Examiners' Report
Principal Examiner Feedback

Summer 2022

Pearson Edexcel International GCSE
In Mathematics A (4MA1) Paper 2F

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Summer 2022 Principal's Examiner Report
International GCSE Mathematics
4MA1 Paper 2F

Those who were well prepared for this paper made a good attempt at all questions. It was good to see several students attempting the grade 4 and 5 questions and gaining a couple of marks for these, even if they could not see the question all the way through. The paper differentiated well.
Overall, working was shown and was followable.
Most of the questions in the paper were accessible to the majority of students. Although some struggled with questions of a problem-solving nature, there was ample opportunity to score well with the significant number of familiar looking questions.

Students should be aware of the word 'hence' in questions (such as in 27(ii)) and understand that this means they must use their answer to the part before.

Students should be encouraged to look at the reality of their answers. For example, some candidates wrote that after investing 50 000 dollars for 4 years at 1.3% compound interest they would receive over a million dollars interest.

A couple of students had VERY small writing making it hard to read and sometimes also meant that they incorrectly read their own numbers resulting in unnecessary errors.

Question 1

Converting between fractions, decimals and percentages enabled most students to make a confident start to the paper. Only rarely was 0.3 given as 3%, $\frac{29}{100}$as 2.9 or $\frac{17}{20}$ as 0.17. Putting positive and negative integers in order of size in part (d) was straightforward for most; the only regularly seen error was to reverse the order of the negative values. Ordering decimals in part (e) was less well done; if an error was made, it was usually to place 0.04 as having a greater value than 0.044 In part (f), given that $\frac{3}{10}$ of 400 cars were grey, a majority of students were able to work out the number of non-grey cars for both marks, although a significant number of students gave the number of grey cars to gain 1 of the 2 marks.

Question 2

Seven shapes were shown and students needed to select the two that were congruent and the two that were similar but not congruent. This was successfully done for congruent shapes but only a small number of students could select the two similar shapes. Part (c) required students to draw a line of symmetry on one of the shapes; the line passed diagonally through the squares on the grid but a noticeable number of horizontal and vertical lines also appeared. Part (d) asked for the perimeter of one shape and part (e) for the area of a different shape. A regularly seen error with perimeter was to give 11 cm, miscounting by one, and with area to give 96 cm^2, presumably from multiplying together the length of every side. A noticeable number of students confuse perimeter with area; for each part only about half the students gained a mark.

Question 3

Working with a sequence of numbers is a familiar topic. Finding the next term and explaining how they found this answer (+6) provided most students with 2 marks. Many went on to work out the 28th term correctly.

Explaining why 96 could not be a term of the sequence produced simple but correct responses, for example, the sequence is all odd numbers or the term should be 97 not 96, and also quite sophisticated ones equating the nth term ($6n + 1$) to 96 and explaining that 95 ÷ 6 does not produce an integer solution for n

Incorrect answers in (c) included 'because the sequence goes up by 6 each time'

Question 4

Questions based on a bar chart are usually very well done and this question was no exception. Reading values, drawing a bar on the chart and doing a simple subtraction provided almost all students with all 3 marks.

Question 5

The first part of this question required students to find the sum of the possible pairs of numbers that two spinners could land on and enter them into a table, which had been started for them. While most were successful, it was concerning that for this relatively straightforward task, seemingly random numbers were entered, or the table left blank by around 10% of the students. Part (b) asked for certain probabilities to be worked out from the values in the table and over half the students gained both marks. Some benefitted from the follow-through marks if their table was incorrect. It is pleasing that almost all students now give probabilities in one of the acceptable forms, a fraction, decimal or percentage, although ratios and words were still seen.

Question 6

This described two different special offers for buying dog food. Offer A was for buying 1 tin and getting 1 at half price. Offer B was for getting 20% off a pack of 6 tins. Two people bought 24 tins each, one using offer A and the other offer B. Over half the students could use the prices given in the question and work out the difference in the amounts that the two people paid and gained all 4 marks. However, there were also those who were not able to interpret the information successfully. For offer A, some worked out the cost of 24 tins using offer A and then simply halved this amount. Others worked out the cost of 2 tins correctly but multiplied this by 24, not realising that they needed only 12 sets of 2 tins. The most common error with offer B was to work out 20% of the cost of one pack or of the cost of 4 packs, (these appreciating that the tins came in packs of 6), but then to use this as the cost rather than subtracting from the normal price. Of those who did not gain full marks, over half at least managed to deal with either offer A or offer B and gained 1 mark for their method.

Question 7

Looking at responses for finding the circumference of a circle again highlighted the confusion students have between the concepts of perimeter and area, with the area being calculated more often than the circumference, and only about a third of students getting the 2 marks. It was rare to see a correct method with an incorrect answer and so most students gained either 2 marks or zero. An incorrect answer of 20.4 made a regular appearance, from multiplying the radius by pi. A small but noticeable number of students who wrote 6.5^2 actually worked out 6.5×2, presumably not understanding squared notation.

Question 8

Given the numbers of various non-red flowers amongst 200 flowers, students had to work out the fraction of red flowers and give their fraction in its simplest form. A large majority were easily able to do this to gain 3 marks. One mark could be lost by not fully simplifying the fraction or by giving a fully simplified fraction for non-red flowers. One mark was awarded for finding the number of red flowers or for an un-simplified fraction for the number of non-red flowers. Another error seen was using the number of non-red flowers as the denominator, rather than the total number of flowers. Almost all students were able to gain at least 1 mark.

Question 9

Given that there was a total of 3.5 litres of water, together with the fact that 3 cups each contained 200 millilitres of water and 4 jugs each contained x millilitres of water, students were asked to work out the value of x. It was pleasing that the introduction of x did not seem to concern the students, although it was rare to see reference to x within the working. However, the use of x was not required and around half the students gained all 4 marks here. Where students were unable to progress to the solution, a good number were able to convert either 3.5 litres to millilitres or, less often, 200 millilitres to litres for a B mark; however, 200 millimetres was regularly seen as 2 litres. Some students did not register that the cups contained 200ml each and divided the 200 ml by 3.

Subtracting a total of 600 millilitres of water from the 3 cups from the total provided students with the first method mark. Division by 4 was needed for the second method mark but many stopped before doing this. Often only one lot of 200 millilitres was subtracted; if this was then divided by 4, students could benefit from a special case method mark.

Some students arrived at the correct answer in the working space but wrote 2900 on the answer line. It might have been that they misunderstood the second line of the question, believing that x represents the volume of water in 4 jugs.

Question 10

A kite with area 12 cm^2 (this area was not given in the question) was drawn on a square grid and students were asked to draw, also on a squared grid, a rectangle with the same area the kite. Responses fell into three almost equal categories: a correct area for the kite worked out and a rectangle of the correct area drawn, 3 marks; an incorrect area worked out but clearly stated and a rectangle with that area drawn, 2 marks; no area indicated and a non 12 cm^2 rectangle drawn, 1 mark. Occasionally a kite or a triangle were drawn instead of a rectangle or the grid left blank, with around 15% of the students not gaining any marks.

Question 11

Writing a product of terms as c^6 produced the most correct answers out of the five parts in this algebra question, with most of the wrong answers given as $6c$. Over half the students could collect like terms, although some were unsure how to deal with the term with no coefficient. Expanding a bracket was generally well understood, although x^2 could appear as $2x$ and the x was sometimes missed from $5x$

Factorising a two term expression by finding a common factor produced correct responses from about half the students; many incorrect answers were seemingly random. Part (e) required a formula for the total number (T) of marbles sold from m small bags of 15 marbles and p large bags of 40 marbles. A final answer of $T = 15m + 40p$ gained students the full 3 marks. Some went on to lose one mark by erroneously simplifying this and giving $T = 55mp$ as their answer. Variations on the correct formula gave some students the opportunity to gain either 2 marks or 1, with $T = m + p$ being the simplest version that could be given credit, for 1 mark, and this was seen as often as the fully correct formula.

Question 12

An exchange rate between euros and Swedish Krona was provided, together with the cost of an identical bag in euros and in Swedish Krona. Students were asked to find the difference between the costs of these two bags. They were not told in which currency to give their answer but simply told to state the units of their answer. This did not seem to cause any issues and a large majority gave correct answers in one currency or both, though a few did lose a mark by forgetting to state which currency. The majority of students tended to convert to Swedish krona more regularly than euros. Some students only worked out the cost of one or both bags, and did not progress to finding the difference, for the award of one mark. For some students, there was the common dilemma of not know whether to use multiplication or division in the conversion, some attempting both but not making clear which was their chosen method.

Question 13

The question stated 3 choices of snack and 3 choices of drink and students needed to write down all the possible combinations for choosing one snack and one drink. Around 80% of students gained both marks. A number were able to pick up 1 mark, for missing some combinations or for including incorrect combinations or repeated combinations alongside at least 6 correct combinations.

Writing for example:

- chocolate and orange juice/apple juice/water
- crisps and orange juice/apple juice/water
- fruit and orange juice/apple juice/water

is not an acceptable way of writing down combinations.

Question 14

For one mark, students needed to state that the given transformation was a rotation, without reference to any other transformation. It is still the case that, despite the word *single* transformation, some students indicated that it had also been reflected or moved, negating the mark they might otherwise have gained. A second mark was available if they gave both the angle and the centre of rotation; too often only one of these was stated. Overall, around half the students gained credit in part (a). In part (b), it was clear from their drawings that most students understood the concept of reflection and a little over a quarter could correctly reflect shape *A* in the line $x = -1$ However, a significant number of students could not identify this line. Some were able to benefit from the award of 1 mark for drawing a reflection of shape *A* in any vertical line, a correct reflection in the line $y = -1$ or for reflecting shape *B* rather than *A* in the correct line.

Question 15

Using a calculator to work out a given numerical calculation and then to write down all the figures on the calculator display provided a straightforward way for a large majority of students to gain 2 marks. Errors were rare, although it was noted again that the squared term 8.3^2 was sometimes interpreted as 8.3×2

Question 16

There has been an encouraging improvement in students' ability to work with sets and Venn diagrams. Around 90% of the students gained either 3 marks or 2. The most common errors were to omit the 6 from the region outside the circles or to include all the values in the universal set in the region outside the circles.

Question 17

Six integers, a, b, c, d, d, d, were listed with the information that the mode of the integers was 9, the median 8 and the range 4. Students needed to work out the value of a, the value of b, the value of c and the value of d. Finding all four correct values gained students 3 marks. Of the 4 values, giving $d = 9$ was the most commonly seen correct value. From this, using the range to find $a = 5$ was the next most frequently seen correct value. With these two values correct, students gained 2 of the 3 marks.

It was not uncommon to see the calculation 9 – 5 = 4 and then see a = 4 on the answer line.

Finding the median was the hardest part for most students, who failed to appreciate that the median does not need to be one of the given integers; thus $c = 8$ was frequently seen and following this the value of b tended to be given as either 6 (correct) or 7 (incorrect). There were also responses that were clearly the result of guesswork and around a third of students scored no marks.

Question 18

The difficulty for students locating lines given by their equation was again apparent in this question, where 3 lines needed to be drawn; nearly half were unable to do so. $y = 1$ and $x = 2$ were shown regularly interchanged. $x + y = 7$ was the least recognised of the lines. Often $x = 7$ or $y = 7$ or both were drawn instead, producing a rectangular region for part (b) which, however, did not score a mark. Around 20% of the students gained a mark for indicating a region in part (b), where a follow-through mark could be given for a region that came from a vertical line, a horizontal line and a line with negative gradient and giving an enclosed region. A noticeable number of blank responses were seen.

Question 19

Another on-going difficulty for students is the conversion of time, here 5 hours 24 minutes. This either needed to be given as 5.4 hours or converted to minutes or a mixed number $5\frac{24}{60}$; for those who knew to divide the distance by 5.4 this was a straightforward way to gain 3 marks. Many more did the conversion to minutes but often scored only 1 mark, as after their division of distance by minutes, the method was not completed by multiplication by 60. An alternative way that some students were able to pick up one (special case) mark was for dividing the distance by 5.24 as this at least showed some understanding of how to work out an average speed, even though they could not correctly convert the time. Such responses appeared more regularly than correct ones.

Question 20

For students who can deal with fractions, there continues to be an improvement in showing their methodology. Here the question was a subtraction with mixed numbers. Showing two correct improper fractions gained the first mark, showing these values over a common denominator gained the second mark and completing their working through to state that the improper fraction coming from the subtraction was equal to the given answer, gained the third mark. Where this final stage was not written down, only 2 marks could be awarded. Decimal attempts were seen but not worthy of credit, but this approach does not appear as often as it once did. There were inevitably also some quite random workings with the figures given in the question and a little under a half of students did not score any marks. Blank responses were regularly seen.

Student who initially wrote $\frac{7}{21} - \frac{18}{21}$ rarely showed sufficient working to enable them to score more than 1 mark.

Question 21

This question, with a shape made from a rectangle and a trapezium, proved the most challenging for the students. The total area of the shape was given, together with the lengths of a number of sides. There was sufficient information to find easily the area of the rectangle and those who calculated this gained the first method mark but such students were in a minority. This mark was also available for those who calculated the area of part of the shape or the area of the surrounding rectangle. Subtracting the area of the rectangle from the given total gave the area (98 cm^2) of the trapezium, in which one dimension was missing and needed to be found. On its own, the subtraction could not be given a mark but many stopped at this point not knowing how to proceed. They were not able to equate 98 to the formula for the area of a trapezium with relevant values substituted in, needed for the next mark, and so only gained the first mark. Those who did appreciate what to do next usually went on to find the required length for the award of all 4 marks. Of those, most did not formally solve an equation but worked numerically step by step to find the length of *CD*

There were many attempts to work with finding missing dimensions around the perimeter of the shape but without using these to calculate an area no marks could be given. Increasing numbers of blank responses appeared.

Some students treated the shape *ABCDEFGH* as a trapezium, thus scoring zero marks.

Question 22

A high number of students recognised that this question needed them to use trigonometry, but it was clear that many are confused as to which ratio they needed to use and which arrangement of it was needed to find the length of a side. For those whose first step of working was correct, most went on to gain the full 3 marks. Often seen were responses that wrongly combined the angle given in the triangle with the sine ratio, gaining no marks; however, those who worked out the size of the missing angle in the triangle and used this with the sine ratio tended to gain full marks. Use of tan or Pythagoras required extra steps of working and understanding and most such attempts simply faltered with nothing worthy of credit. Other incorrect responses reflected a lack of understanding of the topic, with, for example, the angle being multiplied or divided by the length of the given side, and around two-thirds of students were unable to gain any marks.

Again, blank responses were fairly frequent.

Question 23

Changing a speed given in kilometres per hour to a speed in metres per second highlighted a lack of knowledge of the relevant conversion factors. 81 kilometres expressed as 81,000 metres was regularly seen for one mark, but so were 810 and 8100 metres. It was also not uncommon to see 0.81 metres. Division by 60 was often used but with many failing to realise that division by 3600 was needed. Division by 3600 could gain a method mark, even if the numerator had been incorrectly converted. Those who used both 81,000 and 3600 almost inevitably arrived at the correct answer for the full 3 marks. Many stopped after converting the distance and simply gave this as their answer. Not all students made any attempt to produce an answer.

Question 24

This question involved dividing 300 celebration cards in given ratios, finding a fraction and a percentage of resulting values and then expressing the sum of these as a fraction of the 300 cards. Students were not directed by the wording as to how to attempt this problem-solving question and so it was very encouraging that over a third were able to arrive at the correct answer for 5 marks. Some were able to work out the ratio part of the question, while others could find either a fraction or percentage of the numbers that were given as the ratios. It was good to see students pick up some marks for the bits of working that they could do, even though they could not see the problem as a whole. They should be encouraged in general to attempt what they can rather than leave a response blank, which a significant number did here. Some students neglected the ratio and found both $\frac{2}{5}$of 300 and 36% of 300 while others simply did the sum $\frac{2}{5}+\frac{36}{100}$

Question 25

Asked for the amount in a savings account at the end of 4 years when 50,000 dollars is invested with 1.3% per year compound interest elicited a pleasing number of responses showing 50,000 multiplied by 1.013^4 thus taking students directly to the correct answer and being awarded the full 3 marks. Others arrived at their answer by the lengthy process of multiplying by 1.013 for each of the years separately, or the even lengthier process of finding 1.3% of the amount and adding it, repeating this for each year. Although correct answers were seen from these methods, they often led to errors or not completing the process through to the end of the 4 years. A commonly seen error was to multiply by 1.3 or by 1.03 for which no marks could be given. There was, as in previous series, a lack of understanding about compound interest and a large number of students worked with simple interest; the maximum available for such an approach was 1 mark. This was also the case for those used depreciation instead of compound interest. Although less than for some questions, blank responses were not uncommon.

Question 26

For some students, solving algebraically a pair of simultaneous equations presented no difficulties and such students were rewarded with the full 3 marks. Others have a fair understanding and could produce two equations with a matching coefficient for one variable but made errors in either adding or subtracting their equations usually because they could not correctly deal with the positive/negative numbers. Where only one numerical error was made and students could then substitute their found value into an equation in an attempt to find the second variable, it was possible for them to gain both method marks. However, there were many responses showing seemingly random algebraic manipulation, usually coming from flawed attempts to add or subtract the equations as they were given in the question and subsequently ignoring one of the terms. Others did not attempt this question and overall around three-quarters of students scored no marks.

Question 27

While around a quarter of students could factorise the quadratic expression $x^2 + 5x - 24$ and some of these then use this answer to solve the related quadratic equation, the majority had little appreciation of what was required. Where there was some understanding of factorising, an incorrect pair of brackets where either $ab = -24$ or $a + b = 5$ was awarded 1 mark. The most commonly seen incorrect answer was $x(x + 5) - 24$. A few students tried to use the quadratic formula, but usually with only partial understanding. In any case, this question required the solutions to be found from factorisation; using the formula as a sole method could not gain any marks. Again, a significant number of students left this blank.

Question 28

It was very encouraging to see a number of fully correct answers to this final question on the paper. Such students were not put off by a letter being used to denote a weight, although rarely was it used in their working, which was fine. Where full marks were not scored, a small number were at least able to make a start by finding the total weight of 7 parcels given their mean weight, and/or the total weight of 4 parcels, likewise given their mean weight. This gained them the first method mark. Of these, some went on to subtract to find the weight of the remaining 3 parcels but many gave this as their final answer, not appreciating that they were asked for the weight of each of these parcels and needed to divide by 3; without this division, the second method mark could not be awarded. Additionally, there were a significant number of responses which showed fairly meaningless manipulation of the numbers given in the question, in particular 3.3 plus or minus 2.7 and 2.7 ÷ 7. There were also many blank responses.

Summary

Based on their performance in this paper, students should:

- read questions very carefully and even when they think they have the answer, check they are giving what was requested
- have more exposure to area problem solving questions
- increase understanding of time in hours and minutes converted to decimals
- improve their basic algebra knowledge
- be encouraged to make an attempt at a question rather than leaving it blank
- not cross out work unless they are replacing it with something better
- check if answers are realistic
- check any rounding instructions
- show clear easy to follow working
- ensure they know the difference between perimeter and area formulae

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