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Examiners' Report
Principal Examiner Feedback

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In Mathematics (1MA1)
Foundation (Calculator) Paper 3F

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GCSE Mathematics 1MA1

Principal Examiner Feedback – Foundation Paper 3

Introduction

The overall quality of the presentation of work has improved since last year, and even since the summer series. In that series there were too many cases of candidates misreading figures from questions, but that was not the case in November, where candidates showed greater care in reading figures and in presenting their work.

Approaches to questions that required some interpretation or explanation were inconsistent. Questions 10 and 16 were answered well, but poor attempts were made in questions 13b and 22. On too many occasions candidates included contradictory or incorrect statements, which cannot be credited under the definition of a C mark. However, it must be noted that rarely were these questions ignored. Candidates must be congratulated for having attempted these even where they were unsure.

Mathematical performance generally appears to have improved on this paper since last year, though was not always consistently good across the whole paper. Within a broad range of questions the paper was able to discriminate well. Weakest areas continue to be the application of ratios, scales (including scales on graphs) and rates, but also algebraic manipulation and problem solving. Most demonstrated good use of a calculator, though on some occasions it was clear that they did not have an understanding of the way in which their calculator worked or did not have one at all, such as in questions 17 and 29.

Questions which had a slightly unexpected approach, that is required more thought, caused immediate problems for many, even in the earlier part of the paper. This includes question 12 involving simple ratios, and question 15 which involved several stages of calculation. Later in the paper questions 20 and 24 appeared unfamiliar to many, with frequent contradiction in their working. Questions 23, 24, 27 and 28 were the more challenging questions for those striving to demonstrate ability at the highest grades available, and a significant proportion of candidates therefore failed to score many marks on these questions, but again it must be noted that rarely did candidates fail to show some attempt at these questions, and it was not uncommon to find even the weaker candidates picking up some marks.

There were far fewer attempts using trial and improvement approaches. These mainly occurred when candidates showed evidence of not having a calculator, mainly evident in questions 15, 20 and 23.

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 7, 15, 20, 23 and 24.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

This question was not answered quite as well as one might expect. Whilst many gave the correct answer, a minority had 0.41, 0.46 in the wrong order.

Question 2

A well answered question.

Question 3

Nearly all candidates gave the correct answer.

Question 4

The main error here was when candidates thought they had to round up to 20.

Question 5

A well answered question.

Question 6

In part (a), 6 was the most common answer, but some candidates mis-counted and gave either 5 or 7 as their answer.

Part (b) was well answered, though a small number of candidates read off April instead of May.

Question 7

The majority of candidates completed this question with no issues. Of those candidates who failed to gain full marks, the most common error was in failing to give their answer in correct money notation, that is stating £145.6 rather than £145.60. This lost the final accuracy mark. Some candidates lost marks by doing a variety of strange calculations which some checking would have spotted. This included $208 - 0.25$, 52×93.6 , or cases of finding 52 then showing $208 \times 60p$ rather than $52 \times 60p$.

Question 8

Part (a) was a well answered question.

In part (b) many candidates gained both marks. Common errors included attempting the question by summing the numbers, but not always summing all of them, or by dividing by 2, 3 or 5. A few candidates found the range or median. Some candidates lost marks because they did not extract the correct numbers from the table.

Question 9

Candidates were well practiced with coordinates, and only a few failed to gain the marks in both part (a) and part (b), usually by reversing the coordinates.

In contrast, it was rare to see a correct answer in part (c). Frequently the y axis (and sometimes the x -axis) was often just marked with a cross. Drawing $x = -3$ was a common incorrect answer, although many candidates felt it needed to be a diagonal line, often going through point B . Another common error was to draw a line through A and B .

Question 10

In part (i), most students were able to find one of the two solutions given in the mark scheme, 11, 10 being seen most frequently. Errors occurred when candidates assumed it was a linear sequence and only found the first difference and applied that throughout, or where they had difficulty processing a decreasing sequence and added onto the starting number and found the terms that came before the start of the sequence instead of terms 4 and 5. Occasionally arithmetic errors lost the mark.

In part (ii) candidates had difficulty in explaining the decreasing difference, often referring to the amount or sequence going down by one rather than the difference. The most common successful strategy for gaining the mark was for writing the differences, $(-4, -3, -2, -1)$, sometimes on the sequence itself. Those that did not use numbers had less success here as many of the worded answers without examples were too vague or incoherent. Candidates are advised to practice talking about differences in terms of what operation they are performing and its value. There was also some confusion as to whether it was an increasing or decreasing sequence.

Question 11

This question was answered well. Common errors were to find the surface area or the perimeter of the shape. A significant number of candidates seemed to confuse volume with area formulae (of triangles or trapeziums) as they halved a perfectly good volume and thereby ruined their answer. Candidates are advised to be more aware of the dimensionality of area and volume and how this relates to the units used for these different concepts.

Question 12

This was answered well by most candidates, many of whom obtained 2 marks by stating the ratio $1 : 6 : 3$ or an equivalent ratio. Frequently 1 mark was given for finding one correct pairing of ratios. Few candidates went down the algebraic route, but those who did often picked up at least 1 mark. Those who simply wrote down three acceptable numbers without using ratio notation could only gain 1 mark.

Question 13

In part (a)(i), the answer of 40 was most often correct. The most common incorrect answer for this part was 80, the misconception being that the angles at C and D were equal.

In part (ii), most candidates were able to give the standard response. Some omitted either “angles” or “quadrilateral” from their answer, which was a requirement for the mark.

In part (b) a high proportion of candidates were able score the C mark. The most common responses included: stating that the angles in a triangle should sum to 180° or that the angles

of the given triangle incorrectly sum to 190° . Unfortunately, there were a number of responses seen that either stated incorrectly or spoiled a good response by asserting that the triangle should be equilateral or isosceles, which of course was an incorrect statement. Some also chose to change the 60° angle to 50° ; while this answer may imply the correct angle sum it is not a correct statement as that angle did not need to be that size.

Question 14

In part (a), the answer of 30 was most often correct. But in part (b) many candidates were unprepared for the requirements for reading from the graph and scaling their reading. There were very few who chose the most appropriate value of 20 to scale to 80, and many who took inaccurate readings from the axis. This question highlighted that candidates need more practice with this topic of the curriculum.

Question 15

A significant number of candidates were able to score some marks on this question although only a small proportion of candidates were able to progress through this problem to achieve a conclusion based on correct comparable figures. Most candidates made a good start by finding the cost of 1kg of carrots. Those who were able to progress further then chose to isolate the cost of 2.5kg of onions. Where candidates scored the first P2, many struggled to scale 2.5kg to 4kg and were therefore unable to progress through the remainder of the question correctly. Of the candidates scoring 0 marks, many incorrectly halved the £2.36 to split the cost of the carrots and the onions equally. Common errors that stopped candidates from progressing correctly included the multiplying of different quantities by 2 to get 5kg of onions or 5kg of onions and 4kg carrots or 6kg of carrots. Some good responses might have gained full marks had the candidate fully answered the question by communicating the correct conclusion.

Question 16

Stating the need for labelling was the successful answer most often given. Only occasionally was the second mark achieved. Many candidates identified that the number of potatoes added up to 300, but rarely showed an understanding that scaling to 360° was required. Very few candidates actually worked out the correct angles of 108° , 126° , 126° to illustrate the incorrect pie chart.

Question 17

Part (a) showed poor understanding of rounding to significant figures with answers of 8, 80 and 87.6 being common. Many candidates gave answers such as 876 or rounded to the nearest thousand (88 000) or rounded down instead of up (87 500) whilst some candidates included a decimal point in their answer.

In part (b), the majority of candidates answered this question correctly but a written method was rarely seen. There was some evidence of omitting to use brackets in the calculation. Of those who didn't score full marks, many scored the method mark for calculating the numerator or denominator correctly. Indeed, those candidates who worked out the numerator and denominator separately would usually go on to gain full marks. It was surprising that a good number of candidates chose to arbitrarily round their answers to 1 or 2 decimal places and calculate an estimate. Some copied the answer from their calculator incorrectly putting 13.254 thus costing themselves 2 marks.

Question 18

This question posed some difficulty for candidates to complete correctly. Candidates who were able to rotate the shape 90° anticlockwise into quadrant four were rewarded with at least one mark if they were unable to position it or draw it correctly. While uncommon, if candidates were able to rotate it correctly clockwise into quadrant two with centre the origin were also rewarded with one mark. More often than not candidates scored no marks due to a variety of errors. Some candidates rotated 180° rather than 90° or were unable to rotate it anticlockwise by the correct centre (often resulting in the shape not being fully in quadrant four). Candidates would benefit from a better understanding of this assessment objective and perhaps using tracing paper.

Question 19

The axes scaling proved challenging for some candidates in this question and thus they were unable to correctly read off values from the graph. Though the majority of candidates gave the correct answer of 15 for part (a), a significant number gave the incorrect answer of 20 instead.

In part (b) the majority of candidates gave a value within the acceptable range. The most common answer was 4.5 and the most common incorrect answer was 7. Candidates who drew guidelines on the graph had greater success.

In part (c) candidates were less successful and a multitude of errors were seen stopping many candidates from scoring all or some of the marks. These included not knowing or being able to substitute correctly into the speed/distance/time formula, being unable to convert minutes into hours or even reading the correct values from the graph. It was common to see answers of 5 and 0.2 from $20 \div 4$ (no marks) and $4 \div 20$ (1 mark). It was rare to see a correct answer of 12, but when it was seen it was often due to a scaled approach to this question rather than 20 minutes being converted to a fraction of an hour or attempting to convert 0.2km per minute.

Question 20

Most candidates were able to gain 2 marks for at least 3 correct ingredients for 25 scones. It would seem that asking them to go further caused some confusion and errors were made. Some candidates were able to get as far as 3 marks but failed to get the final mark as they had made an earlier inaccurate calculation for flour. Working was often set out poorly particularly that worked out the amount for 5 scones and then added two lots of amounts for 10 scones.

Question 21

Poorly attempted with many not completing a correct first step. $A = 3p - 9$ was a very common answer. Some were able to score 1 mark for the first step and showing the result of adding 9 to both sides getting $p + 9 = 3a$. Very few attempted dividing by 3 as a first step.

Question 22

This question was answered well by a large proportion of candidates, who identified that Rob should have added the ratios before dividing. Comments such as “add the ratios and then divide by 120” were accepted as simply being poorly worded. Some candidates spoilt an otherwise good answer suggesting that after adding the ratios, they should multiply 40 and 24

by 8, which was an incorrect statement. Often candidates showed full correct working for sharing 120 in the ratio 3:5 which was an alternative way of answering the question.

Question 23

Candidates who used a 2-way table for this question were significantly more likely to score full marks than those who chose a series of written calculations. The majority of candidates did not use words to describe the answers to their working out, so they frequently got themselves lost in a page full of numbers. Most candidates scored one mark on this question, with the majority opting for a process to find girls choosing French (44) or total number of girls (110). Of the candidates that were able to progress past a first step, most were able to go on and score full marks, however there were a number of responses seen that did not identify the correct answer from their working or table and often placed a wrong total on the answer line.

Question 24

Nearly all responses scored zero marks. Responses that scored all 4 marks were very rare. Very few candidates used the correct formula for the area of the cross-section or for the whole cylinder, many using the diameter rather than the radius. Most candidates failed to find a volume, but simply found the area of a rectangle by multiplying 80 by 160 and worked with 12800 as if it was the volume of one cylinder. The most common way of scoring a mark was for finding the amount of fertiliser for each tank. Where marks were gained this was generally for the process of working out the volume of a single tank or for a process to find the volume of water per tank. A small minority of candidates got 1 mark for showing 8000 in their working. The ratio of 100:1 equalling 101 parts evaded nearly all candidates, resulting in minimal full mark answers.

Question 25

There were far more correct answers than similar shape questions in previous years with many candidates getting 2 or 4 marks. If candidates were awarded two marks for the first part, they frequently went on to get two marks in the second part too. Candidates either knew how to calculate a scale factor and got the answers correct or made wild attempts at finding relationships. A few candidates fell into the classic misconception of adding something on to find the missing sides, rather than finding the ratio between the corresponding lengths. In part (a), a common error was to correctly find the scale factor of 4, but then incorrectly multiply by 5 to get 20, whilst in part (b) a common mistake was to divide by the 5.

Question 26

In the first part of this question, there was a clear split between those candidates who understood the concepts of a tree diagram and were able to insert the correct probabilities and those that seemed to not know that probabilities needed to sum to 1 and often just repeated values in the tree that they could already see. Full marks and zero marks were the most common, although some students were able to identify the 0.7 but not the other two probabilities.

In part (b) most candidates attempted some form of calculation although $0.3 + 0.35 = 0.65$ was the most common approach and led to zero marks. Very few candidates seemed to know that they needed to multiply the probabilities.

Question 27

Part (a) was poorly answered; it was rare to see a correct answer with 80, 800, 0.8, 0.08 all appearing more regularly than the correct answer of 0.008

In part (b) conversion between km and m remains a weakness; in too many cases candidates showed a division operation instead of multiplication, even worse with 100 instead of 1000. The proportional factor of 1000 was almost always correct. Conversion between hours and minutes was, perhaps predictably, less effectively completed overall with many attempts dividing by 60 once rather than by 60×60 .

Question 28

Only a few candidates were able to gain marks on this question. Those who did were only able to gain one mark for either finding the total mean height 50×167.6 (=8380) or the mean height for the 20 men (=3640). The most common mistake was to add both given mean heights (167.6 and 182), halve the sum, then multiply the result by 30. Candidates found it challenging to find the sum of the data when given the mean. Some candidates calculated both totals but then didn't know what to do with the results. A lot of answers simply wouldn't have made any sense if the candidates had actually thought about it needing to be a height.

Question 29

In part (a), there were many answers which included the digits 675 but rarely the correct response. Too many candidates appeared to want to give the answer as a standard form number. Examples of incorrect responses included 67 500 where they had multiplied by 10 000 rather than divided by 10 000 and 0006.75, demonstrating an incomplete understanding of standard form.

In part (b), many candidates struggled with the format of a number written in standard form. They were able to use their calculators to find 659 200 as the answer to the calculation but then struggled to put it into standard form; sometimes despite being able to convert from standard form to an ordinary number, gaining 1 mark instead of 2 marks, which was quite common. Those that failed to score often attempted to do it without the calculator or did not know how to enter numbers in standard form into their calculator.

Question 30

Part (a)(i) was surprisingly well answered. A common error was for the numbers to be reversed in the vector. But in contrast part (ii) was not well answered. While many candidates were able to show a substituted expression, they often failed to multiply both the 2 and the 3 of vector \mathbf{a} by 2 before doing the subtraction. Some candidates forgot to account for the sign and added the vectors instead.

Many of the candidates failed to attempt part (b). Most of those who did make an attempt did not know (or failed to recognise) that $2\mathbf{d}$ would be parallel to \mathbf{d} , just drawing a random diagonal line. Some of the candidates drew a correct vector but not from point P . Copying the vector without doubling it was another common error.

Summary

Based on their performance on this paper, candidates should:

- take care when reading figures from questions, and transcribing their own work
- ensure that when giving explanations that responses are focused on the demand of the question
- write their figures legibly, avoiding any possible confusion when writing 1s and 7s, when writing 4s and 9s, and even when writing 0s and 6s.
- show their methods clearly
- ensure they know how to scale numbers, and use scaling on axes of graphs
- practice algebraic manipulation, particularly in relation to finding the subject of a formula
- understand better how to change between units, including compound units.
- practice using ratio in real life contexts

