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Examiners' Report
Principal Examiner Feedback

January 2019

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

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January 2019
Publications Code 4MA1_2HR_1901_ER

IGCSE Mathematics 4MA1 2HR Principal Examiners Report

Students who were well prepared for this paper were able to make a good attempt at all questions. It was encouraging to see some good attempts at topics new to this specification. Students who were prepared themselves for the question on the sum of arithmetic progressions fared well. Generally many students could not recall the formula for the *n*th term.

Students were less successful in applying the formula for area of sector and arc length.

On the whole, working was shown and easy to follow through. There were some instances where students failed to read the question properly. For example, in question 13 some students could not write down a percentage increase as a decimal pr as a percentage.

Completing the square, probability, Venn diagrams and indices seemed to be a weakness for many students.

On the whole, problem solving questions and questions assessing mathematical reasoning were tackled well.

Question 1

Part (a) was answered well. Nearly all of the students wrote down the correct interval.

In part (b) many students answered this question well. However, a common error by some students was to use the lower limits or the upper limits to work out $\sum fx$. This method is incorrect and the students need to understand that they must use the mid points. Other common error was to write $\frac{1068}{100} = 106.8$, students should take care when evaluating numbers or writing $\frac{1068}{5}$. It was encouraging to see students writing 10.68 and the rounding to 10 or 10.7 or 11.

Question 2

This question was generally well answered. Some common mistakes included finding the surface area and not the volume, finding the volume of a cuboid and then not dividing by 2 to obtain 180 cm^3, using the radius as 6 and not 3 and using Pythagoras theorem to find the hypotenuse of the triangle and then finding area of triangle 0.5 × 6 × hypotenuse, finding the volume of a cylinder and not dividing by 2.

Question 3

Part (a) was answered well. Many students showed their working and then wrote down the common form of the answer i.e. $6n + 4$. Some students used the formula for the *n*th term of a sequence and credit was given to write their answer in the form $4 + (n - 1)6$.

Part (b) was answered well. Some students equated their formula and worked out the value as 7 and −1. Some students did not use these values to work out the actual term. Another common mistake was to write $n = 5$ or 7 rather than the actual term.

Question 4

This question was answered very well. Many students showed their working, for example,
10 800 × 1.07 and obtaining the correct value. A minority of the students worked out 7% of
10 800 to obtain 756 and then forgot to add this to 10 800 still gaining 1 mark.

Question 5

Many students gained a mark in part (a). Many students knew how to draw the length as 7cm but a significant number were confused by the 220°. There were a few who did not attempt this question.

In part (b) students measured their line as 8 cm and then giving an answer of 160 km if they gained the two marks in part (a). As this was not in the range they lost a mark. It was quite encouraging to see students give the correct bearing in the range. However, some students gave the answer as an acute angle.

Students who appeared to know what to do in part (a) and (b) lost one or even both marks due to a lack of care with their actual drawing. Again, students need to be aware that the tolerances allowed here were ± 2mm and ± 2°.

Question 6

Generally, this question was answered well. Many students were able to score at least 1 mark for calculating the exterior or interior angle of the octagon. A common error to find the angle in the pentagon was to treat the pentagon as a regular pentagon, or to incorrectly state the sum of the interior angles of the pentagon as 360°.

Question 7

Many students answered this question very well. Many students drew a vertical line and used trigonometry to work out the length of 10.5 cm and then add it on to

37 cm. A minority of the students worked used the sine rule to work out some angles ant then worked out the length of *y*. Some common errors was to make a triangle diagonally across the trapezium and then try to work with their diagram, or try and use the area of the trapezium.

Question 8

Part (a) was answered well by the majority of students. However, some students made a minor slip by incorrectly writing that 15 divided by 5 is 5.

In part (b) some students would only consider one side of the inequality or incorporate one of the inequalities into the equation, for example, e.g. subtract 7 so end up with $4x - 8 < 17$.

Question 9

This question was attempted by almost all students with many candidates gaining 2 marks and those that did not, usually gained M1 for calculating 90

Students were more often than not using the concise alternative method of 6000×1.015^4 leading to answer of 6368 and then forgetting to subtract 6000 to find the amount of interest.

Common errors included the use of 1.15 instead of 1.015, subtracting the 1.5% and, of course, calculating simple interest instead of compound, though this did mean they could still gain M1.

Almost all candidates found the value of his investment and not the interest, were usually able to gain M2.

Question 10

In part (a) Ithe majority of students either scored full marks for the correct answer, $4x^4y^3$, or 1 mark out of 2 for a partly correct expression such as $8x^4y^3$

In part (b) most students were able to score at least one mark although some failed to score if they multiplied the left-hand side by 6 but not the right-hand side. Many lost marks by expanding their brackets incorrectly although a high proportion of students who gained the second M1 then went on to score full marks. A common error was in the expansion, some students obtained -9 instead of +9.

In part (c) many students gained the M mark by squaring the left hand side. A large number of students were able to square both sides of the equation and but had difficulty in manipulating $\frac{1}{3}e$.

Question 11

Many students realised that they needed to find the gradient of each line in order to answer the question and had a good amount of success with this question. The students generally gained the first 2 marks. A common error was not to show that $-\frac{1}{2}\times 2=-1$ and use the phrase negative reciprocal thus losing the final mark.

Question 12

Generally, students were able to gain 1 mark by finding 6 or 51. Some students forgot to arrange the list in order of size, and some of those who did could not correctly locate the upper and lower quartile. With a small list it is advisable to find the middle number (median) and then to look at all values below the median and to find the middle of those, therefore finding the Lower Quartile, and similarly for the middle of the values above the median to find the Upper Quartile. Those who listed the numbers (in order) underneath the original list were most successful as they were guaranteed the correct number of figures. Some students ignored what the question was asking them and calculated the mean.

Question 13

It was disappointing to see many students could not answer this question. Many students could write down 0.65 or .65x but had problems in dealing with an increase of 22%. Many students could not write 22% increase as 1.22 or 122. A minority of students did write 1 + 0.65 + 1.22 or 100 + 65 + 122 and obtained the correct answer.

Question 14

This question on the paper caused the most problems for students.

Part (a) caused many problems for a majority of students. Some students did write down (i) as a^2 but then could not answer (ii) and (iii). A common error in (ii) was to write down .

$+b^4$ or a+4b. A common error in (iii) was to write the answer as the reciprocal of b.

Part (b) was not answered well. Many students resorted to trail and error and did not gain any marks. The most successful were the students who used an algebraic approach. A common mistake was to write down $(3^x)^2$ to get to 9^{2x} rather than 3^{2x}.

Question 15

Part (a) was not answered well. Many students gained the first mark by writing down 0.3 × 0.3 × 0.3 × 0.7 and then not multiplying this expression by 4. A common method was to try finding probabilities from a tree diagram and forgetting to realise that there are 4 combinations. This approach was partially successful.

In part (b), very few students used p(at least one head) = 1 – P(no heads) to attempt this question. The most common method was to try finding probabilities from a tree diagram and summing them. This approach was not successful.

Question 16

In part (a), many students could write down 2 in the middle of the diagram. Many students had problems working out the values 1, 3 and 5 instead they wrote down the given values in the Venn diagram. Some students did get all the values correct in the Venn diagram but some students omitted to include the number of people who did not do any of the activities.

Part (b) was answered poorly. The most common incorrect answer was $\frac{3}{120}$

Question 17

Parts (a) and (b) were generally answered well. For part (b), some students who had some understanding of bounds failed to recognise that the denominator of the fraction had to be a minimum in order to produce the upper bound and so used rather than 0.045. Others either showed no knowledge of bounds and simply used the numbers given in the question, others went on from here to give the upper bound as 68.25

Question 18

Part (a) was generally answered well as many students could sketch the correct graph. Some students translated the graph in the opposite direction thus gaining 1 mark.

In part (b) students generally gained 1 mark as they only wrote one of the correct ordinates.

Question 19

This question was answered well. This question was targeting the more able student and many who are used to similar calculations made a very good attempt with the correct answer being seen a pleasing number of times. Those who did not start by using the cosine rule to find *DB* failed to make progress. Those who did, could often find at least the area of triangle *DAB*. Some students tried a right-angled triangle method to find sides and angles, although none were given on the diagram or stated as right angles and this method failed to deliver any marks. Some students used the idea that opposite angles added up to 180° confusing themselves with cyclic quadrilaterals.

Question 20

In part (a), many students could not complete the square. Some students factorised the expression correctly to obtain $3(x^2 + 4) + 7$ so gaining the first mark. The lack of use of brackets for the second step lost the second mark, for example, by writing down $3(x^2 + 4) – 4 + 7$. Only a minority of students gained full marks.

Part (b) was answered poorly. It was rare to see a correct answer.

Question 21

This question produced a wide range of responses. The general standard of algebraic skills was high and there were many completely correct solutions. Candidates gained 1 mark for
$(10x – 3)(x + 1) = 6x$ and a further mark if they rearranged it as $10x^2 + x - 3 = 0$. For solving this quadratic equation, factorisation was a more popular method than use of the quadratic formula. Two regular causes of mark loss were slips in algebra and failure to find the *y* values, after the x values had been obtained successfully. It was encouraging to see the students work out the midpoint correctly by showing their method clearly.

Question 22

This question was only answered by the most able students. Many students did not gain any marks. Some students did gain 2 marks by writing down $\pi \times 5r^2 \times \frac{45}{360} - \pi \times 3r^2 \times \frac{45}{360} = \frac{81}{2}\pi$ but did not include any brackets and then incorrectly assuming that $5r^2 – 3r^2 = 2r^2$ and it should have been $16r^2$. Many students could not get past this stage and then lost all the marks.

Question 23

Many students gained 1 mark by writing down $\frac{20}{2}(2a + 19d) = 1290$ or equivalent but could not recall the formula for the *n*th term of an arithmetic series. A common error was to use the sum formula for the 10th term so ended up with $\frac{10}{2}(2a + 9d) = 66$

Summary

Based on their performance in this paper, students should:

- be able to recall the formula for area of sector and arc length.
- learn, recall and apply the formula for the *n*th term of an arithmetic series.
- be able to interpret intersections in Venn diagrams.
- read the question carefully and review their answer to ensure that the question set is the one that has been answered
- make sure that their working is to a sufficient degree of accuracy that does not affect the required accuracy of the answer.

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