Examiners' Report
Principal Examiner Feedback

November 2018

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

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GCSE (9 – 1) Mathematics – 1MA1

Principal Examiner Feedback – Higher Paper 1

Introduction

The vast majority of students in this series were unable to access many of the later questions on this paper and so most of the credit gained was from the first ten questions. This was mainly due to the nature of the students making up the cohort for this examination series but, it was also clear that some students would have been better off entering at Foundation level.

Arithmetic errors were commonplace throughout the paper, often with students attempting irrelevant calculations. It was pleasing to see many students clearly expressing their communication skills when required. However, the setting out of some student's work did hinder their progress particularly with the longer multi-step questions.

Report on individual questions:

Question 1

This question was poorly answered simply because many students failed to actually evaluate their answer of 3^2 to 9 and so gained only one mark. Students need to be advised to read questions carefully. The most common error was to write 9^5 for $3^7 \times 3^{-2}$, this was usually followed by $9^5 \div 3^3 = 3^2$ giving a correct result from incorrect working thus gaining no marks. Some students tried to evaluate the given powers of 3 but 3^{-2} was often written incorrectly as -9. However, if two out of the three powers of 3 were evaluated correctly then one mark was awarded. Students who wrote these powers as full products often struggled to cancel them out due to not knowing how to deal with the 3^{-2}; the majority of students who attempted this method gained no marks.

Question 2

Part (a) was not well answered as many students were unable to deal correctly with the negative result of multiplying -3 × 18 by 2; 144 + 108 = 252 was a common error. Some students who correctly evaluated 144 – 108 = 36 then failed to even consider the square root. However, the great majority of students gained one mark for a correct initial substitution. Even so, it was disappointing to see 2 × -3 × 18 written as 2 × -3 +/× 2 × 18 so many times.

In part (b), most students were able to score at least one mark in this question for a correct first step. This was usually by correctly subtracting u^2 from both sides of the equation. Those choosing to divide both sides of the equation by 2*a*, often forgot to divide the u^2 term and so gained no credit. Some students wrote $v^2 + u^2 = 2as$ as their first step, again gaining no credit.

Question 3

Students gained good marks here, many scoring three or more marks. 40% of 2100 was usually correctly evaluated, and the most popular approach was to then find the share for each salesman. A good number of students then in error found 25% of 210 instead of 25% of 180 and so gained no more credit. Some calculated all relevant values correctly but then made an incorrect statement.

Question 4

Part (a) was poorly answered with many students thinking that each tap took (120 ÷ 5) minutes to fill the pool. 72 minutes was the modal incorrect answer. Having found this answer, many realised that the answer should be greater than 120 minutes and so simply added the 120 to give an incorrect answer of 192 minutes.

In part (b), many students correctly stated that their assumption was that all taps were working at the same rate of flow.

Question 5

In part (a), many students never realised that the easier approach here was to round the speed of 213 to 200, preferring instead to carry out their calculations using the 213. A common approach was to find the distance travelled in one minute and then in one second. This was often not seen through to its completion as final division into one mile was rarely seen.

In part (b), many students followed a correct answer in part (a) by claiming an underestimate since they had rounded 213 down. Centres should note and communicate to their students how approximations can affect the results of different calculations.

Question 6

Only a few students were able to score full marks on this question. The vast majority clearly knew how to eliminate a variable but failed to score any credit as a result of too many arithmetic errors. Again, working with negative values and non-integer answers proved too much for many students; many stopped at, for example, $\frac{72}{16}$, failing to realise this would cancel down to $\frac{9}{2}$ or 4.5, then started the process again, only to be stopped by another fraction answer usually $\frac{24}{16}$. Some were able to pick up two marks, usually by just making one subtraction error, and then going on to correctly substitute their found value. A significant number of students started from scratch to find the value of the second variable, rather than using the substitution method.

Question 7

Many students correctly found the area of the semicircle (radius 10cm) and then often used this to compare with the area of the square, never realising the need to find the area of the quadrant (radius 20cm). A significant number introduced their own value for pi, often 3, but were usually unable to complete the proof. The fact the given result was in terms of pi should have deterred students from this approach.

Question 8

Values for the sine, cosine and tangent of common angles is clearly not well known with only a few students gaining any credit in part (a).

In part (b), a correct answer of 8 cm was common if not always from a correct method; $0.5 \times 4 = 8$ was a common error. Some students labelled the opposite side 4 cm and then added the two sides to get 8 cm. This also gained no credit. Students should be encouraged to always quote an equation for their choice of trigonometric function; those that did so here were usually correct and so gained one of the two marks available.

Another common error was writing $\cos(0.5) = 4/x$, showing little or no understanding of the value of 0.5.

Question 9

In part (a), the most common error from those students who understood anything about cumulative frequency graphs was to consider $\frac{1}{4}, \frac{1}{2}$ and $\frac{3}{4}$ of 50 instead of 48 resulting in an inaccurate box; the whiskers were usually correct gaining one mark. Many responses were seen where the whiskers were correct, but no box was drawn.

In part (b), far too many students simply compared specific values. Students need to know that, at this level, comparisons must be made of spread and central tendencies within the context of the question. Students found it difficult to interpret the data often confusing it with the number of trains delayed as opposed to delay time in minutes. Referring to delay time was necessary to put their comparisons into context.

Answers to part (c) clearly showed that very few students fully understand the dynamics of cumulative frequency diagrams. Rarely was any reference made to the parts of the diagram between 17 and 25 and 30 and 33. This is an area where centres could concentrate on when delivering this topic.

Question 10

The first step of many students, in part (a), was to expand the denominator. Only a minority cancelled $(x - 1)$ and those that did often ignored the fraction giving $5(x - 1)$ or equivalent as their answer.

In part (b), many students picked up one mark for $2(25 - y^2)$ or other partial factorisations eg. $(10 + 2y)(5 - y)$ but could go no further. A significant number thought that $y^2 - 25$ was the same as $25 - y^2$. Only a few students were able to score full marks.

Question 11

Very few students were able to understand what this question was asking for. However, a good number were able to pick up one mark for 125% or 1.25 with regards to Jack's increase in the amount cereal. A sound approach followed by some students was to introduce their own values of amount and cost of cereal; this approach was often successful. A common incorrect answer was 25%; a lot of students assumed that if Jack increased the amount of cereal by 25% then the price must decrease by 25%.

Question 12

The knowledge and understanding of the theorems of angles in a circle was poor and many students simply treated triangle *ABC* as an isosceles triangle quoting angles of 55°, 55° and 70° ($35^\circ \times 2$) or assumed that *OB* bisected angle *CBA*. Angle *OAB* = 34° was not uncommon but many failed to carry on after this.

Question 13

Very few students got full marks in this question, largely as a result of quoting an incorrect scale factor, usually -3. However, one mark was often awarded. Many students tried to describe a combination of transformations; this gained no credit.

Question 14

Those students who understood the meaning of a power of $\frac{3}{4}$ usually went on to gain full marks in part (a). Students attempting to find the cube of 16 and 81 before finding the 4^{th} root generally failed. Arithmetic errors in cubing 2 or 3 accounted for a number of students gaining one mark only.

In part (b), of those who actually attempted this question many were able to score one mark for finding two of the values of *a*, *b*, *c*. The value of *b* proved difficult and so few were able to complete the question.

Question 15

Only the most able of students achieved full marks here. A mark of 2 was common, however, with ratios of 2:5 and 3:4 or their equivalences seen. Many weaker students unsuccessfully tried to combine the pairs of ratios given. It was pleasing to see some students drawing diagrams to help visualise the problem.

Question 16

This question was often well answered. Most gained at least one mark for showing understanding of the recurring decimal notation. Some students, without fully finding the difference between two relevant recurring decimals, tried to “fiddle” their solution by working back from the given answer; this gained no credit. Centres are advised to explain to their students the need to show repetition in digits to display understanding of recurrence.

Question 17

Some students realised the need to substitute the given points into the equation in an attempt to find the values of *a* and *b*. Once found, it was rare to see an acceptable method leading to the coordinates of the turning point. Some students successfully used $-b/2a$ to find the *x* co-ordinate.

Question 18

In part (a), it was pleasing to see a good number of students attempting to sketch the required graph in the right place. The most common mistakes were translating the graph 2 units in either the negative *x*-direction or the negative *y*-direction.

Part (b) was a different story with only a very few gaining any credit, $y = -g(x)$ was a common error.

Question 19

Of those that attempted to answer part (a), the most common incorrect approach was to find either the product or sum of the two functions or to equate the two functions. Students showing some understanding of combining functions often gained full marks; however, some did attempt to find fg(x) by mistake.

Part (b) was poorly answered with the most common error simply to substitute $x = 7$ into g(x). Some did get the inverse operations in the wrong order giving $\frac{x+1}{2}$. Some interpreted $g^{-1}(x)$ as the reciprocal of g(x).

Question 20

Very few gained full marks in this question. Expansion of the numerator was often good however the correct value of 32 was not often seen owing to arithmetic errors along the way. Those knowing how to rationalise a denominator usually did it correctly to gain one mark. This was independent of a correct expansion for the numerator.

Question 21

Very few students indeed found the correct answer by employing a correct process. Of the few that did succeed, the use of congruent and similar triangles was the usual approach. Some students were able to find vector *AB* and vector *OM* with a few gaining an additional mark for the vector *AP*. These however were rare.

Some simply said that $ON = OP = 3$ and $NB = 2 \times PM = 4$. This got no marks. Students need to be aware that if a vector is shown on the diagram they need to indicate direction.

Question 22

Again, very few students were able to seriously attempt to answer this question. Many found the "12" a distraction and insisted upon using it to develop numerical probabilities. Of the very few making a correct start it was rare to see a solution beyond the product of two correct probabilities.

Summary

Based on their performance on this paper, students should:

- Read questions carefully and ensure that their answers address the requirement of the question.
- Avoid introducing a value for pi when pi is part of the answer.
- Practise working out estimates by rounding numbers and develop an understanding of the purpose of rounding so that they can choose appropriate rounded values.
- Practise substituting negative values into formulae and work with calculations involving negative numbers.
- When using trigonometry, students should be encouraged to quote trigonometric equations before any attempting a calculation.

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