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Examiners' Report  
Principal Examiner Feedback

Summer 2022

Pearson Edexcel GCSE (9 – 1)  
In Mathematics (1MA1)  
Foundation (Calculator) Paper 2F

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## **GCSE (9 – 1) Mathematics – 1MA1**

### **Principal Examiner Feedback – Foundation Paper 2**

#### **Introduction**

The paper was accessible to all students with a good amount of working shown over most of the paper. Some questions, towards the end of the paper, were not as well answered by students but this was due to the differentiation and ramping of the questions.

This is a paper that requires the use of a calculator and students are expected to have access to and use a calculator. There is evidence that some students continue to try to use written methods even when they have a calculator and this can take longer and also lead to inaccurate answers.

Additionally, a pair of compasses was required for this paper, which some students did not have access to. It is essential that students have a full set of equipment when sitting a GCSE mathematics paper.

Students should carefully read both the numbers used in the questions and their own hand writing, inaccurate reading leads to inaccurate answers and will mean students lose marks unnecessarily.

#### **REPORT ON INDIVIDUAL QUESTIONS**

##### **Question 1**

A good accessible start to the paper with a question, that was well answered with most students scoring the mark.

##### **Question 2**

Only about two thirds of the cohort was able to correctly answer this question. Some students added 1 and  $\frac{3}{10}$  instead of finding the difference.

##### **Question 3**

Over 80% of the cohort was able to give the correct answer. Others often gave a different statistical measure.

##### **Question 4**

Well over 90% of the cohort was able to answer this question correctly. The errors seen were to not give a 3-digit number or to give the first 3 multiples of 5.

### **Question 5**

This question was answered correctly by over 80% of the cohort. The common incorrect answer was to give 4% as the final answer.

### **Question 6**

This question was exceptionally well answered with most students gaining the mark. A minority of students lost the mark by omitting a number from their answer or for getting confused on the negatives, giving answers such as -2, -7, -11, 3, 8, 10.

### **Question 7**

Part (a) was not well answered with only approximately half the cohort able to correctly name the shape. The most common incorrect answer was pentagon.

The second part of the question was answered correctly more often than part (a). The vast majority of students were able to give a correct answer for the parallel line.

The last part of this question was more challenging and less than half the cohort could effectively describe a perpendicular line. The students seemed to lack knowledge of the meaning of the word perpendicular rather than the ability to describe a line on the shape. Some blank scripts were seen for this part of the question even when letters had been used for a correct answer to part (b).

### **Question 8**

As to be expected part (a) was well answered with most students able to give the correct coordinates for the point shown.

The second part of this question was also very well answered with the majority of students gaining the mark for demonstrating the ability to plot the pair of coordinates accurately. The most common error seen was to transpose the values and plot the point as (3, -4) or use the incorrect positive or negative version of one or both coordinates. Students usually marked the point clearly with a cross but many failed to label the point. Students are reminded to read the instructions given in questions carefully.

In part (c) a wide variety of answers were seen with varying levels of success; some students did not attempt to draw a circle. A good number of students did not have a pair of compasses and drew a freehand circle. Many students had the centre of the circle as (-1,1) and this gained one mark providing the radius was still 4 cm. Several students drew circles at the correct centre but with an incorrect radius, this gained one of the two marks available.

Centres could significantly improve the success rate of this question by ensuring students are

both correctly equipped and have had opportunity to practice using all necessary equipment as part of their exam preparation.

### **Question 9**

Whilst almost two thirds of the cohort could read off the scale correctly for part (a) this means that one third could not. This is a basic skill which students should practise.

In part (b) the vast majority of students scored at least one mark for clearly identifying either 10 or 56. The upper value of 56 was sometimes incorrect as students misread the scale of the graph or some students lost the final mark for expressing the numbers not as a ratio but as a fraction. The other common error seen was to simply subtract the two values to give an answer of 46. Any incorrect simplification of a correct answer was not penalised as this was not required by the question.

### **Question 10**

This was generally well answered and the modal score was three marks. When full marks was not scored this was often due to arithmetic errors; it was disappointing to see so many arithmetic errors, particularly in the subtraction of £150 from £1428 when a calculator could be used. Students either did not have a calculator or chose not to use it. Centres should encourage students to use a calculator on the calculator papers. A few students decided to add together the £150 and the £1428 before dividing by six. Unfortunately, this was an incorrect process and gained no marks. Some students left two methods to be marked, in this case both will be marked and the lower of the two marks awarded. Students should be discouraged from this practice and make their own choice as to which method they want marking. In this question the choice was often either a fully correct answer or  $1428 \div 6$  and if nothing was written on the answer line then the student scored no marks.

### **Question 11**

The modal mark for this question was two marks for calculating the angle as 39 degrees. However, many students lost the final communication mark for failing to give the correct geometric reason. A few students lost the communication mark by contradicting their working. For example, 'Angles in a triangle add up to 360'. Students should be encouraged to give their geometric reasons as they work through the question and centres should emphasise the difference between giving reasons and showing working.

### **Question 12**

Students were able to use the number machine in part (a) and the vast majority of students gave the correct answer and scored the mark available.

Part (b) was generally well answered with most students achieving full marks. An answer of 6 was often given with no further working shown. Of the successful answers with working,

by far the most common method seen was the use of the inverse operation working backwards from 154. Those unable to give the final answer often gained a mark for partially correct working out, usually  $154 \div 11 = 14$ . Some students did try to work with an unknown and 88 or  $154 - 88$  was often seen but not many using this method seem to complete the process and give an answer of 6. Those students who got as far as  $154 - 88$  or stating 66 were able to gain one mark. The most common incorrect answer seen was 13.27 from subtracting 8 from 154 first and then dividing by 11.

### **Question 13**

Completing the two-way table was well done by the students with the vast majority scoring 2 or 3 marks. The main errors were a failure to give the final total as 198. Students should be encouraged to tick off values in the question as they are used.

Some students placed one of the initial given values in the wrong box or made arithmetic errors. As with most questions on this paper, student outcomes would be improved by making use of their calculator instead of relying on written methods on calculator papers. It is also important to reinforce the importance of checking answers. In this question, students should be encouraged to check if the total column and row of the two-way table add up and if they do not then they should be encouraged to try again.

### **Question 14**

Both parts of this question were well answered with part (b) scoring slightly higher. The symbols used seemed to be well understood by the vast majority of students.

### **Question 15**

Part (a) was accurately answered by about half the cohort. Several students made an arithmetic error, writing  $3 \times 0 = 3$ . This gave an answer of 777 which gained one mark. Where this question was not well answered, common misconceptions were the addition of the frequency column leading to 300 or the addition of the social media accounts column leading to an answer of 10. Both these responses show a lack of understanding of the meaning of the frequency column in the table. Centres should practice using frequency tables in a variety of ways.

Students found the second part of this question more challenging. There were some correct answers seen from correct methods but efficient methods were not always seen. Some students wrote out ALL of the data and then found the median from a very long list. A few students used the method of  $300 \div 2 = 150$  to identify the 150<sup>th</sup> item as the median and then stated 3 as the answer.

There were many incorrect methods used for example many students ordered the number of social media accounts and found the median of those i.e. 0, 1, 2, 3, 4 with a median of 2.

Others ordered the frequencies and found the median of those i.e. 3, 57, 75, 81, 84 with a median of 75, with a few also achieving a final answer of 3 incorrectly from equating their 75 to the number of social media accounts. Another common incorrect method which sometimes led to a correct answer was the calculation of the mean using  $772 \div 300 = 2.58$  and rounding to 3, this was clearly the wrong method and gained no credit. A small number of students identified the mode instead of the median.

Students need to be familiar with all the different types of averages they can be asked to find and be able to distinguish between them, using a variety of tables as well as a list of numbers.

### **Question 16**

This use of scale question was accessible with many pleasingly being awarded the 3 marks available. Students generally answered this question well with many using the correct process to find the scale factor between the two corresponding lengths and then continuing to multiply correctly by the width of the scale drawing. When full marks were not awarded, it was often due to converting the figures and getting confused, such as working with a scale factor of 500, having commonly converted 62 metres into centimetres. This approach occasionally caused confusion when units were not changed consistently. A small minority tried to find area; careful reading of the question is always recommended.

Centres could encourage students to show all steps of their method as there were some answers that may have come from a partially correct method but with little or no working shown credit could not be given. Students could also be reminded that when answering questions involving scale they could draw a diagram to help them.

### **Question 17**

This is a commonly asked question but on this occasion the topic was not well answered. The lack of a table to fill in seemed to confuse some students. Centres should encourage students to set up their own table of values if one is not given. Those students that did this were the most successful in scoring full marks. Even though this graph had a negative gradient many students tried to draw a line with a positive gradient going up in ones instead of down. It was also disappointing to see many students had plotted the correct points but failed to join them up with a line, hence losing the accuracy mark.

Another common error seen was to have the correct graph for the positive values of  $x$  but the incorrect values for the negative values of  $x$ . It would help students to recognise the format for the equation of a straight line and know that their graph should be both straight and have all points joined.

### **Question 18**

A range of marks were awarded for this question which tested students' ability to convert between different time units and to calculate the mean. Many were able to convert 25.3 hours

to minutes by multiplying by 60. Where this was unsuccessful it was often the case that students converted the 25 hours correctly but could not deal with the decimal part. Often 0.3 was incorrectly converted to 20 or 30 minutes, this meant that the mark for time conversion could not be awarded. However, students were able to gain a mark for working with the mean when they divided what they thought the time was, in minutes, by 115. Students who started with  $25.3 \div 115 = 0.22$  often failed to go any further and incorrectly interpreted this as 22 minutes.

A significant number of students attempted to divide the number of appointments by the total time.

### **Question 19**

The majority of students gained marks on this question. Many gained three marks for finding the number of bags as 20 and the percentage increase as £23.76. Unfortunately, most students were unable to go onto the next stage of  $23.76 \div 20 = 1.188$  and then round to £1.19. Of those students that managed this calculation, some gave the final answer as £1.18 but many seemed unable to do the final division and so started to 'guess' possible answers and multiplied up in a trial and improvement method; this method was rarely successful.

A common error was to attempt the build up method for the percentage calculation, by finding 10% and then 5% and adding appropriate multiples to get to 35%. There were many responses where the intermediate figures, often inaccurate, were stated without giving the process they came from given, this does not score marks as no process is available to mark. Students should be encouraged to use calculators for this type of question on a calculator paper.

Only a small minority attempted the alternative method to start working with the price of the small bag first before working with percentage and most who did stopped when they reached £0.88.

### **Question 20**

Part (a) saw a pleasing number of successful attempts for a late question on the paper with almost a third of the cohort scoring both marks. Many students were able to place 0.87 correctly, with the 0.94 proving more difficult for others. A commonly seen misconception involved trying to sum the probabilities to make 0.13 or 0.87 in the second stage instead of summing to 1. Centres should remind students of this difference between probability tree diagrams and frequency tree diagrams.

Part (b) proved to be more of a challenge for this cohort, with many adding the probabilities instead of multiplying. There were some students who could not identify the required probabilities. This question was not well answered.



## Question 21

Part (a) of this question was not well answered with students displaying many misconceptions concerning powers. Many students added the powers instead of multiplying them or simply wrote  $15x$  as the answer. Other common incorrect responses were  $15$ ,  $x^{-2}$  and  $243$ .

Part (b) was well answered by students, with the vast majority scoring at least one mark and many scoring both the available marks. Those who were unable to reach the correct simplified answer of  $40 - 10x$  were usually able to multiply the first bracket to obtain  $4x + 12$ . The order of the terms in the second bracket seemed to confuse some students and the negative  $14x$  caused confusion with students not confident with negative numbers failing to simplify this to  $-10x$ . Students scored better when they fully expanded both brackets and then collected like terms together. An incorrect answer of  $40 + 10x$  was common to see. Students would benefit from more exposure to questions with negative terms and questions where the  $x$  term is in different positions within the brackets given.

Students found the third part of this question challenging. With many displaying little understanding of extracting a common factor and just giving an answer with just one term. Some students did gain 1 mark for a partial factorisation often extracting 3 or  $3x$ . A common error seen was to assume that two brackets were needed and this approach obviously led to incorrect answers.

Students would benefit from understanding the meaning of ‘factorise fully’ as opposed to just extracting a single factor and also from being taught to look at their factorised expression and ensure it had no further common factors and that it multiples out to the original expression.

## Question 22

Describing transformations is a standard type of question and should have been accessible to most students. However, the most common mark awarded was zero. Students did not answer this question well, with the most common response describing the movement of the shape using left, right, up and down commands rather than using a column vector and failing to state ‘translation’. Some students used incorrect transformations, such as rotation or reflection. If a vector was given, it was often incorrect using the inverse vector instead, implying that they had gone from T to S (direction of translated shape was switched). Relatively few students gave answers with multiple transformations which was pleasing to note.

Centres could encourage students to use a path on the diagram provided to connect a corresponding vertex of each of the shapes, as this seemed to be a successful approach to identifying the correct vector, and to learn the correct terminology for transformations.

### **Question 23**

This error interval question was not well answered by students. Most students had an idea of what was being asked but struggled to find the upper and lower bounds due to not considering the place value of the initial value.

The most successful answers were often those where a number line was drawn with the nearest metres shown and subsequently identifying where the bounds would be.

In addition to blank responses, common errors included giving the values as 89 and 90, 85 and 95, 85.5 and 95.5 or 89 and 91. Finding 89.5 as the lower bound was seen as a single answer and awarded a mark more often than finding the upper bound.

To improve student outcomes, centres should encourage students to use a number line method where the number to add or subtract is half the degree of accuracy asked for. Students would also benefit from having a better understanding of inequality notation.

It is also worth reinforcing that numbers are not always rounded to the nearest 10.

### **Question 24**

It was pleasing to see that the many students were able to at least begin this multi-step problem involving area and proportion, with many gaining marks on this question.

Most students were able to work out the area of the field at festival B and score the first mark, with many then continuing to use proportion correctly. Two or three marks were often awarded to students who were able to find the available area per person for each field, with many then continuing to complete the solution and gain full marks. However, a larger than expected number of students were unable to progress any further once they had found the area available at Festival B, with common mistakes being to subtract or divide the two areas rather than using proportionality. The final mark was occasionally lost due to arithmetic errors but the amount of working shown was pleasing to see.

Part (b) of this question was demanding for most students. This type of question is a specification requirement and, as with previous years, the conversion of units of area proved not to be well known. For this example some students did have the notion that the squared term was involved but mistakenly wanted to square the 3 as well giving the popular incorrect value of 90000 or 9. Others said that you had to use  $100 \times 100$  but said this was to multiply by 1000. This is a contradiction and as such so no marks were awarded. Students should be encouraged to check for contradictions in their explanations.

### **Question 25**

This was another question that was not well answered. The majority of students did not understand the need to work out distances using the coordinates given in the question. Both positive and negative values were accepted for these distances. There were many students who gave the answer of (11,17) implying that the differences of 7 and 8 were correctly calculated and added on to (4,9). However, in most of these responses, there was no working shown. When working was shown, students often tried to draw axes and plot points. The use

of a diagram did allow some students to progress though this question and there were a small number of students who managed to find the y-coordinate.

### **Question 26**

Most students scored at least one mark in this question for working out the value of 4% of £679. Some used 12% and only considered simple interest, students are reminded to read the questions carefully as the second mark could not be achieved unless compound interest was used. A very few students used the approach of  $679 \times 0.96^3$ , others listed each the value for each year. Students should be encouraged to write down all their processes when using a calculator to make their intention clear as some inaccuracies or rounding can occur during working. Unfortunately, some students typed  $679 - 4\%$  into their calculator, to give 678.96. It was also common to see students find 4% and add on or use the formula with a decimal multiplier for increasing.

### **Question 27**

It is very pleasing to see that the modal score for this question was 4 marks. This question involved two conversions, the use of proportionality, and a conclusion. For those students who did not score full marks it was pleasing to note that many could correctly convert both the monetary and the fuel terms correct. This gained two of the marks available. However, they then failed to use the proportionality element which often meant doubling one commodity or halving or to find comparable unit prices.

Of the many different approaches to answer this question, comparing the cost of 8 gallons in pounds with the cost of 8 gallons in euros and cost of 18 litres in pounds to the given value of 18 litres in euros were the most popular and most successful. The most common error was connected with incorrect use of currency conversion with many attempting to divide by 0.85 rather than multiply by 0.85 when converting euros to pounds.

To improve outcomes students need exposure to different conversions in a variety of situations and need to think more about the units presented to them. Students would also benefit from improving their presentation of their calculations when answering these types of question. Systematic approaches were often always successful and when students split their working into two sections, one for Spain and one for Wales, they were often able to complete the processes required and often gained at least 3 or 4 marks, depending upon arithmetic accuracy and the final decision.

### **Question 28**

Student's responses to this last question were very mixed, some not attempting it at all. However, a good number of students gained full marks and others two marks. The last mark was often lost where the students failed to solve an equation correctly giving the value of y as

2.75. It was pleasing to note that many students used the correct method but were, unfortunately, let down by careless arithmetic.

## **Summary**

Based on their performance on this paper, students should:

- read carefully questions
- practice questions involving negative numbers and using their calculator to work with these
- give succinct explanations when a written answer is required
- use a calculator rather than relying on paper methods, particularly when working with percentages

