratio was usually incorrectly written as $\frac{11}{55}=\frac{x}{40}$ for which one mark was awarded.

In part (b) the most common scoring answer was an assumption that no tags fell off, closely followed by no births or deaths. A few appeared to misunderstand that the question was asking for assumptions giving answers such as 'all the frogs were caught' or giving numerical values from their answer in part (a).

Question 19

A challenging question with only a few forming an equation in terms of one variable. Of those who correctly linked the radius and the height, only a few used Pythagoras to find the slant height. Of those who were successful on this question, clear algebraic manipulation was used to obtain an expression for the curved surface, most commonly embedded within a full equation for the surface area of the cone. Most learners in this case would then simplify the equation through eliminating π first and then simplifying the fraction to obtain a correct solution.

Question 20

Most of those who obtained marks on this question had correctly recognised that making y, rather than x, the subject would be the most sensible approach. Of those who made a correct substitution for y^2, it was invariably sign errors that cost them the most marks. Use of the quadratic formula was seen more often than use of completing the square and again it was sign errors that led to incorrect solutions. Reasons for a learner obtaining 3 rather than 4 marks was for failing to find the y values, not clearly identifying the final pairs of values (good practice being x_1, y_1, x_2, y_2) or leaving answers in surd form despite the question instructing that answers should be given to 3 significant figures.

Question 21

In part (a), there were many blank responses, attempts at translations and reflections in the y axis. Those who reflected in the x axis often did so correctly although there were a number that had one incorrect segment.

In part (b), there were various misunderstandings apparent. Some incorrectly identified point P as (90, 1), whilst others added 180 to their y coordinate of point P rather than subtracting 180 and some added both the 180 and the 4 to their y coordinate. Invariably those that obtained one mark usually did so for having (90, b) or (a, 3) rather than for identifying the coordinates of P.

Question 22

Various responses were seen to this question with common incorrect answers being from 30×92 or $54 \times 10 + 76 \times 10 + 92 \times 10$. Of those who gained just one mark it was usually for correctly finding the area of the triangle in the first section. Of those that had an appreciation of what they needed to do, many limited their marks by incorrectly reading values from the graph or not doing as instructed and using 3 strips of equal width.

Question 23

A challenging question with the most common mark being awarded for drawing a curve with a *y* intercept at –7. Of those that recognised the need to complete the square, scores were higher; common mistakes in this being to not square the 3p. Most of those who correctly identified the turning point drew it in the correct quadrant but some did not gain full marks as they incorrectly identified roots at –1 and 7 or –p and 7p.

Summary

Based on their performance on this paper, learners are offered the following advice:

- Practise basic algebraic processes such as expanding a single bracket, factorising and collecting terms that can be used when changing the subject of a formula.
- When comparing distributions, ensure that comparative words are used such as “greater” or “higher”
- Ensure that recurring decimal notation, rather than terminating decimals are used when converting a recurring decimal to a fraction.
- Achieve a greater understanding of equivalent proportion in capture-recapture.
- Work on appropriate rounding, especially with monetary questions.

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