Examiners' Report
Principal Examiner Feedback

November 2018

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

A significant number of students found this paper difficult and were clearly unprepared for some of the questions. In this reformed GCSE examination, they would probably have been better entered at Foundation level, where accessing a greater number of marks would have given them a more rewarding, and probably productive experience.

But there were some able students who were able to make a good attempt at most of the questions on the paper. Performance was not always consistently good across the paper, but with a good range of questions the paper was able to discriminate well at the lower end. Questions towards the end of the paper were designed for the most able aiming towards grade 9, so it was inevitable that these would be out of reach of the majority of those entered for this paper, even at Higher level.

Weakest areas included algebraic manipulation and derivation, percentage calculations, application of ratios and proportion, and geometric reasoning and proof.

Questions which assessed the use of mathematics across a range of aspects of the specification were sometimes done poorly, such as questions 10 and 13, but in other cases done well, such as in question 5. There was also inconsistency of approach to questions that might be considered more traditional where the process of solution might be considered predictable, such as poor attempts in questions 3, 4 and 8, yet good attempts at questions 1 and 7. There were fewer attempts using trial and improvement approaches, and it was disappointing to find poor arithmetical skills, even though this was a calculator paper.

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 questions 4, 5, 10 and 17.

Report on Individual Questions

Question 1

Many students made a good attempt at part (a), usually gaining 3 marks. Common errors included repeating the 8 in both regions of the intersection of A and B, and failing to put the numbers 4, 12, 16 and 24 outside the circles. Students need to be aware that all the numbers in the Universal set need to appear somewhere in the Venn diagram.

Part (b) was not as well answered, even though a follow through was allowed from their (sometimes incorrect) Venn diagram. The main error was to write the number 8 as the numerator rather than 1. The number used as the denominator did not always match the total of the numbers that they had presented in part (a).

Question 2

Most students recognised that the line of best fit was in the wrong place. Those who gave two references to the line of best fit limited themselves to a maximum of 1 mark. A minority of students identified a problem with the horizontal scale. Others tried to find fault with where the graph started.

Question 3

Of those who gained marks, using parallel lines to find angle *ABE* along with angle *BEF* was the most common approach, usually leading to the correct answer of 60°. But many made incorrect assumptions about the diagram, some assuming an equilateral triangle and others an isosceles triangle, neither of which were correct. There was a mark attributed to giving reasons, but this was rarely awarded either because reasons were not given, or incorrect reasoning was given. An early error was frequently to state *BEF* as 45°.

Question 4

Though some students treated this as a simple interest question, the most common error for those who understood the principle of compound interest was to use an incorrect multiplier, including 1.25 and 1.35. Those who used a partitioning method regularly made arithmetic errors. Of those who worked through the problem correctly, some failed to notice that the question required a comparison of the interest amounts, rather than the total amounts, thereby losing the final mark.

In part (b) many again attempted a comparison of the total amounts rather than the interest, though those who had worked out the interest in part (a) usually went on to gain the mark in part (b). Where recalculation was done the mark was frequently gained though not for those who recalculated using the 4% across the 3 years.

Question 5

The area of the trapezium was incorrectly calculated by many. The following step of working (that of division by 2, 5 or 10) were usually done well, but many students failed to round up the number of tins to a whole number. Some assumed you could buy the paint by the litre, and not in 5 litre tins. Those who worked through all stages ended with a comparison of 90 and 91. This was the most successful method, but other methods were credited that resulted in a comparison of the number of tins, or even the number of litres needed.

Question 6

Many gained the first mark by showing the equation as $y = 3x + c$ but could not get any further. Answers of 11 were common as students did $15 - 9 = 6$ and then added 5. Students who started the question trying to find the difference of y and the difference of x either misplaced signs or had the relevant fraction upside down. Some drew sketches but these were of little help, especially when drawn incorrectly.

Question 7

Part (a) was usually well answered, but in part (b) there were few answers that gained full marks. Most attempted to convert the given figures to ordinary numbers which was usually done correctly, but the final step of conversion to an answer in standard form was not done well, frequently with the power of 10 given incorrectly.

Question 8

Students had some work to do on the drawing before getting to R. With many the reflection in $y = -x$ caused difficulty, but most could reflect in $x = -1$. But any work on the diagram was superseded by an attempt to describe the combined transformation. Most often the only description that earned credit was mention of a rotation, with some gaining an additional mark for indicating it was a 90° clockwise turn (or 270 anticlockwise). Rarely was (-1, 1) seen. Other common answers included confusing clockwise and anticlockwise, and some who tried to describe a series of transformations.

Question 9

This was poorly answered. Students showed confusion between truncation and upper/lower bounds, with most using (incorrectly) the figures 6.5 and 7.5

Question 10

Very few students managed the percentage calculation, usually trying to combine the wrong set of numbers, having little idea of how to work out a percentage change. But the first three marks were readily available to many students. Working with 20 and 30 litres was the usual start to the solution, from this working out the number of tins required and then the cost, with 248 being shown. From this the cost of 50 litres could be found, with both 248 and 334.8 being shown to achieve 3 marks. Weaker students started with the 20 and 30 but did not know what to do with these figures.

Question 11

Students found more success with this question, the main inhibitor being a failure to write down all the steps and working needed to “show that” 1335 was the resulting number. There were some 2-way tables used, but students did not know what to do with such a diagram, once complete.

Question 12

Algebraic manipulation was a weakness shown by nearly all students taking this paper. Inappropriate cancelling, mistakes in multiplying out terms and in simplifying hindered most students in making much progress. In part (a) students regularly failed to get beyond simple algebra into the need to factorise in order to simplify, showing little understanding that such a step was necessary.

In part (b) there was some knowledge of what to do to find a common denominator by some, either taking 1 or 2 stages to do this, but multiplying out the numerators caused further problems. Negative signs were badly handled: many ignored the minus sign in front of the 4. The most able students succeeded by using all 3 fractions with the correct numerators and common denominator.

Question 13

This question differentiated well. Many found the radius or diameter for the first mark, but from there many seemed at a loss as to what to do next. Of the minority of students who made further progress the most common method was to use Pythagoras's Theorem to find the height of the triangle. But having found the height it was often seen that the base used was the diameter and not the radius; there were also examples of premature rounding which placed many answer out of range.

Question 14

If this question was attempted at all the graphs presented were varied with not many students getting the correct shape, with many most commonly related to quadratic or cubic curves. Very few were able to find, or indicate the point of intersection with the *y* axis.

Question 15

There were many who failed to attempt this question. Of those who did make an attempt it was common to see 42.25 used as a radius in πd or πr^2.

Question 16

In part (a) students approached this question in many different ways.
Many did 1 – 0.65 = 0.35 and thought this was the answer. More did
0.65 × 0.35 = 0.2275 and left it there. Those who drew a tree diagram usually saw that there were two options and doubled to get the correct answer.
In part (b) students had more success with many getting 42. The most common method was 78 ÷ 0.65 arriving at 120. Some used 78 × 0.35 but then some did not seem to know how to proceed.

Question 17

From this point on through to the end of the paper there were many students who made few attempts at the remaining questions.
In this question students sometimes gained the first mark for associating algebraic representations with the correct ratio. Beyond this step few knew what to do with their expressions. More able students went on to form simultaneous equations to solve.

Question 18
Students sometimes gained the first mark for either showing a method to find the gradient of L_1, or for stating L_2 as $y = -3x$. A few tried working with the general equation $y = mx + c$ but most did know what to do with it.

Question 19

Some students made a start to this question by showing some rearrangement, recognising that m^2 was 81 or 121, and some even went on to identify a pair of critical values. Most often this was 9 and 11, since it was rare to find students who wrote down the negative, as well as the positive values of the square root of m. There were some attempts at trial and improvement which rarely gained any marks since students gravitated to the value of 10 rather than the critical values for the inequality.

Question 20

It was disappointing to find how few students were able to use given formulae and perform a simple substitution into them. Use of the diameter rather than the radius was seen too often, or not halving the diameter for the top half of the cone, or even not halving to find the volume of a hemisphere. Surprisingly it was not uncommon to find students who changed the 1/3 to ½ for the volume of the cone. In dealing with the densities, there was a lot of adding since students did not realise that each one applied to each part of the shape.

Question 21
Students failed to have any cognisance of what was needed for a proof. It was also rare to see any mention of cyclic quadrilaterals. Many assumed incorrectly that triangle *ABC* was equilateral or isosceles with base *AB* often followed by drawing a line from *C* to *O* and attempting to use a right angles triangle. There were also many references to tangents, though there were none in the diagram.

Summary

Based on their performance on this paper, students should:

- be prepared for an extensive range of topics, sufficient that they can make a good attempt at a majority of questions on the Higher paper.

- practice algebraic manipulation and derivation, percentage calculation, application of ratios and proportion, and geometric reasoning and proof, in preparing for future examinations.

- practice their arithmetical skills and ensure that they can use their calculator correctly to check processes and calculations.

- present their working legibly and in an organised way on the page, sufficient that the order of the process of solution is clear and unambiguous.

- spend more time ensuring they read the fine detail of the question to avoid giving answers that do not answer the question.

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