Examiners' Report
Principal Examiner Feedback

January 2020

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

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Introduction

Many questions on this paper were of a similar format to those set in the past, particularly those set at grades 4 to 6, and therefore it gave ample opportunity for well-prepared candidates to make a strong start. Questions at the end of the paper were challenging in places and when candidates are required to produce several lines of working it is important that writing is legible and their logic is easy to follow.
Statements that tell candidates that working must be shown must be adhered to. Awarding full marks for correct answers is not automatic in these cases, as accuracy marks are dependent on a valid method seen.

Question 1

Most candidates secured full marks on this opening question. The marking scheme was eased a little in part (b) as one error was allowed in either the tree diagram or the division ladder as long as one occurrence of a 2 and a 5 was present. A small minority of candidates that wrote the correct answer in part (b) and showed no working were awarded no marks. This decision was taken to prevent candidates with a prime factors facility on their calculators gaining an unfair advantage.

Question 2

Frequency tables, where the data is grouped, are a common feature on iGCSE papers and candidates are usually familiar with the method of multiplying the frequency by the mid-interval values to gain full marks. Again one error was condoned in the calculation of the total annual spend to gain both method marks. A minority of candidates did not read the question carefully and worked out the average weekly spend and hence lost the accuracy mark.

Question 3

Whereas most foundation students tried a numerical / trial & improvement approach to this question, the majority of the higher tier students were successful at least in forming a linear equation, based on the number of buttons in the three tins. Weaker students managed to obtain one mark by writing '4x' or 'x-7' even if they could not correctly form an equation.
A disappointing number stopped when they had successfully solved the equation (reaching $x = 24$) and stating that as their final answer instead of 17. In these circumstances the final accuracy mark was lost.

Question 4

Despite the absence of a specific reference to use a method based on Pythagoras, the majority of candidates realised that this was to be the tactic to be used and a majority scored all 3 marks. The accuracy mark was awarded for a value of 10.1788 ... seen in the body of the script as a final calculation, or this decimal rounded or truncated to 1 decimal place on the answer line.

Question 5

Most candidates were successful here in gaining all 3 marks. In isolated cases some divided 2470 by 216 and did not realise their answer was a speed in kilometres per minute. Weaker candidates converted 3 hours 36 minutes to 3.36 hours and gained 1 method mark for 2470 ÷ 3.36.

Question 6

Most candidates, in possession of a pair of compasses and a ruler, were able to gain the 2 marks available. The conventional method was to draw equidistant, intersecting arcs from *A* and *B* above and below the given line. Some started their arcs from an equal distance in from *A* and *B*, and some made their two pairs of arcs both intersect above the line *AB*. Candidates lost 1 mark by either not extending their perpendicular bisector to both sides of the line *AB* or by drawing an accurate perpendicular bisector by measuring and using a protractor.

Question 7

Accuracy marks here were dependent on gaining the method mark first. The most obvious way, and favoured by the vast majority of candidates, was to simply add the two linear equations together to reach $10x = -5$ to gain this method mark. It is a shame that a minority stated that x was then equal to -2 from here. Other methods, such as the elimination of x or by substitution, proved more challenging but often led to the correct values for x and y.

Question 8

This question was the first on the paper where a significant minority failed to gain full marks. In some cases this was through carelessness in reading the question whereby candidates proceeded to increase the starting value by 19%. In other circumstances using a step by step method (over 3 years) led to a loss of accuracy through successive rounding. There were some instances of using simple interest instead of compound. Some students found 19% of 20000 and multiplied this value by 3 to reach their final answer. More able candidates were able to recognise and use the economical approach of 20000×0.81^3 to reach the correct answer.

Question 9

For weaker candidates, this question posed 2 significant challenges. The first was to establish the correct equation of $30 = \frac{27}{1.2x}$ and the second was to manipulate this equation to deliver the correct answer. Some weaker candidates failed at this second hurdle and their equation became $30 \times 27 = 1.2x$ or similar. However for the main body of students, the final answer was successfully obtained.

Question 10

This question was good source of marks in parts (a) and (b) and only a minority fell short, usually by not stating their answer to part (a) in standard form.

Question 11

Part (b) proved to be more difficult that part (a). Two inequalities out of the three had to be correct to gain 1 mark. In all cases writing $>$ instead of $\geq$, and $<$ instead of $\leq$, was condoned. Candidates usually lost marks from the obvious error of having their inequality symbols facing the wrong direction.

Question 12

Of the students who didn't obtain full marks, most managed to obtain a mark for finding angle ABC, either through working or drawing on the diagram.
Having found angle $ABC = 48°$ for 1 mark, many candidates divided this by 2, worked out that angle $ABE = 156°$, and then opted to use the formula for the sum of the internal angles of a polygon $[180(n-2) = 156n]$ to reach the correct answer. A more economical method was to divide 360 by 24 by using the sum of the external angles of a polygon = 360°. Either way this question proved a good source of marks for competent candidates.

Question 13

This was a polarising question where students gained either full marks or zero. Two marks were awarded for establishing the correct equation or 1 mark was awarded for establishing the correct expression for the volume of a prism based on the cross-section being a trapezium. The few that scored zero marks usually forgot to multiply the area of the cross-section by 10.

Question 14

This question again proved to be a good source of marks for candidates with the knowledge of the correct method to be followed. Many who did not achieve full marks gained 1 mark for placing the numbers in either ascending or descending order (1 error was condoned here). Those scoring zero marks usually did so by taking 7 and 17 as the quartiles from the unordered list.

Question 15

Completing the table correctly with all 4 missing values was a challenge for some. Negative x values and a fractional component for the linear term of the quadratic graph contributed to this challenge. It is disappointing to note how a significant minority are still unaware of the symmetrical properties of a quadratic graph. In these cases their graphs behaved erratically from plotting some incorrect y values from their incorrect x values. Some students joined their points with straight line segments and this was also penalised by withholding the accuracy mark.

Question 16

Part (a) of this tree diagram question was a good source of marks.
In part (b) some misread the question and took the branch that yielded the odd, odd combination, missing the point that to get an odd total we needed an odd + even
or an even + odd combination.

Part (c) was a good discriminator question for those aiming for higher grade passes. Some students reused their answer to part (b) which was not relevant for this part of the question.
A few spoiled their opportunity of gaining full marks by extracting "6" from their final answer of $\frac{6}{25}$ instead of 25.

Question 17

In part (a) the obvious challenge was to get the correct (simplified or unsimplified) algebraic expressions in 3 regions of the Venn diagram. Many fell short here, but were able to pick up 2 marks for placing the values 5, 9, 3, 6, and 2 in the correct positions.
Part (b) lent itself to an algebraic approach and its success largely depended upon part (a).
In part (c), "9" was a common incorrect answer where candidates had failed to consider the value "5" outside of the 3 regions for the sets *C*, *D*, and *R* and a number of candidates identified the 9 and 5 but wrote both of these values on the answer line rather than add them together.

Question 18

Candidates familiar with the intersecting chord theorem usually scored full marks here, otherwise the score awarded was inevitably zero.

Question 19

For those candidates embarking on a conventional method of solution in part (a), a score of 1 mark only was awarded most often to those candidates that failed to spot the double negative in multiplying out the second bracket (i.e. $- -25$ becoming +25) at the second stage. Otherwise the mark awarded was either 3 marks or zero.
In part (b) many favoured the method of using the quadratic formula, rather than factorisation, to find the critical values. Unfortunately some lost sight of the fact that they were solving a quadratic inequality and not a quadratic equation and hence left the critical values of -1.6 and 5 as their final answer. There were many cases of both inequality signs facing the same direction as in the question, giving $x \le 5$ and $x \le -8/5$ as final answers. These students did not appear to consider the visualisation of the quadratic graph.

Question 20

This question was a challenging question for the majority. The key to success was using the Area Scale Factor (ASF) correctly but many missed this point and proceeded to base any equation on the Linear Scale Factor (LSF) of $\frac{13}{9}$ or $\frac{9}{13}$. Even those who formed a correct equation often fell foul of incorrect algebraic manipulation in the latter stages.

Question 21

Part (a) was good discriminator question, teasing out those with good algebraic skills and those without. Weaker candidates missed the point of factorisation completely and ended up cancelling the (–) 9 with 12 or the 4 with either 10 or 12. For those who gained partial marks it was usually

through factorising only the denominator correctly. It was frustrating to see students who got the correct answer and then incorrectly cancelled an x from top and bottom.
Gaining full marks in part (b) was relatively rare. The modal score was probably 1 mark for getting the first stage correct (either reaching 2^{5y+2} or 2^{15y} or 2^{2n})

Question 22

Those gaining zero marks here were probably unaware that the formula for an Arithmetic Series was given on the inside front cover. Those who successfully reached the correct value of the common difference ($d = 7$) either used their their knowledge of the expression for the nth term or simply recorded all 9 terms, starting with -6, to reach an answer of 50.

Question 23

Having to complete the square for a negative quadratic posed an extra challenge. Some tried to start with a division of -2, rather than a factorisation. Many candidates were “rescued” in part by applying special case scenarios in the mark scheme that were designed to mitigate for minor algebraic errors early on in the candidates’ work, in attempting to find the correct answer.

Question 24

Questions set in the International GCSE at grade level 9, as in the case here, often require accurate working at each stage throughout the question. Therefore all marks followed from gaining the first method mark which was awarded for correct working leading to the gradient of the line $\mathbf{L}_2$. More able students were usually able to reach this first stage and go beyond to state the equation of $\mathbf{L}_2$.
In the latter stages of this question a variety of methods were used to calculate the area of the triangle AOB. Very often these involved finding the lengths of OB and AB and the angle AOB and using the formula 0.5 x OA x OB x sin (AOB).
Very few spotted the more economical method of 0.5 x OA x 16 and this would have been more clear if candidates had drawn a diagram. Centres would benefit from encouraging students to draw diagrams.

Question 25

As with the previous question, each stage of the candidates’ working had to be correct and minor errors were penalised. The latter usually occurred in subtracting the expansion of one bracket from another.
The question required using algebra to justify the proof. Therefore candidates need to secure both method marks and then reach a stage of $20x$ (where N = $5x$ was inserted at some stage) to gain full marks.

Question 26

Most students obtained at least one mark for finding *OC* or *AB*, even if they could go no further. If the selected method was to use *ON* as a certain fraction of *OC* or alternatively *AN* a certain fraction of *AB* then this became an intricate question to complete successfully and to mark. It is to be commended that many able candidates were able to achieve this.
Some of the brightest candidates noticed that triangles *ONB* and *ANC* were similar (as *OB* was parallel to *AC*) and therefore used ratios 4 : 6 (or 2 : 3) to work out that either $ON = \frac{3}{5}\,OC$ or $AN = \frac{2}{5}\,AB$. The vector *ON* could therefore be found with this very economical method.

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