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January 2020

Pearson Edexcel International GCSE
in Mathematics A (4MA1) Paper 1FR

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Publications Code 4MA1_1FR_2001_ER

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4MA1 1FR January 2020 Principal Examiners report

The first two thirds of this paper were well attempted with all those questions seeing marks awarded. It was rare to see success on the latter part of the paper, in particular from question 18 onwards. Familiar topics such as directed number, finding percentages of amounts, pictograms and bar charts were answered well and students showed a good understanding. It was pleasing to see students show workings out for almost all questions, in particular where the wording of the question specifically asked for it.

- 1 The opening question for this paper saw varied success on each of the three parts. Parts (a) and (b) were answered very well with almost all students able to give the correct answers. Occasionally in part (a) the question was misunderstood and a single digit number was given as the answer. Part (c) saw less success with incorrect answers of 1 and 9 being seen as often as the correct answer of 17.
- 2 The second question on this paper required students to deal with directed numbers and it is pleasing to report most students scored well on all parts. Part (a) was to find the range which was answered well and almost all scored 2 marks. Part (bi) saw most students gain 1 mark for correctly finding the mode. In (bii) it was pleasing to see the majority pick up 2 marks for a correct answer of -1 . Of those that didn't, some were able to gain 1 mark for ordering the numbers with no more than one omission or error or for giving an answer of 0 e.g. finding the middle of the unordered list. There were a small number of students who found the mean.
- 3 Part (a) saw most students successfully draw a kite and gain 1 mark. In part (b) around half of the answers given were correct, with Hexagon and Pentagon regularly seen. Part (ci) saw more success with many students able to give the correct answer of Cuboid. Occasionally Rectangular Prism was seen which was also accepted for 1 mark. Part (cii) was less well answered with 12 or 5 often seen given as the answer.
- 4 The first problem solving question of the paper saw students trying to work out how many pairs of gloves could be bought with the remaining change following other purchases. It was pleasing to see a good number achieve the correct answer of 5. Common errors included only accounting for one box of nails (instead of 2) and one piece of wood (instead of 4), although if this was then followed through correctly 2 marks could be gained for an answer of 14 via the special case.
- 5 This cohort dealt well with the combination of a bar chart and pictogram in this 4 mark question. It was rare to see any workings out shown but there were plenty of correct answers seen. Of those who didn't score full marks, some had a fully correct pictogram but an incorrect value for the key, such as 2, presumably confusing the key for 4 squares with 1 square.

- 6 Part (a) of this algebra question was answered well with almost all students picking up 1 mark for a correct simplification. Of those that didn't, $3r5t$ and $8rt$ were common incorrect answers. Parts (b) and (c) were both answered well with incorrect answers rarely seen. Part (d) was a stark contrast to the rest of the question with a correct answer of 13 seldom seen. The most common incorrect method was to fail to include brackets around the -3 , or to include the brackets but also have the power of 2 inside the bracket; both of these gained 0 marks.
- 7 This probability question was answered well with all parts seeing plenty of success. Most students were able to list the 9 possible combinations for Mohsen's outfits. Some should note that it is not necessary to write out all the wording for each combination e.g. 'blue shirt and green trousers' can be much more efficiently listed as B,G. Part (b) saw many able to give a correct answer; $\frac{1}{6}$ and $\frac{1}{9}$ were commonly seen incorrect answers. In part (c) many were able to work out the number of black counters in the bag and therefore give a correct probability; it was common to see fractions, decimals and percentages. Some students gave a ratio which could gain 1 mark if it was $7 : 20$, otherwise 0 marks. Another incorrect answer seen was $\frac{7}{13}$, which gained 1 mark.
- 8 The full range of marks were seen for this problem solving question. A good number of students were able to work out the length of the rectangle as 7. From there a multitude of methods were seen, most of them not fully correct. The most common incorrect answer seen was 51, coming from the assumption the two short vertical lengths on the shape were 3.5 rather than 3. The special cases of 66 (finding the perimeter of 3 rectangles) and 68 (treating the perimeter of one rectangle as 28 cm) were both seen regularly and gained 2 marks. There were a small number of students who picked up all 4 marks and it was pleasing to see that once the correct vertical lengths of 3 cm were seen, students went onto get the correct answer.
- 9 In part (a), it was pleasing to see a good proportion of this cohort understand the meaning of 3 significant figures and give a correct answer. Of those that didn't, an attempt to round to 3 decimal places was often seen. Part (b) was also answered very well with most students giving the correct answer, as was part (c).
- 10 Measuring bearings continues to be a problematic topic for 4MA1 students with many failing to give a correct answer in part (a). For those that did measure the angle correctly, 3-figure notation was rarely seen, although a 2 digit angle e.g. 50 was accepted for 1 mark. Part (b) saw more success with many students able to measure the distance on the page accurately and multiply by 2.5. There were still plenty of incorrect or blank responses given. Part (c) rarely saw the full 3 marks being given for a correct position for C. There were plenty of instances where 1 or 2 marks were given for working with the scale correctly and/or measuring a bearing of 115° from A.

- 11 This familiar linear graphs question saw the full range of marks being awarded. There were a good number of students who were able to correctly plot the points required accompanied by a straight line. Some failed to draw the line but did plot all points to gain 2 marks. Some drew a line through (0, 3) with a gradient of 2, presumably trying to use the gradient-intercept method but confusing the two key values.
- 12 This 5 mark problem solving question saw the full range of marks awarded. It was pleasing to see a good number of students able to interpret the information correctly, find the amount of loss Greg made and then go on to a correct percentage loss of 5%. There were two main ways that students gained 3 marks only; the first was to have a correct method to find both the income and outgoings but then fail to deal with the percentage. The second was for students who incorrectly found the total income, usually because following finding $\frac{1}{2}$ of the 36 oranges, they then did $\frac{1}{3}$ of the remaining oranges (18) rather than $\frac{1}{3}$ of the total oranges (36), meaning they lost the 3rd method mark. They could, however, gain the 4th method mark for correctly using their outgoings and income to find their percentage loss.
- 13 Part (a) of this transformations question saw a good number of students pick up at least 1 mark for using rotation. The second mark was also seen regularly either through a correct centre or angle of rotation with direction. It was common to see the direction missing from the angle of rotation. Centres should once again remind their students that if a question like this one asks for a single transformation, an answer describing more than one transformation will be awarded 0 marks; it was common to see a rotation described followed by a translation or reflection. Part (b) saw some success too with plenty of fully correct answers seen. For those that did not score 2 marks, 1 mark was often seen for a correct reflection in the line $x = k$ where $k \neq -1$; the line $x = 0$ was the most common incorrect line of symmetry used.
- 14 This ratio question proved to be a challenging one for this cohort. There were a few students who understood the information in the question and managed to reach the correct answer for 3 marks. If full marks were not awarded, it was rare to see anything other than 0 marks. The most common incorrect method was to deduce that £36 was to be shared between all 3 people and not just Asha and Julie.
- 15 It was pleasing to see a large proportion of this cohort make a correct start on this familiar fractions question and change both mixed numbers into improper fractions. Many then went on to gain 3 marks for a complete method, usually through correct cancelling e.g. $\frac{16^2}{5} \times \frac{21}{8^1} = \frac{42}{5} = 8\frac{2}{5}$ or by multiplying numerators and denominators and then cancelling e.g. $\frac{16}{5} \times \frac{21}{8} = \frac{336}{40} = \frac{42}{5} = 8\frac{2}{5}$. There were some students who went straight to $8\frac{2}{5}$ from $\frac{336}{40}$ and lost the final mark as their method was not

- complete. Some left the answer blank or tried to work with decimals which scored 0 marks.
- 16 Part (a), changing the subject of a formula, saw mixed results. There were some who managed to make a correct start and go onto successfully make a the subject. There were alternatives seen to the version given in the mark scheme, such as $a = \frac{g-d}{-2c}$, which gained 2 marks. There were a large amount of students who made an incorrect start and therefore gained 0 marks; it was common to see $g-d = 2ac$ and $g+d = 2ac$. In part (b) students needed to fully factorise an expression which some were able to do for 2 marks. Of those that didn't, a partial factorisation was often seen, gaining 1 mark. There were still a large number of the cohort who didn't understand the meaning of the word factorise; $-3e$ or $-3ef$ were common incorrect answers. It was pleasing to see more correct answers than incorrect in part (c). For those who didn't score 2 marks, many scored 1 for 3 out of 4 terms correct or 4 out of 4 correct ignoring signs. In part (d) there were a good number of students who managed to pick up 2 marks for a correct answer of n^6 . Of those that didn't, some picked up 1 mark, usually for simplifying the numerator to n^{11} . There were plenty who scored 0 due to misunderstanding of the index laws, in particular $n^{5.6}$, presumably from $4 \times 7 \div 5$, was seen often.
- 17 Understanding set notation continues to be an issue for students at this level. Parts (ai) and (aii) saw very little success. In (ai) it was common to see the answer of 'e', presumably from students confusing the union symbol with intersection. For those that did get the idea of union, many let themselves down by repeating the 'e'. In (aii) a range of incorrect answers were given. In part (b) some students were able to identify that e was common in all three sets and give a correct decision. Some identified that e was common in all three sets but gave an incorrect decision and therefore gained 0 marks. A large proportion of this cohort were not able to interpret the question and left the workspace blank.
- 18 To pick up any marks on this area question students had to first have a correct method to find the area of the semicircle. Unfortunately, this was rarely seen. For those that did manage it, most went on to gain full marks, usually for comparing their area of the semicircle with the area covered by the 12 boxes followed by a correct decision. There were a small number of students who had a fully correct method but an incorrect decision, gaining 2 marks.
- 19 This bounds question was answered poorly with correct answers rarely seen on either part. Common incorrect answers were 4.5 and 4 for the upper and lower bound respectively.
- 20 This question required clear algebraic working and those students who were successful in gaining full marks generally factorised the given quadratic. It was not uncommon to see correct answers with no working shown or with a trial and improvement method; these both gained 0 marks. Some students successfully

- factorised the quadratic but then gave this as their answer; this gained 2 marks. The majority of methods shown were incorrect ones and it is clear this cohort find solving quadratic equations a challenge.
- 21 Reverse percentages are clearly an area of difficulty for this cohort as correct answers were rarely seen on this question. The majority of students deduced that 20.40 needed to be increased by 15% leading to the common incorrect answer of 23.46.
 - 22 Of those who made a correct start to this question, it was pleasing to see almost all go on to gain the correct answer. Unfortunately, fully correct answers were few and far between. Common incorrect methods included adding 28 and 26.5 and dividing by 2.
 - 23 The first method mark on this 5 mark density mass volume question was accessible and almost all those who attempted this question gained it for finding the volume of one block. Some students were then able to go on to gain the next 2 method marks, usually for finding the volume of the statue or the mass of one block. This was the end of the line for most but some were able to go on to find 12.35... blocks were needed and give a final answer of 13. Some students misinterpreted 12.35... and rounded down to give an answer of 12, which gained 4 marks.
 - 24 This perimeter and linear equations question was a bridge too far for the majority of the cohort. Many failed to find expressions for the perimeter of either shape and therefore gained 0 marks. Some multiplied linear expressions to gain 'areas' and others simply added the 3 lengths given in the diagram. There were a small number of students who were able to set up a correct linear equation and go on to solve it, although some stopped their method at $x = 6.5$ and lost the final accuracy mark.

Summary

Based on their performance in this paper, students should:

- Practise measuring and drawing bearings.
- Read question carefully and ensure they have interpreted the information correctly.
- When asked to describe a single transformation ensure only one transformation is given.
- Practise sets in general but in particular interpreting the union, intersection and complement symbols.
- Practise finding upper and lower bounds for values given to a certain degree of accuracy.

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