Examiners' Report/
Principal Examiner Feedback

Summer 2016

Pearson Edexcel International GCSE
in Mathematics A (4MA0) Paper 3HR

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Summer 2016
Publications Code 4MA0_3HR_1606_ER

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Introduction

This paper was accessible to most students with the last four or five questions differentiating at the top end of the ability range.
Many students showed careful working and so were able to benefit from method marks even when an arithmetic slip occurred. Algebraic questions were generally well answered and in many cases students took notice of the statement 'show clear algebraic working'. There was evidence of students failing to read questions thoroughly and doing too much or too little but often not answering the question that was asked.

Question 1a

(a)The correct answer of 21 was seen in almost every case. A few students misread the question and gave Roger's share rather than Rafael's. Those that did not know the method to use often divided the 30 by 7 and then multiplied by 3
(b) Again the majority of students gave a correct answer here. Those that did not, usually misunderstood the question and thought they had to share 75 in the ratio 4 : 3

Question 2

(a) Many students were able to factorise the expression fully. For those who were able to do some correct factorisation one mark was awarded; most students were able to gain at least one mark on this question
(b)The majority of students gained full marks. The few who did not made careless arithmetical errors.

Question 3

The minority of students who did not score full marks interpreted the question as a more complex problem in probability with (or sometimes without) replacement, sometimes with unsuitable tree diagrams.

Question 4

Many students gained no marks because they found the interior angle: they should have read the question!

Question 5

Most students gained full marks for part (a) and those that did not, often gained a mark for finding 8% of 28
In part (b), many could not express the information in a form that allowed them to solve the problem, though they did realise that the prices were still reduced by 8%.
Disappointingly, most who answered correctly did not give the answer in money notation – to 2 decimal places, although they did not lose marks for giving 37.5 instead of 37.50.

Question 6

In part (a), many students could not deal with both ends of the inequality effectively, apparently not understanding the algebra required. Some did separate the inequalities and were often successful.

In part (b), a large proportion gained full marks for correctly listing the integers although they had not gained marks for the first part.

Question 7

The handful of students who did not gain full marks mostly lost them through not expressing their answer as a product; they either listed the primes or left the numbers in a factor tree or ladder.

Question 8

This question exposed the weakness of many students with transformations.

Few students were able to answer part (a) correctly, giving both the word translation and the vector. Some expressed the vector in words, often successfully, but many made errors when trying to use vector notation, often writing it as coordinates.

Most rotated the shape correctly for part (b) but a significant number used a different centre or an anticlockwise rotation; these students were able to pick up one mark.

Question 9

Almost all students answered part (a) correctly. A small number could not use the correct method for part (b): some did not use the given probabilities, assuming a fair die, some multiplied the probabilities and a few found the probability of an even number.

Question 10

The most common reason for not obtaining full marks here was not reading the question and finding the mean instead of the total. A significant minority multiplied the frequencies by the class widths. The upper bound was occasionally used, rather than the midpoint showing confusion with cumulative frequency.

Question 11

Many students could not recognise the gradient from the equation of the line as given, or did not realise that the gradient of line **L** would be the same. Some confused the x and y co-ordinates when substituting to find the constant term. A significant number clearly had no experience of working with co-ordinate geometry, though several did solve the problem concisely and correctly.

Question 12

(a) A good amount of students gained full marks for this question but those who didn't, often picked up a mark for a correct use of index laws with $\frac{a^{11}}{a^{7}}$ being most common but also $\frac{a^{11}}{a^{10}} = a$ was frequently seen.

(b) Although there were many correct expressions for *p,* problems did occur with the use of negative numbers. Having got to −2p = 5 – 4q students went on to either just divide by 2 or were not clear where the negative sign should go, leading to clumsy algebraic equations. Some students would clearly benefit from more practice with negative terms in algebra.

(c) This is a very standard question that was generally well answered. There were a lot of errors or misunderstanding when students transferred their answers to the answer line as signs often changed, e.g. $8y^2 + 10y - 3$ often became $8y^2 - 10y - 3$ which lost them a mark. Another common error was to write $8y^2$ as 8y and some students got the constant wrong as they added instead of multiplying.

(d) A lot of students could deal with the powers of a and b but found finding the cube root of 8 a problem, $\frac{8}{3}$ being a common incorrect answer. If full marks were not awarded, students could pick up a mark for two of the three terms correct and most were able to benefit from this at least.

Question 13

The majority of students were able to use Pythagoras' theorem twice, successfully. Many lost marks through using a rounded answer for BD rather than substituting BD^2.

Question 14

Most students could complete the tree diagram successfully, and many went on to multiply the relevant probabilities correctly and answer correctly. A number added the probabilities along the branches, showing a lack of understanding.

Question 15

Most students could differentiate successfully, and many went on to let $\frac{dy}{dx} = 0$. A surprising number used the quadratic formula, not always correctly: those who factorised usually found the correct solutions. It must be noted that we only asked for the *x* coordinate of each of the turning points, but a surprising number also gave us the *y* coordinates – this was a waste of their time and students must get used to reading questions carefully.

Question 16
Many students did not understand that the frequency is proportional to the area, not the height of a bar in a histogram, this was shown by the common wrong working for part (a) of 5 + 10 + 15 = 30, ie using the heights of each bar. Many did not have a correct method to find the frequencies nor to complete the histogram. It should also be noted that the horizontal axis went up to 150 as it was graduated in 10's, but the bar only had to go up to 145; students must not assume the final bar should go to the end of the axis and must read the values needed.

Question 17
Most students answered part (a) correctly though many went on to find the length of ED which was not required. Part (b) was more challenging and most could not find a correct expression. In part (c), many squared the ratio of lengths and gained a mark but could not write an equation using x and y and so could not solve the problem.

Question 18
Although most students could find f(0.5) successfully for part (a), the rest of the question was not answered well; many did not know what ff meant, and clearly did not know what domain meant, many students answering 0 here. Rather more made a start on part (d) and could multiply both sides of the equation of the function, but then tied themselves in algebraic knots as they could not gather the right terms to find the inverse function.

Question 19
Not many students were able to answer this question correctly. Those who could not were either confused by which the angle at the centre to use, or thought *OABC* was a cyclic quadrilateral. Many gave their reasons, setting out their working in an orderly fashion, although reasons were not requested.

Question 20
(a) The students who recognised that they needed to factorise the numerator into linear factors were usually successful. Some bizarre alternatives for the simplifying the fraction were seen – and they were not successful. Working had to be shown to gain full marks: some students gained no marks because they gave the answer without algebraic working.
(b) Few students were able to expand the brackets or simplify effectively. Some then gave rambling explanations about multiples of 3, though many did take out a factor of 3 and leave it there. A large proportion of students substituted numerical values for a and made little progress.

Question 21

Many students did not progress beyond $4^{2k+8} = 8$. Those who could transform the equation to powers of 2 were then successful in completing the solution. Some used trial and improvement which was not a valid method to award marks.

Question 22

Only a minority of students could concisely and accurately solve this multi-stage problem. Almost all could find an expression for the sector, but the area of the triangle caused difficulties for many, and few could express the shaded area in terms of the radius. Premature rounding cost accuracy marks to some.

Summary

Based on their performance on this paper, students should:

- Ensure that they read the question carefully and not give the answer that they think is needed.
- Maintain full accuracy throughout a calculation only rounding the final answer.
- Ensure that they understand which terms are positive and which negative in any algebraic expression or equation and deal with them appropriately.
- Note that where an algebraic solution is requested, substituting numbers for letters will gain no credit.
- Learn that with tree diagrams the probabilities along the branches should be multiplied rather than added.

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