Examiners' Report
Principal Examiner Feedback

Summer 2017

Pearson Edexcel International GCSE
In Mathematics (4MA0) Paper 4H

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Report on individual questions

Question 1

(a) For those who knew the meaning of the union and intersection symbols this question was very straightforward, but inevitably, some students got the symbols the wrong way round.

(b) On the Higher tier, most students were able to give the correct reason, but a few students were not familiar with the intersection and empty set symbols and so did not understand what to say. A few ticked 'Yes' but gave the correct reason for 'No' which was puzzling and gained no marks.. Some students recognised the meaning but said there are members in common, without properly looking and realising that there was just one member.

Question 2

(a) At this level, many students gained the correct answer for this substitution question. Those who did not, were able to gain a method mark if they showed a fully correct substitution with brackets around the $(-3)^2$ and certainly not (-3^2) which students who knew something about the need for a bracket sometimes wrote. Many students who used the brackets correctly for the squared term still went on to incorrectly calculate $(-3)^2$ as -9

(b) A fully correct solution was given in the majority of cases for this equation question. The need for 'clear algebraic working' was adhered to by all but a very small minority who gained no marks for a correct answer without working. For those who found manipulating an equation correctly a challenge, a method mark could be gained for expanding the bracket correctly and this benefitted a number of students.

(c) ~~the~~The correct answer for possible values of y for this inequality was frequently seen. Of those who did not gain 2 marks, the rest were mostly able to benefit from one mark for a list with one error or omission or the list including -2 and excluding 3. A number of students did not recognise that 0 was an integer value.

Question 3

(a) At this level the majority of students were able to give the correct answer for this currency conversion question. A few were unused to dealing with such a large number of rupees for £250 and so put in a decimal point, thus losing them the accuracy mark.

3(b) Again, the majority of students taking this paper were able to convert rupees back to pounds, the only problem being that some failed to read the question carefully and did not realise there were four 500 rupee notes to convert back into pounds; these students could gain a method mark for converting 500 rupees to pounds. Even though, to the nearest £ was asked for, many students failed to give their answer to this degree of accuracy.

Question 4

Some students were able to find the coordinates of the midpoint of AB, but there were several spurious attempts, showing little understanding of what was required. Some students used a gradient type method, subtracting the y coordinates and dividing by the difference of the x coordinates, while others simply added the coordinates, showing no intention of dividing by

2. Sketches often failed to show a method to find the midpoint. If students picked up only one mark, it was generally for the y coordinate being correctly given as 7; the x coordinate of −1.5 seemed harder to find.

Question 5

(a) This part of the question was very straightforward for the vast majority of students who were very familiar with what was required. However, some students wrote their answer as a fraction $\frac{6}{20}$ and only gained 1 mark.

(b) Many responses to this part of the question were correct but there were a number that when told the probability that Astrid will lose is three times the probability that she will draw, divided the remaining probability by 3 rather than by 4.

Question 6

This question was answered very well on the whole with many students picking up full marks and those who didn't generally picking up at least a mark for a formula such as $T = m + g$ or just $6m$ or $9g$.

Question 7

(a) Many students were familiar with the method to show the addition of two fractions and gained full marks. Sometimes those who made the lowest common multiple of the denominators 96, showed $\frac{56+36}{96} = \frac{23}{24}$; these students failed to show the next step we would expect without the use of a calculator $\left(\frac{92}{96}\right)$ and so did not earn the accuracy mark.

7(b) the majority of students were able to gain the first method mark for showing the correct improper fractions. Some students then correctly cancelled or showed the stage $\frac{5}{3} \times \frac{31}{15} = \frac{155}{45}$ which secured the next method mark. A few students showed $\frac{5}{3} \times \frac{31}{15} = \frac{31}{9}$ the answer that a calculator shows and therefore failed to gain the second method mark. The final mark was gained for $\frac{1}{3} \times \frac{31}{3} = \frac{31}{9}$ **or** $\frac{155}{45} = \frac{31}{9}$ **or** $3\frac{20}{45}$ or an equivalent sum to this if a different denominator had been used. The important thing throughout the working is that students needed to show the working they would get in a calculation without the use of a calculator. Some students thought that after converting the fractions to top heavy fractions, they had to find the common denominator in order to multiply the fractions; this was an unnecessary step which resulted in some students making mistakes when cancelling.

Question 8

At this level the majority of students were able to tell us the polygon had 15 sides. If full marks were not gained, many were able to benefit from the first method mark for 180 – 156, the calculation to find the exterior angle of the polygon. Those who used the exterior angle method were generally more successful that those who tried to use 180(n-2)= 156n as many used just 156. Some students were able to get full marks using a trial and error method to find the number of sides.

Question 9

Many students worked confidently through this question and gained full marks. Those that did not, often showed a lack of understanding of what was required, but they regularly gained the first 2 method marks for finding the amount of money Ned received before he was given extra from Liam. A small number of students subtracted the money whilst some added it to the wrong person. Also a few students failed to divide the money into the 12 shares, but instead divided 420 by 4, then 420 by 5 and then 420 by 3, the share that each got, rather than dividing 420 by (4 + 5 + 3).

Question 10

(a) The majority of students gained full marks for this indices question, showing they know the rules of indices for multiplying.

(b) This question was a little more challenging than 10(a) and although we saw many correct responses, some students subtracted the numbers rather than dividing and some divided the indices rather than subtracting them.

(c) Many students know that any value to the power zero is 1 and there were few who were not rewarded with the mark here.

(d) Several students failed to gain full marks here because they struggled with the power $\frac{2}{3}$, and in particular 27 to this power; the most frequent incorrect answer was $18x^4$. Many were either able to deal with the number component OR the x term but not both thus picking up just one of the two marks

Question 11

Many students worked easily through this question requiring the use of Pythagoras' theorem or trigonometry to find the radius of the circle, then used this to find the area of the circle and finally subtracted the area of the square. Those who failed, generally didn't realise they had not been given the radius of the circle and used either 7 or half of 7, the given length of the side of the square as the radius. A few worked through the problem, but thought they only had to find the area of one of the shaded regions rather than all four. Some of those who used the correct method to answer the question rounded the diameter to 10 cm making the radius

5 cm, this resulted in their final answer being 30 cm² rather than 28 cm² resulting in the loss of the accuracy mark.

Question 12

There was a disappointing response to this question requiring students to work out the interquartile range from a list. Firstly 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. Some used the formula $\frac{n}{4}$ and $\frac{3n}{4}$ and gave the 3rd and the 8th values for the Lower and Upper Quartiles. 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

(a) Although there were several students giving the correct answer for the pair of parallel lines, many students did not realise the need to rearrange the equations so that they could look at them in the same form to find which had the same gradient. We gave a method mark for rearranging the equation of either B or C, but this was frequently not awarded. Those that tried to rearrange equation C often failed to deal with the negative signs correctly giving an incorrect gradient of -2. Many who tried to rearrange equations B and C failed to divide the number term thus resulting in incorrect equations. Very few students stated explicitly the gradients and of those that did this the majority picked up the M1 mark. Many students just gave the answer A and D because they both had a $2x$ in; however, the gradient of A was +2 and that of D was −2.

(b) Whilst many students were able to pick up a method mark for showing they understood that an equation with gradient $-\frac{5}{2}$ would be in the form $y = -\frac{5}{2}x + c$, many struggled to get further. Those that were able to correctly substitute $x = 1$ and $y = 3$ often found a correct value for c but were unable to write the equation in a form where all coefficients and constant term were integers, so they gained only 2 marks. A number of students identified $y = -5/2x + c$ but then substituted $x = 1$, $c = 3$

Question 14

(a) Most students were able to correctly write down the size of angle *ACD* but often did not know the reason or were unable to use the correct terminology.

(b) Again, most students were able to find the size of angle AOD, but were unable to give the reason or use the correct terminology (Some used edge or perimeter instead of circumference and origin instead of centre), although the reason was more often correct in this part than in (a).

Question 15

(a) Many students struggled to work accurately through the 'show that' often getting a bit muddled on the way or omitting stages in their working. Those that were able to use the area of a trapezium formula rather than a rectangle plus or minus a triangle had an easier option and were often more successful. In many answers, the lack of brackets meant that a correct approach was not correct when read. Many students overcomplicated the working out of the question, e.g. when using the area of a trapezium formula instead of multiplying both sides by 2 to get rid of the half, many multiplied the brackets by the half first, even before expanding the brackets. This resulted in many students making unnecessary errors and made the proof far more difficult than it needed to be. Some students worked out the value of x in this part, showing a lack of understanding and gaining no credit.

(b) Many students have got the message that 'show working clearly' means that if they don't they will be penalised; though of course there were still a small number that gave the answer without showing us where it came from. Some students gave us both the positive and negative solutions to the quadratic equation and were penalised as clearly, x could not be the negative value in this case. A number of students failed to understand the difference between "show" and solve, attempting to solve the equation in (a) and then attempting a different method of solving, almost entirely without success, in (b).

Question 16

(a) Some students struggled to realise that all three sets of branches had different probabilities on them; however, these students often picked up a method mark for 2 correct probabilities in the correct position. A few students made errors in calculating the probabilities for 'does not rain' which cost them a mark.

(b) The method marks were followed through from incorrect probabilities in (a) and several students were able to benefit from this. Some students did not realise that the probabilities needed to be multiplied together along the branches, often adding them. Some students got confused between when to add and when to multiply probabilities, this was demonstrated in their working out as $0.8 + 0.35 \times 0.2 + 0.4$

Question 17

(a) The differentiation was often fully correct and those not able to differentiate every term were often able to pick up a method mark for 2 correct terms. A small number of students went on to differentiate a second time.

(b) A good number of students were able to give a correct equation by putting $\frac{dy}{dx} = 5$ and continue working with this. Those that were unable to gain a method mark either substituted $x = 5$ into $\frac{dy}{dx}$ or into the original y or made $\frac{dy}{dx} = 0$. Some students failed to get past the first mark because they wrongly worked out -25 -5 to be -20. Several students attempted to solve the quadratic by putting the constant term on the RHS and factorising.

Question 18

We saw several correct attempts at this histogram question, but we also saw many that just plotted frequency. Sometimes rather interesting scales were used which made marking very tricky! For those that were able to get the bars fully correct, they often failed to gain the accuracy mark for a fully correct histogram because the label 'frequency density' or a key/scale was missing.

Question 19

For those that realised what was needed for the area of a kite, this was a very straightforward question. However, we saw many interesting attempts at trying to find angles and sides. An alternative method of finding *AC* and then angle DAC or *ACD* was used by some successfully, but for the marks available, it was not well rewarded as it was a very inefficient method. Some students attempted to split the triangle drawing a line BD and incorrectly assuming the angle had been split into 2. For those that were not successful it was apparent that many knew little of the properties of a kite with angles of 55 and 70 being part of their answer.

Question 20

This question was clearly targeting the more able student and we saw very few fully correct responses. The question combined time, distance, speed with upper and lower bounds and although some credit could be gained for not using all values correct, the accuracy depended on knowing that for the lower bound of a division sum you must divide the lower bound by the upper bound. Students who knew about upper and lower bounds could often give the lower bound for the time, but because the distance was written correct to the nearest 0.5 km rather than the nearest 0.1 km, there were several mistakes made. The most common mistake for the more able students was using 63.45 as the lower bound and a few did $\frac{63.45}{45.85}\times 60$ losing only the A1 mark. Another common mistake to use the original data to calculate the speed and then attempt to get a lower bound.

Question 21

Again 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 *LN* failed to make progress. Those who did, could often find at least one of the angles needed out of *NLP* and *MLN*. Many 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.

Question 22

Many students struggled with this question and we saw many blank or partial responses. If students attempted the question it was important that they knew how to deal with the 8 and the 10^{9n} in order to gain any method marks. A common answer amongst those we saw was 0.5×10^{-3n} where candidates gained 2 marks and were only a step away from the correct answer in standard form.

Question 23

A question targeting the more able student which was often seen left blank or only a rough attempt made. We did see a pleasing number of correct responses but common mistakes were made, such as forgetting to divide the surface area of a sphere formula by 2, forgetting the flat circular surface of the hemisphere and not dividing the formula for the volume of a sphere by 2 for a hemisphere.

Summary

Based on this paper, students should;

- Keep full accuracy in a question until the end.
- Know the properties of quadrilaterals, e.g. a kite in this case
- Have plenty of practice manipulating formulae
- Remember when to add and when to multiply in probability calculations
- Have plenty of practice with the four rules of fractions

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