Examiners' Report
Principal Examiner Feedback

Summer 2017

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

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Summer 2017
Publications Code 1MA1_3F_1706_ER

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

Introduction

Students appeared to have had sufficient time to work through the paper and had generally attempted the majority of questions. Standard approaches and techniques were used well.

It was pleasing that students showed clear working out for most questions. Centres should continue to emphasise the need to show full working, particularly on a calculator paper. It is often apparent that a calculation has been performed but unless values are correct, part marks cannot be awarded for processes not shown.

Some students lost marks through not reading questions with sufficient care. Both Q9 and Q12(a), for example, required a decision to be made and marks were often lost unnecessarily because students completed the mathematical working correctly and then failed to state a conclusion.

Most students appeared to use their calculators but there were still some who lost marks through unnecessary arithmetic errors. When students carry out the more straightforward calculations mentally they should use a calculator to check their work. Arithmetic errors were also very common when times were being added in Q9.

In some questions students had to select the processes needed to solve a problem in context and performance on these questions was encouraging. Q14, for example, was well answered with a large number of students managing to use the exchange rate correctly as was Q18 with many students showing the ability to deal successfully with fractions, percentages and ratios.

Many students found the questions involving algebra challenging. Substituting into a formula was generally done well but students found it harder to write an algebraic expression and to rearrange a formula. The lack of algebraic skills was particularly evident in Q13 where students were expected to derive and solve an equation and in Q16 where they were required to solve simultaneous equations.

Geometric reasoning skills were generally weak. Many students had little or no idea how to show that the polygon is a hexagon in Q19 or how to show that the two triangles are similar in Q21.

Students should be encouraged to check that their answers are sensible, especially in practical situations. In Q14, for example, the total cost of the holiday was sometimes found to be less than the cost of the flights and in Q23(b) the value of the house before the increase was often greater than its value after the increase.

Students should take care when writing their answers. There were many answers in which the digits were not clearly written or crossed out in such a way that they could not be interpreted.

Report on individual questions

Question 1

Part (a) was nearly always correct. A few students started with the longest river, not with the shortest river.

Part (b) was answered well and it was rare to see a response where a mathematical calculation was not attempted. The most common approach used to show that Ami is correct was to work out 112 × 3 = 336. Some students chose to divide the length of the River Thames by 3 and some divided the length of the River Thames by the length of the River Don. A few students made arithmetic errors which meant that the mark could not be awarded and there were some with correct working who contradicted the question by stating that Ami is wrong. Other incorrect answers that were commonly seen included 112 × 4 and 354 − 112

Question 2

It was pleasing that many students were able to write an expression, in terms of p and b, for the total number of cups. Many students gained one mark for writing $12p$ or $18b$ or $p + b$ (which was very common). Students who used both $12p$ and $18b$ often gave a fully correct expression although answers such as $12p \times 18b$ and $12p$, $18b$ were quite common. There were many students who went on to incorrectly “simplify” their algebraic expression. Those that wrote $12p + 18b = 30pb$ or $12p + 18b = 30$ scored only one mark. Some students used unconventional algebraic notation such as $p12$ and $p \times 12$ and this was accepted.

Question 3

Q3(i) was answered very well. Incorrect answers included 10 and 19. Some students misread the question and wrote down a four digit number. Q3(ii) was also answered very well. Incorrect answers included 195 and 270

Question 4

This question was answered quite well. The most common method was to start with 32 ÷ 4 = 8 followed by either 8 × 5 or 32 + 8. Some students worked out 32 × 5 = 160 and then 160 ÷ 4. It was common to see a correct first step leading to either 8 or 160 and then for this value to be given as the final answer. This scored one mark. There were also responses in which 40 was seen embedded in the working, eg 40 ÷ 5 × 4 = 32, but not given as the final answer and these also scored one mark. The most common incorrect method used was 32 ÷ 5 × 4 = 25.6 because many students assumed that 4/5 of 32 was required.

Question 5

Most students were able to give a ratio as the answer in part (a). Many of these ratios were either 1 : 3 (the correct answer) or 1 : 4 (the most common incorrect answer). Ratios equivalent to 1 : 3 such as 25 : 75, 14 : 42 and $\frac{1}{4}:\frac{3}{4}$ were acceptable and were seen often.

Part (b) was answered well. Many of the students who did not give a correct ratio in part (a) were still able to answer this part correctly. Many students started with 56 ÷ 4 = 14 followed by either 14 × 3 or by 56 – 14. A common mistake was to give 14, the number of white tiles, as the final answer. Only a few students followed through from an incorrect answer in part (a) and generally they gained full marks.

Question 6

In part (a), the majority of students knew that the median is the middle number and were able to explain that Bridgit had not ordered the numbers. A few students stated that the median is 15, sometimes showing an ordered list of numbers, but did not answer the question by explaining what is wrong with Bridgit's method and gained no mark.

Part (b) was answered very well with most students able to find the range correctly. Errors were often the result of students using an incorrect highest or lowest value. Some students, though, did identify these as 22 and 12 but did not know how to combine them.

In part (c), the majority of students knew how to work out the mean. Errors included keying into a calculator so that only the final value was divided by 7 and adding up the numbers but arriving at an incorrect total. In such cases, those who showed their working were able to get one of the two marks available.

Errors in this question were often the result of students confusing the measures, eg giving the mean for the range and vice versa.

Question 7

The majority of students wrote down all nine possible combinations and it was pleasing that many of the lists were systematic and written in a logical order. Those that did not use such a logical approach were more likely to miss out or repeat combinations. Answers with one or two of the combinations either missing or repeated were sometimes seen and these were awarded one mark. Very few students failed to score at least one mark.

Question 8

This question was answered very well, with the majority of students subtracting 36 from 372 and dividing the result by 4. It was surprising, on a calculator paper, to see 372 − 36 sometimes evaluated incorrectly. However, a mark could still be earned for a correct method provided the calculation being attempted was shown. A significant number of students did not deal with the deposit correctly. Some added the deposit before dividing by 4 and some simply ignored the deposit and worked out 372 ÷ 4

Question 9

The majority of students were able to get at least one mark on this question and many went on to give a fully correct response. Many different methods were seen. The most widely used approach was to start at 9 am and add on the five times to find the time that Davos would finish cleaning. Another common method was to find the total of the five times and compare it with the length of the day. Time lines were often used but students did not always account for the minutes correctly. Mistakes were often made when adding on times, eg 2.55 pm + 75 minutes = 4.05 pm, and the use of unconventional time notation, eg writing 1 hour 40 minutes as 1.40, also led to many errors. The inclusion of a break caused confusion for some students about whether to add or subtract 75 minutes. Some felt that it should be split up into shorter breaks but were unable to record this accurately. Some of the students who found the total of the five times as 430 minutes divided 430 by 60 to get 7.16 hours and interpreted this as 7 hours 16 minutes. Students were generally very good at providing a statement as to whether Davos would finish cleaning by 4 pm although some students made no decision and could not be awarded the final mark.

Question 10

Those students who started by dividing 90 by 6 generally went on multiply the result by 5 and write down a final answer of 75. Some of those that got to 75 in their working then wrote a different answer, such as 15, on the answer line and scored two of the three marks. The mistake made by many students was to divide 90 by 5 and then multiply the result by 4, giving a common incorrect answer of 72. Very few students used the diagram to support their thinking.

Question 11

Many students were able to substitute the value of v into the formula in part (a) and get an answer of 11 with working usually shown. Some students, though, did not know how to substitute correctly and answers such as 42 + 3 = 45, 4 + 2 + 3 = 9 and $4^2 + 3 = 19$ were quite common.

Far fewer correct answers were seen in part (b). When the answer was written as $v = T - 3 \div 4$ only one mark could be awarded due to brackets being omitted. It was not uncommon for students to gain one mark for getting as far as

$4v = T - 3$ and then either give this as the final answer or follow it with an incorrect step. Some students indicated the intention to subtract 3 from both sides of the formula but were unable to do this correctly. It was very rare to see an attempt at division by 4 as a first step. Many students wrote an incorrect answer such as $v = 4T + 3$ or $v = \frac{T+3}{4}$ or $v = \frac{T}{4} - 3$ on the answer line without showing any working and could be awarded no marks. A few students attempted to use flow charts, which on the whole did not lead to the correct answer.

Question 12

In part (a) many students found the volume of one cube, 2 × 2 × 2 = 8, and said that Vera is correct because 6 × 8 = 48. Those that carried out the calculations but did not state that Vera is correct scored only one of the two marks. There were also responses in which the incorrect evaluation of correct calculations led to one mark being scored. Some students did not read Vera's statement with sufficient care and stated that she is incorrect because the volume of the cube is 8 cm^3, not 48 cm^3. Many of the incorrect responses seemed to be referring to surface area rather than to volume.

Part (b) was poorly answered with many students unable to draw a cuboid that could be made with 6 of the cubes. Some did draw a 2 by 3 by 1 cuboid or a 1 by 6 by 1 cuboid and scored one mark and sometimes these cuboids also showed the correct dimensions. There were many cuboids drawn with either no dimensions or incorrect dimensions and many cubes drawn. Some students drew a rectangle rather than a 3D shape gaining no marks. It should be noted that even a badly drawn cuboid with appropriate dimensions would have gained a mark. It was disappointing that relatively few students were able to make a correct attempt at finding the surface area of their cuboid. Volume calculations were very common.

Question 13

Correct answers were quite common and it was pleasing that some of these came from an algebraic approach. However, such algebraic attempts were rare. Many of the students using algebra got no further than writing down expressions for the three angles. Sometimes only two of the three expressions were correct, usually x and $4x$. The third angle proved to be the most problematic, with incorrect expressions such as $x - 27$ and just $- 27$ seen. Relatively few students were able to use their three expressions to set up an equation. The majority of correct answers came from a trials approach rather than from an algebraic method. Students who used a trials approach that did not result in the correct answer gained no marks.

Question 14

Students generally made good attempts at part (a) with many achieving full marks. The main stumbling block to a successful outcome was an inability to use the exchange rate appropriately to deal with the two currencies. The majority of those that attempted a conversion chose to change from dollars into pounds, which was not surprising as the question asked for the answer to be given in pounds. A few changed £1500 into dollars and found the total cost in dollars before converting it into pounds. The majority of students gained the first two marks for finding the total cost of the hotel room ($2744) and the total cost of the wifi ($60). Those that realised they needed to divide by 1.90 to change dollars into pounds often did so at this stage. A common mistake was to add 2744, 60 and 1500 and divide the total by 1.90. Those who decided to deal with the currency conversion as the first step and changed $196 and $5 into pounds were more likely to have an answer affected by rounding errors. When attempting to change dollars into pounds a common mistake was to multiply by 1.90 and some students even multiplied by 0.90

In part (b) a few students thought that having fewer dollars to £1 would have no effect on the total cost of Andy's holiday. The majority of the students, however, were split between those who thought it would be cheaper and those who thought it would be more expensive. Success in this part did not appear to depend on the number of marks gained in part (a).

Question 15

Students who started by putting 15 in the intersection generally went on to answer part (a) quite well and often placed all seven numbers correctly inside the circles. Some students, however, wrote two 15s in the intersection or wrote 15 in more than one region. The outside region, $(A \cup B)'$, proved to be much more problematic. It was very common to see either no numbers at all in this region or duplicates of the numbers that had already been placed inside the circles. Those who did attempt to put the rest of the odd numbers in the outside region sometimes failed to include all eight numbers. It should be emphasised to students that each number in the universal set should appear just once in a Venn diagram. Many students scored the one mark for labelling the circles, usually with *A* and *B* but occasionally with "multiples of 3" and "multiples of 5".

In part (b) many students scored one mark for a correct denominator of 15 or, more usually, for a denominator that followed through correctly from their Venn diagram. A correct numerator was seen far less frequently and it was evident that many students confused $A \cup B$ with $A \cap B$. Some incorrect notation for probability, eg ratio, was seen.

Question 16

This proved to be a challenging question for many students and it was frequently not attempted. Some of the students that appeared familiar with simultaneous equations realised that x could be eliminated straight away and subtracted to get $5y = -10$ although errors were often made when subtracting. Having got to $5y = -10$ and $y = -2$ students substituted this y value into one of the equations. Those that got to $3x + -2 = -4$ were often unable to find the correct value of x. Some students could not isolate x correctly and some got to $3x = -2$ but then wrote $x = -1.5$. Some of those that did succeed gave a decimal answer rather than the fraction $-\frac{2}{3}$ and when this decimal was –0.6 the accuracy mark could not be awarded. Many students appeared not to realise that x could be eliminated straight away and proceeded to multiply one or both equations. Students should be encouraged to look for matching terms to begin with. Nevertheless these students were often able to achieve a pair of equations which they could add or subtract to eliminate one of the variables. Some used an incorrect operation in an attempt to eliminate one variable and arithmetic errors were very common. Students who found one value usually went on to substitute this value into an equation in order to find the other value.

Question 17

Part (a) was not well answered. Many students chose to write out a list of the 25 dress sizes and these students were usually able to find the median dress size. Common incorrect answers were 11 (the median of 8, 10, 12 and 14) and 7 (the median of the four frequencies).

Part (b) was answered very poorly indeed with relatively few students able to explain that Zoe is not correct because some of the women could have both a shoe size of 7 and a dress size of 14. The majority of those who said that Zoe is not correct gave explanations that focused on the fraction calculation rather than on the context, eg stating that she should have multiplied the fractions. Many students thought that Zoe is correct.

Question 18

It was pleasing to see many fully correct and well-presented solutions to this multi-step question. Many students were able to work out either $\frac{2}{7}$ of 420 to find the number of vanilla cakes or 35% of 420 to find the number of banana cakes and often they did both. A common mistake was to subtract the number of vanilla cakes from 420 and then find 35% of 300, not 35% of 420. However, students who did this were still able to gain three of the five marks if the processes that followed were correct. Some converted $\frac{2}{7}$ to a percentage but premature rounding often led to a loss of accuracy. Despite this being a calculator paper, a surprising number of students attempted to use a non-calculator method for the percentage calculation, often with incomplete or inadequate working shown. Students who got as far as subtracting the numbers of vanilla cakes and banana cakes from 420 to find the total number of lemon cakes and chocolate cakes then had to divide this total in the ratio 4 : 5. A common error at this stage was to divide the total by 4 and by 5 instead of by 9. Some students attempted to use the ratio 4 : 5 on a quantity that was not the total number of lemon cakes and chocolate cakes, eg finding $\frac{4}{9}$ of 420

Question 19

Showing that polygon P is a hexagon proved to be beyond many students and this question was not well answered with a significant number of blank responses seen. Fully correct solutions were usually based on interior angles although some neat solutions that used exterior angles were seen. Many of the successful students started by finding the interior angle of a dodecagon and then used angles round a point to work out that the interior angle of polygon P is 120°. The final step for these students was to show that the interior angle of a hexagon is 120°. Alternatively, some students worked out the interior angles of a dodecagon and a hexagon and the final step for these students was using angles round a point to show that 150 + 120 + 90 = 360. Some students omitted the final step and scored three of the four marks. Some students worked out one angle, the exterior angle or interior angle of either a dodecagon or a hexagon, and got no further. It was not uncommon to see errors in arithmetic. There were a significant number of students who gave a worded discussion often indicating that the three sides of polygon P could be reflected to form a hexagon. Others drew a hexagon either on the diagram or in the working space.

Question 20

Many students were able to use volume × density to find the mass of at least one of the ingredients. Most went on to find the masses of all three ingredients and add these to find the mass of the drink. Rather surprisingly, many students stopped at this point and gave 324.45 as the final answer. Those who showed a complete process to find the density of the drink usually gave a correct answer. A common mistake in this question was to divide volume by density in an attempt to find mass. Some students simply added the three volumes and added the three densities and attempted to do something with their results. Even when they had written the "density triangle" in the working space some students did not know how to proceed.

Question 21

This question was not answered as well as might have been expected. The most common approach was to show that each side of the larger triangle is 2.5 times longer than the corresponding side of the smaller triangle. Some students used a scale factor of 2.5 but did not apply it to all three sides and could only be awarded one of the two marks. A few students used trigonometry to work out the size of the smallest angle in each triangle and stated that the two triangles are similar because they have the same angles. Many students had no idea how to show that the two triangles are mathematically similar. Some worked out the area or the perimeter of each triangle and there were some who applied Pythagoras' theorem to both triangles. Many students simply wrote a statement that referred to each triangle having a right angle. Some students thought it was enough to rotate the triangle to look like the other one to show they were similar.

Question 22

The table in part (a) was generally completed well and students were often able to use their values to draw a fully correct curve in part (b). Some students plotted the points correctly but then didn't join them or else joined them with straight line segments or joined them with a curve that missed one or more of the points, resulting in one mark only. When plotting the points from the table most mistakes were made plotting (4, 1.5) and (5, 1.2).

Question 23

Part (a) was not answered very well. Students were more successful at writing down the least possible value of the house than the greatest possible value of the house. A variety of incorrect answers were seen. These included 159 000 and 159 999 in Q23(a)(i) and 164 000 and 169 999 in Q23(a)(ii).

Students who recognised that 210 000 = 105% in part (b) not only gained the first mark but usually went on to get the correct answer. Not surprisingly, the most common mistake was to work out 5% of 210 000 and then subtract the result from 210 000 or, less frequently, to add it to 210 000

Summary

Based on their performance on this paper, students should:

- Practise writing algebraic expressions and formulae
- Practise setting up algebraic equations to solve a problem
- Use a calculator to check calculations that are carried out manually
- Practise completing Venn diagrams and learn the necessary set notation
- Read the information given in each question very carefully

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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