Examiners' Report
Principal Examiner Feedback

November 2019

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Foundation (Calculator) Paper 3F

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

Introduction

This paper provided most students with a good opportunity to show their understanding. The vast majority of students made a good attempt at most, if not all, questions showing they had been well prepared for the examination.

On the whole students seemed to be reasonably well prepared and had access to suitable equipment, with calculators evident in almost all cases. Some students seemed to lack rulers but were not penalised for this.

Students continue to show improvements in demonstrating an ability to attempt problem solving questions and in this series response questions seemed to have improved.

Report on Individual Questions.

Question 1

The one mark was awarded for students being able to find two different factors of 12. Most students were successful either listing factors or writing a pair as a product. Those who didn't gain the mark had usually mixed up the word factor with multiple.

Question 2

A very well answered question showing students have a good understanding of basic fractions of amounts. Almost all students knew that to find $\frac{1}{3}$ they had to divide by 3, and it was only those making an arithmetic error that typically failed to score the mark. This was a real shame when a calculator was available.

Question 3

This question required students to be able to convert between basic decimals and fractions. Again, it was well answered by students with most scoring the available mark.

Question 4

Another well answered question; most students scored the mark.

Question 5

In this question students were required to convert metric units, in this case kilometres to metres. Generally speaking, the students performed well, but there was evidence of students not fully understanding their conversion and either dividing by 1000 rather than multiplying or multiplying by 10 or 100.

Question 6

Students were required to extract a ratio from a diagram of the shaded to unshaded squares.
The question was answered well with most of those who actually worked with ratio able to do so successfully. However, some students got confused and tried to work with fractions: $\frac{3}{5}$, $\frac{3}{8}$, $\frac{5}{3}$ and $\frac{5}{8}$ being commonly seen or worked with 'the whole' eg 3:8.

Question 7

A good number of students gained both marks, but where that wasn't the case, many gained one mark for the first step. These students then typically completed the calculation in the wrong order, often arriving at 44. Of those who scored zero this was often a result of not including the "×" when substituting and simply writing 48 rather than 4 × 8, typically leading to an answer of 51.

Question 8

It is clear that many of the students were familiar with this sequence (triangle numbers) and were simply able to write down the next two terms. Many others were able to decipher the correct pattern and generated the next two terms by addition of 6 then 7. Some of these students only gained one of the two marks, for, despite knowing what to add, they made arithmetic errors along the way.

Question 9

Part (a) required students to tally data and complete a frequency column. This was generally answered very well. However, there were a number of students who completed frequencies in the tally column and then wrote probabilities (out of 18) in the frequency column and thus lost a mark. A small number of students wrote cumulative frequencies in the frequency column but often showed correct frequencies in the tally column.

Part (b) required students to draw a bar chart to represent this data, and again this was completed well, although the most common mark was two out of three marks. This was because most students made a mistake in some way. The most common of these mistakes was to miss the frequency label from the vertical axis or to have a non-linear vertical scale.

Part (c) was for recognising the most popular pet. The only students who dropped this mark were ones who left the response blank.

Question 10

Part (a) required students to draw a diameter on a circle, which the vast majority were able to do. The most common incorrect response was to draw a radius rather than a diameter, or to extend the diameter beyond the circumference of the circle.

In part (b) the question demanded the student draw a segment. A significant proportion of students made the mistake of drawing a sector instead.

Question 11

Part (a) saw the first problem solving question on the paper, and it was one that was answered very well. Students are really starting to get a solid understanding of money based problems and have good success.

It was pleasing to note that only a small minority showed arithmetic errors or incomplete processing. Students who failed to score any marks simply subtracted the cost of one set of lights from 20 and chose to ignore the multiple lights and multiple £20 notes given in the question.

Part (b) was testing students ability to find a fractional change of an amount. Those who failed to get any marks usually tried to subtract $\frac{1}{5}$ or 0.2 from 120, rather than finding $\frac{1}{5}$ of 120 and subtracting that. Very few students followed the more efficient method of finding $\frac{4}{5}$.

Question 12

Another problem solving question answered well by many students. The full range of marks was awarded. The initial mark was for a first step in the process, finding the weight of the small boxes, which almost all students were able to score. The next process was to find the number of large boxes. The most efficient method was to subtract the weight of the small boxes and divide by 750. However, with this being a foundation paper, more inefficient build up methods were regularly seen (and catered for in the mark scheme) and the second mark was regularly awarded. In most cases, once the second mark was awarded, so was the third. This tended to not be the case only when arithmetic errors occurred. Again, with proper calculator use this error could have been eradicated.

Question 13

A very well answered question. A large number of students were able to extract the correct two values from the stem and leaf diagram and find the difference for two marks. It was not uncommon for students to write the answer as a range of values, such as 31 – 74, rather than subtract, and in this case one mark was awarded. Of those who were not awarded the marks, it was often due to finding the median and on occasion, some found the mean.

Question 14

Both these response questions were well attempted by students and, in general, answered well. Part (a) was looking for students to realise that the area had been found rather than the perimeter, and many did. There were some cases where the response included mathematically incorrect statements, such as P = 7 + 3 = 10, and where this occurred the mark was not awarded.

In part (b) students were expected to realise that a triangle cannot have a negative length. This part was answered less well than the previous one, with many students either being unclear in their response, or making incorrect statements. It was not uncommon to see arguments relating to 180 (degrees) or students trying to find the value of x themselves, without sufficient information to do so.

Question 15

This item posed many problems for students, with many unable to get beyond two marks. The best responses were the more structured ones, and it was good to see students using two-way tables or frequency trees, to structure their response. Typically, students scored one or both of the first two process marks (which could be awarded in either order) by finding either the number of boy or girls, along with the number of school dinners or packed lunches. It was from this point that many were unable to progress and often we saw incomplete processes. It was also unfortunate to see students mis-assigning values, eg girls = 0.55 × 800 = 440, which made the processes incorrect. Students should be encouraged to take real care in how they present their responses; those who approached the question in a logical and structured way, ticking off information in the question at each stage were more successful.

Question 16

The fundamental part of this question was the first step, where students had to equate the sum of the probabilities to 1. Without using this, students were unable to gain credit for later processes. Once students had found that the sum of the probabilities for blue and green is 0.35, they had to divide this value in the ratio 3 : 4. This was done with varying degrees of success, many dividing by 3 and 4 separately rather than dividing by (3 + 4). Students were able to work in any suitable form (fractions, decimals and percentages) and those who worked in percentages were able to gain process marks with a missing % symbol. However, it did need to be present to gain the final accuracy mark.

Question 17

A really well answered question. There were relatively few cases of incorrect tables, and where there were incorrect values they tended to be when x was negative. It was rare to award no marks in part (a).

Part (b) was answered very well, and in many cases better than part (a). It was not uncommon for students to have incorrect values in their table and to then draw a fully correct graph. The method mark in part (b) was able to be awarded as a follow through mark from their table in (a) provided one mark had been scored in part (a). The most common cause for a lost mark in this part was to not complete the graph by joining the points plotted with a line.

Question 18

It was disappointing to see so many students unable to fully complete this question. Many students were able to complete a reflection, but many were either unable to draw the mirror line, or just assumed it was something else. Common mirror lines seen were $x = 3$, $x = 2.5$, $x = 0$ and also $y = 2.5$. There were also a significant number of students carrying out rotations and perhaps even more commonly, translations.

Question 19

The majority of students attempted the expansion as their first step, and in many cases, were successful. Of those who were not successful this was for a variety of reasons. Common errors were to exchange the minus sign for a plus; to fail to multiply the second term when expanding, or to expand but not as part of an equation. The second mark was for the correct answer. As under general guidance, markers were able to award the first mark for an embedded "17" in working provided it wasn't contradicted by the answer line.

Question 20

The Venn diagram question was answered really well by many students and the award of three or four marks was common. Generally speaking a good proportion of students were able to score at least three marks, normally for a correctly labelled diagram with at least 2 regions correct. When mistakes were made, it was often from values in more than one region, or quite commonly, for the region $(A \cup B)'$ to be either incomplete, or containing all the values.

Question 21

This was a question that students generally struggled with. Most were able to make a start and gain the first mark for finding the profit. At that point many students did not know how to progress further to find the percentage profit. Students generally knew division was necessary part of this calculation, but often this was seen as profit ÷ new rather than profit ÷ original and as a result no further marks were awarded. It is evident that percentage change and percentage profit is an area that foundation students need to work on further. Trial and improvement methods were seen and were usually unsuccessful in finding a correct solution; this method should be discouraged.

Question 22

Most students were able to gain at least one mark in part (a), normally for 3 of their 4 terms correct. It was very common to see $2x$ in place of x^2 or to have the constant term incorrect. Many students who did gain one mark were unable to gain the full marks as they often over simplified their expression by combining non-like terms.

Part (b) was testing students ability to factorise into a single bracket. One mark could be awarded for a correct partial factorisation, removing either the factor of 3 or x correctly from the expression. The first mark could also be awarded if one of the correct factors, $3x$ or $(3x + 2)$, was found. Another frequently seen incorrect response was an attempt to factorise into two brackets due to the $9x^2$.

A small proportion of students correctly factorised the expression and checked that the expansion would lead them to the original expression but then wrote the original expression on the answer line rather than the factorisation.

Question 23

A good number of students were able to gain both marks. Of those who didn't a large proportion gained no marks, often because no intermediate work was shown. Students really should be encouraged to show intermediate steps of working as good exam technique and ensure the method mark can be awarded.

In part (b) students were asked to round their answer to part (a) to 4 significant figures. This mark could be awarded whatever was seen in (a) provided the value had at least 5 significant figures. It is clear many students have no real understanding of what significant figures means, with many giving 4 decimal places, or including trailing zeros.

Question 24

Another familiar style of question and again answered well. Most students gained two marks for a correct answer in range. Of those who didn't it was surprising to see many failing to draw in a line of best fit, which students should be encouraged to do. Some students were able to gain a mark for taking a reading from $x = 34$

Question 25

Finding an estimated mean is another question that students should be well prepared for. It was common for students to fail to gain the second method mark as they divided by 4 rather than 18. The final mark was then only gained by those students who had correctly used the midpoint values and had a complete correct method.

Question 26

Conversion of metric units of volume is clearly something that students at this level find difficult. Various powers of 10 were used, most commonly 10 and 100 rather than 1000.

Question 27

Questions involving time and conversion of time are always a challenge and this problem solving question was no exception. A good number of students were able to gain the first mark for finding the time difference of 1 hour 18 minutes, or 78 minutes. The next two processes were interchangeable. A calculation of speed was required, but unfortunately in many cases could not be awarded as the division was often completed the wrong way round. The other mark was for a conversion of either time (if done before the speed calculation) or speed. It was this step that students found most challenging with many either not completing it at all, or often multiplying by 100.

Question 28

Part (a) and (b), which involved conversion to and from standard form, were generally answered well and worth a single mark each.

Part (c) was another interpretation question, and like the questions earlier in the paper, it was answered quite well. Students were expected to realise that the major contributor was the power of 10 and hence B is bigger, and many were able to articulate this well enough. However, there were a number of misconceptions that became evident through responses. Some students made the same mistake as the person in the question and felt the number of decimal places was key. A good number also felt it was to do with the number of zeros, rather than the magnitude of the number and also scored no marks. Unfortunately, some students left the decimal point in when converting to ordinary numbers and therefore often lost the mark in their explanation.

Question 29

This geometry problem was broken into three steps. A process to use angles in a parallelogram (or parallel lines) to find an angle of 63. The second was to use interior or exterior angles of a pentagon, and then finally to combine these as a process to find x. With the first two steps, if there was any contradiction by mis-assigning the correct value to an incorrect angle either in working or on the diagram, the mark was not awarded. Many students were able to gain some credit, more typically for the 63, but often no more. Those who knew how to calculate interior or exterior angles, often got confused and stated them incorrectly, and as a result gained no credit. It is clear though that many students have no understanding of how to find angles within polygons. Students should also be reminded that diagrams are not drawn to scale and also be discouraged from making assumptions based on the diagram such as x being equal to the angle in the parallelogram or that x was an angle inside an isosceles triangle if a line was extended from the parallelogram.

Question 30

The final problem on the paper was one that many students were able to attempt, and in many cases gain some credit. The problem could be approached in various ways. Students could either start at one shape, find its area, use the scaling factor of 9 and then calculate the radius of the other shape. This could be done starting at either **A** or **B**. However, most students started with one shape, found its area and then the other area using the scaling factor of 9. Rather than then find the radius, students re-started with the second shape and found the area and showed these were the same. Both ways were equally acceptable and a decent proportion of correct responses were seen. Of those who didn’t gain full marks the common error was to fail to divide by 4 when finding the area of **A**. It was pleasing to note that very few confused formulae for area and circumference and used the correct formula in their work.

Summary

Based on their performance on this paper, students should:

- be encouraged to use their calculators to check basic calculations.

- remember to keep working their working inside the boxes provided or use an extra sheet to ensure working worthy of credit is seen.
- remember to use their calculator in percentage questions.
- ensure that they are able to identify between the different types of transformations.
- show calculations for each stage of working carried out.
- read questions carefully to ensure that they have used all of the information provided
- have further practise at questions involving a passage of time and resulting compound unit calculations
- ensure that they have set out their work clearly so that stages of their calculations can be easily found and used.

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