Examiners' Report
Principal Examiner Feedback

Summer 2022

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

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

Introduction

It was pleasing to see many students clearly showing their working and using their communication skills when required. However, there were still many examples of students doing working out in their head. This was often incorrect and, because there was no supporting working to show where the answer had come from, this couldn't be rewarded.

The understanding of many of the concepts on this paper was sketchy for this cohort. Areas of the curriculum that need more attention are, fractions (Q12) calculating speed, distance, time (Q16), stem & leaf diagrams (Q21), standard form (Q26), angles in regular polygons (Q27) and quadratic graphs (Q28). A major concern is the standard of arithmetic shown throughout this paper. However, there were questions or part questions where students of varying ability were able to pick up marks.

Students often did not appear to check their answers for reasonableness – accepting an answer of £14000 or more for a monthly gas bill (for example in Q11) and a time of arrival at work of 2 pm having set off at 7.30 am (in Q16).

The quality of handwriting from some students made their responses difficult to read.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

For the first question on the paper, this question was not well answered. Many students were clearly unaware of the conversion factor of centimetres into millimetres. The most common errors were using a factor of 100 to give an answer of 4000 or using a factor of 10 to divide rather than multiply with 40 being often given.

Question 2

The usual error in collecting these four algebraic expressions was to give an answer of e^4 instead of $4e$, carelessly reading the operation as '×' instead of '+'.

Question 3

Very well answered with most students gaining the mark. It was pleasing to see many using a ruler resulting in accurately drawn diagrams. Where the mark was not given, it was usually due to an inaccurate positioning of the reflected vertex of the triangle.

Question 4

Most students correctly identified the value of the 6 as six thousand.
16000 and 600 were the most common errors.

Question 5

This was answered well with many showing understanding of equivalent forms, A few gave the 3 values in reverse order and were penalised for not reading the question carefully enough. A common misunderstanding was for 0.5 to be less than 0.45 thinking perhaps that since 5 < 45 then 0.5 < 0.45. A small proportion did not convert all values to the same equivalent form which resulted in evaluating $\frac{1}{2}$ as smaller than 45%.

Question 6

Very well answered with few errors. Errors tended to be either giving the number of sunshine hours on Sunday or the sum of the two day's values.

Question 7

Generally well answered, some with minimal working shown. Careless arithmetic was a major reason for some students not gaining full marks in this question. 20 – 6 = 24 or 20 – 6 = 12 were the most common errors made but by dividing correctly by 2 to get 12 or 6, 2 out of the 3 marks available were possible. A common approach was to list costs of candles in multiples of 2. However, it was not uncommon for some multiples to be omitted, thus affecting the final number of candles bought. Some weaker students got no further than working out the number of candles that could be bought for £20. To gain any credit £6 ÷ 2 also needed to be seen. Giving an answer of 14 on the answer line was also common following correct calculations, with 7 candles often being an embedded answer.

Question 8

In part (a), the modal mark was 2 for a fully correct bar chart. Sometimes just one bar was drawn correctly gaining one mark. Failure to score any marks was more often than not because the student left the whole diagram blank.

Part (b) was a little more demanding. Many realised why Rupa was incorrect but could not always express their reasons clearly. The marking was sympathetic and credit was given if explanations implied some understanding.

Some confused January's results with February's, resulting in contradictory information given in their response. A common misunderstanding was that only whole numbers could be used, or that rainfall could not be measured in part cm.

Some students found it difficult to find the half-way point between 15 and 20. Many read from the graph and stated that the amount of rainfall was 17 or 18 cm. This question exposed many mis-conceptions regarding decimal and whole numbers, discrete and continuous data.

Some students contradicted the question and asserted that Rupa was correct.

Question 9

Both parts of this question were answered well with very few mistakes seen.

Question 10

Whilst many were able to find the required temperature of 27, $-15 + 42$ was often evaluated as -57 or $+57$. The drawing of a temperature scale was a common approach, sometimes leading to the correct answer but often leading to an answer of 26 (counting from -15 upwards 42 times). 33 was a very common answer were $-15 + 42$ was incorrectly calculated using column method.

It is a concern that this question was poorly done by many students.

Question 11

Many students did not realise that the number of units of electricity used in November was the difference in the two meter readings, and simply multiplied the November reading by the 16p. Two marks were still available here if a correct method for long multiplication was shown. Whilst a correct method of long multiplication was often seen, the number of simple arithmetic and place value errors in multiplying is a cause for concern. Place value errors were also common within the final answer, where £7360, £736.0 and £7.36 were seen on many occasions. Some managed to score 3 marks but lost the final mark as no units were included.

Some students tried to find the difference in the readings by subtracting the larger value from the lower value.

Question 12

In part (a), there did seem to be some improvement in the addition of two fractions at this level, although the predictable incorrect answer of $\frac{6}{18}$ and its simplifications were often seen.

A common denominator of 72 was often preferred to the more straightforward 12. A number of students did change the denominators to 12 but then forgot to adapt the numerators appropriately.

Whilst many were successful in multiplying the two fractions correctly in part (b), many again converted the fractions to equivalent fractions with a common denominator. Unfortunately, this was often followed by just the multiplication (or in some cases addition) of the numerators keeping the same common denominator.

In this part of the question, the answer had to be given in its simplest form. Many students ignored this demand leaving $\frac{15}{80}$ as their final answer or lost the accuracy mark for incorrect cancelling of $\frac{15}{80}$. It was far too common to see division methods applied in this question, often accompanied by KFC written on the page. Overall, it was encouraging to see this question was attempted by almost all students, which is an improvement on previous series.

Question 13

Both parts of this question were answered well. In part (a), the usual error was seen using incorrect probability notation. With there being just one mark for this question, answers such as 4 : 15, 4 in 15, 4 out of 15 or similar gained no credit.

In part (b), often the correct answer of 0.7 was written as 70% or $\frac{7}{10}$, both alternatives being perfectly acceptable. Some thought that as there were only two colours of counters in the bag then they must both have the same probability of being chosen, giving 0.3 as their answer.

Question 14

Basic arithmetical errors prevented many students gaining full marks here. 24 – 5 and/or 6 × 4 were often seen calculated wrongly. The most common error was through incorrect substitution, usually resulting in 64 – 5 = 59 or $6 + 4 - 5$. Some students attempted to balance and solve the equation.

Question 15

In part (a), either the concept of estimation seems to be poorly understood at this level or students are increasingly not reading questions carefully enough, but it was very common for students to attempt to find the exact product of the two given values. This gained no credit at all.

Unfortunately, in part (b), many students used long multiplication techniques to find the value of 29.6 × 32, often making arithmetical errors along the way. Some, perhaps thinking this part was similar to the previous part, estimated the result, working out 30 × 30 = 900. This would have been an ideal approach in order to find the relative size of the answer but alone gained no credit.

Question 16

Distance, speed and time formulae were understood by many students and 50 ÷ 40 was often seen in part (a). Poor arithmetic then often followed with results such as 1.1 or 1.2 hours. Very few students were then able to convert the part hours to minutes and 1 hour 10 mins or 1 hour 20 mins were the usual results. When a correct division giving 1.25 was found, this was then incorrectly converted to 1 hour 25 mins by many students giving a final answer of 08:55.

Build up methods were common for this question, with 1 hour associated with 40 miles. However, most of those who used this approach were unable to reconcile the remaining 10 miles with a correct time.

Weaker students often wrote 50 ÷ 40 and then proceeded to divide 40 by 50 and many worked out 50 × 40. Others used 7.30 as the ‘time’ in the formula. A small minority of students clearly didn’t read the question carefully and gave an answer of 1hr 15mins for the time taken rather than the time of arrival.

More students had success in part (b), realising that if the average speed was greater then the time of arrival would be earlier.

Question 17

It was very pleasing to see so many students correctly relating the information given to the diagram before them. Very few errors were made, usually through carelessness when they were.

In part (b), the most common answers were either the correct answer of $\frac{12}{72}$ for two marks or $\frac{12}{32}$ for one mark where students just considered the adults and not the whole population. Giving the answer as a ratio 12:72 gained one mark

A significant number of students insisted on trying to give their answer as a decimal. If their initial fraction was seen, any attempt at converting to a decimal was ignored. However, some students only offered a decimal answer and this was virtually always incorrect.

Question 18

The most popular method in answering this question was by working out the amount of sugar required to make 20 and then 5 scones. Some did simply work out 40 × 2.5
In the former method, loss of marks was a result of not explicitly identifying the number of scones that were being considered. or finding the amount of sugar required for 20 scones accurately but then simply adding 5 more grams for the 5 extra scones.

A significant number just multiplied by 25, thinking the ingredients given were for one scone. Some students wasted considerable time by working out the amount of each ingredient in making 25 scones.

Question 19

Finding 20% of 240 was the more common starting point here although many methods to do this were incomplete or flawed. It was not uncommon to see 10% = 24 and then a second 10% equal to half or a tenth of 24. Poor arithmetic was often the reason for loss of marks. Even those who found 48 often couldn’t get to 288. A significant number went on to subtract 20% from the 240 rather than adding it or did not realise they needed to add it on resulting in a common final answer of 48.

Question 20

Many students found the demand of this question just too great, and where to start puzzled a great many. Some just worked with the given fractions, adding or subtracting and in some cases multiplying them together. Very few were able to tease out a process to find the required fraction. One mark was awarded for adding the two given fractions, this being just one step away from a correct solution. One mark was also available for identifying the fraction of the unshaded parts of rectangles A and C. However, many simply wrote 3 (instead of $\frac{3}{8}$) and 2 (instead of $\frac{2}{11}$) in the appropriate places. Fraction arithmetic remains an issue with many students writing $\frac{5}{8}+\frac{9}{11}=\frac{14}{19}$. Of those who did make a sensible start, $\frac{49}{88}$ was a common answer which gained 1 mark. Also, $\frac{127}{88}$ was a similar common incorrect answer.

Question 21

Those students who understood the concept of a stem and leaf diagram usually scored well, losing marks generally through carelessness by omitting a value or giving an unordered diagram or an incomplete key. Some errors in the key including 'people' when the figures were ages. Pictograms and tally charts were quite often seen.

Question 22

This question was answered poorly by all but a few students. Many recognized the radius as being 3 cm but were unable to find an expression for the area. The height of the cylinder was often taken as 6 cm instead of 5 cm.

A common error was to correctly find the area of the plan, 9π, and then multiply it by the area of the front elevation. Some students used numerical values for π and this was acceptable in assessing the process but not in the final answer. Whilst many students did realise that they needed to use πr^2, or even $\pi r^2 h$ they lacked the confidence to evaluate this with the given information.

Weaker students did attempt to count squares in working out the area of the plan but this was usually accompanied by counting squares to find the area of the front elevation as well.

Question 23

It was common to see the critical value of 5 identified by many students, usually as the solution of a linear equation, but less were able to actually solve the inequality. Attempts to add 27 to both sides as a first step were seen but were poorly executed in many cases. $7x < 35$ was often seen alone with no subsequent conclusion offered.

Some students employed trial and improvement methods, quite often ending up with an answer of 4 (the greatest possible integer value of x)

Question 24

Many students gained at least one mark here for correctly identifying the prime factors of 124, usually by way of a factor tree diagram. However, so many failed to write these as a product. Many students faltered on their first factorisation, pairings of 2 and 64 being a common mistake. Of the students who completed the factor tree correctly, many then only wrote '2×2' and seemed put off by '31' as a prime factor (many then attempting to split 31 further, obviously unsuccessfully).

Question 25

Those students understanding the concept of ratio usually started correctly by dividing the 160 vehicles in the ratio 3 : 7, resulting in 48 (16 × 3) cars. Failure to then complete the solution correctly was generally a result of finding either $\frac{1}{8}$ of 48 or 25% of 48 and then immediately subtracting the single result from 48 and then calculating either $\frac{1}{8}$ or 25% of the remainder.

Some students misinterpreted the first line of the question and assumed that here were 160 cars and then proceeded to find $\frac{1}{8}$ and 25% of 160 leaving them with an answer of 100. This was marked as a special case with the award of two marks.

Question 26

Very many students had clearly not covered standard form in depth and therefore were unable to make any meaningful sense of this question. 1630 and 16300 were common errors in part (a). In part (b) 438×10^3 was often seen.

In part (c), 4000 and 0.00006 were sometimes seen but no credit was given until a multiplication had taken place. Correct values of 0.24 and 24×10^{-2} were sometimes seen but rarely then put into standard form. Incorrect understanding of how the power changes was common with students writing 2.4×10^{-3} as their final answer. The majority of students appeared to score 1 mark for answers of the form 2.4×10^n where $n \neq -1$

Question 27

Predictably in this question, many students were confused between interior and exterior angles in regular polygons. Many times the interior angles of a regular pentagon and a regular hexagon were quoted (or worked out to be) 72^o and 60^o respectively. No marks were available after this major error. Contradictions between diagram and working were often seen. A significant number of students simply divided 360 by 3 or measured the angle with a protractor. Students who found the correct interior or exterior angles usually went on to score well, arithmetical errors again preventing full marks at times; 18 as the answer to $\frac{540}{5}$ being frequently seen. It was good to see that so many students know how to find the total number of degrees in the sum of the interior angles of a polygon.

Question 28

Accurately completing the table of values in part (a) was rare with the usual mistake occurring when substituting the negative value of x. Some ignored the quadratic expression given and simply tried to complete an arithmetic sequence.

If a mark had been awarded in part (a) for at least two correct values, then at least one mark was usually earned in part (b) for correctly plotting their values. The drawing of a graph following a fully correct table in part (a) was sometimes spoiled by a ‘flat bottom’ to the quadratic curve through (1, -1) and (2, -1) or by joining the points with line segments. Many students did not understand what was required in finding solutions to the quadratic equation in part (c). Those that did, often wrote their solutions in a coordinate form; one mark was still available for this.

Question 29

Only the more able students, appreciating the need to find the volumes of the given cubes, made any progress in this question. Some multiplied the mass by the volume and then tried to simplify their ratio. Some did divide the masses by the volumes but left the un-simplified ratio $\frac{81}{27} : \frac{128}{64}$

The most common error was to divide the masses by the length of an edge, leaving a ratio of 27:32. Also common was to multiply the 81 and 128 by 3 and 4 to get 243:512

Question 30

This final question was very poorly answered by students, many leaving the solution blank.

Summary:

On the evidence of their performance on this paper, students need to:

- take more care when reading the questions. There were a considerable number of misreads which prevented complete solutions.
- write clearly so that correct values quoted are not altered in subsequent working.
- be more careful when performing simple arithmetic calculations, particularly in build-up methods.
- think about the reasonableness of their answers.
- set their working out clearly, crossing out working that is being replaced.
- avoid any temptation to merely offer an answer only without showing their working.
- be able to convert fractions of an hour into minutes.
- know the difference between an interior angle and an exterior angle of a regular polygon.

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