Examiners' Report/ Principal Examiner Feedback

Summer 2013

International GCSE Mathematics A (4MA0) Paper 4HR

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International GCSE Mathematics A (4MA0)
Paper 4HR June 2013

General comments

Many students found the paper accessible, yet challenging. Their level of algebraic fluency was good; they made good use of standard techniques, also calculations and manipulations were accurate. Most had been well prepared to handle the routine tasks and were able to demonstrate competence of a high order. The solution of algebraic and trigonometric problems was particularly very impressive.

Question 1

Most students were able to give the correct answer of 1.5:1 or $\frac{3}{2}:1$. Some students misunderstood what they had to do and worked out the ratio of the number of girls to the total number of children in the class.

Question 2

Most students could name the transformation correctly as a translation. 'Translate' was also accepted, but not 'vector', 'transposed', 'transition' or 'transferred' or ‘transaction’ or ‘translocation’. There was some confusion over the description of the translation with, in many cases, the vector given being that from Q to P rather than P to Q. Other wrong answers included the vector with the x and y components transposed.

Question 3

Part (i) proved to be very accessible for students with most scoring all 3 marks and very few failing to get any marks at all. Part (ii) proved to be less successfully answered with many students not understanding that for the mean to drop, the next word must have the nearest whole number of letters below their answer to part (i).

Question 4

The vast majority of students gave the correct answer for part (a). Many students could find the correct answer to part (b), providing that they understood the condition that C must lie on the circle with AB as diameter. For those that did not understand this, they often put C at the point (8, 3).

Question 5

Virtually all students scored full marks on part (a)(i). There was less success on part (a)(ii) where some students misinterpreted the demand and divided by 85% rather than 15%.

Similarly, part (b) was misunderstood with some students working out $\frac{7}{12}$ of \$320 presumably from a misconception that the \$320 was the total amount. In general, however, this part was also well answered.

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Question 6

Part (a) required the use of angles on a straight line and angles on parallel lines. The most common successful approach was to work out angle *ABC* as $68°$ and then use alternate angles.

Some students thought that angles *BCD* and *CDE* were equal. The most direct way of working out the answer to part (b) was to use the sum of the exterior angles of a polygon. Many students did this, and were not penalised if they had used an incorrect value for their answer to part (a). The most direct way of completing part (c) was to use the interior angle sum formula for a polygon. Many students instead used the formula for the internal angle of a regular polygon and came with the answer of 108, not noticing that this was smaller than some of the interior angles they had already worked out in part (b). Some students worked out the sum of the interior angles they found in the polygon.

Question 7

For students who were comfortable with the pair of inequality signs, part (a) proved to be straightforward. Most solved the inequalities by operating simultaneously on both sets and were able to write down the solution almost immediately. Some worked with one end of the inequality only, ending up with $3 \leq x < 3$ or $-1 \leq x < 7$. Part (b) was even more successfully answered with the majority of students scoring both marks. A few lost marks by omitting 0 from their list of integers which satisfied both inequalities.

Question 8

This standard Pythagoras question was very well answered with the vast majority of students scoring full marks.

Question 9

Most students recognised that the two base angles were equal and wrote the equation $3x + 32 = 87 - 2x$. Once that was done virtually all of those students went on to find the correct value of x by solving the equation. A few students thought that the remaining angle in the triangle was x and tried to set up an equation by using the angle sum of a triangle. This was given no marks.

Question 10

The vast majority of students were able to complete the cumulative frequency table. Many went on to produce a correct cumulative frequency graph and read off at 135 the correct value for the upper quartile. Some students plotted their values at the midpoints of the intervals and a common error in part (c) was to read off from the graph at 150 ($\frac{3}{4}$ of 200). This scored 0 marks.

Question 11

The most efficient way to do this question (and one that does not require use of a calculator) is to pick out the prime numbers which are in both A and B , use the lowest powers of these primes appearing and multiply the resulting terms together to get $3^2 \times 5$. Many students did this. Some also evaluated both A and B (45000 and 416745) and then divided both successively by 5, 3 and 3 until 1000 and 9261 were obtained when it is obvious that there is no common factor to find. It was also interesting to see several students using the Euclidean algorithm to find the Highest Common Factor. Less careful students often made the answer 15 from selecting the primes that were common to A and B.

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Question 12

Most students spotted the right angle, found angle APO and then used base angles of a triangle to find angle OBA before completing the question. A few, who were also often successful, worked out angle OAB, then angle BAP and then completed by using the angle sum of a triangle in triangle ABP.

Question 13

Part (a) was a standard pair of simultaneous equations which were solved successfully by the vast majority of the students. Solution by elimination was used far more frequently than solution by substitution. In the elimination method, the most common error was not adding when the y terms were $6y$ and $-6y$ or subtracting incorrectly when the x terms were both $35x$.

Students are advised to be cautious with such questions. For example, in substituting a correct solution for x or y back into an equation to find the other value, signs were often incorrectly inserted.

In part (b), most students knew that the coordinates corresponded to the solutions of the equations in part (a). They were awarded the mark if their answer for part (b) was essentially the same as part (a). Those students, who did not score a mark, generally left the answer line blank.

Question 14

There were a variety of responses to this question. More able students were very succinct and wrote $3380-\frac{3380}{1.04^2}$ and then the answer on the answer line. A good number of students multiplied the 3380 by 1.04^2 or carried out the correct division, but neglected to subtract off the original amount. Students who wrote down the expression $(1 + 4\%)^2$ did not receive any marks for the multiplier unless they followed it by 1.04^2 or its equivalent.

In many cases 3380 – 3125 = 225 was stated, suggesting a misread of double digits from the calculator.

Students who treated the question as one of simple interest, rather than compound interest tended to gain no marks.

Question 15

The vast majority got part (a) right. Similarly, on part (b)(i), the success rate was very high.
On part (b)(ii), students were expected to state that the opposite angles of any quadrilateral are supplementary. Many students did state either this or its equivalent. For a mark to be awarded, a candidate had to refer to 'cyclic', 'opposite' and 'supplementary' or ' sum to $180°$ '

Question 16

Most students recognised that this question was a straightforward application of the cosine rule. As such, most made a successful start to the question. A large number of students completed correctly to give an answer of 10.2. Errors on the way to the answer included inaccurate applications of correct operator precedence (BIDMAS) and a lack of square rooting a correctly evaluated expression.

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Question 17

This was a fairly standard proportionality question and as such many students were able to provide full solutions. Some students lost marks in part (a) through not using an = sign, in particular writing $y \propto \frac{1}{4}x^3$ on the answer line. Others assumed that the proportionality was linear in x despite the x^3 in the first line and thus, scored no marks.

Question 18

Both parts (a) and (b) were very well done. There were hardly any wrong answers to part (a) and it was very rare to see anything wrong on part (b) apart from expressions such as $\frac{6}{10} \times \frac{6}{10}$ or $\frac{6}{10} \times \frac{6}{9}$

Part (c) proved to be more challenging as the candidate had first to work out what combinations gave an odd sum. It was pleasing to see many correct answers. Some students did not realise that there were 4 possible pairs (3,4), (4,3), (7, 4) and (4,7). Such students mostly gave one or two expressions for the probability of 1 or 2 of these combinations and therefore gained only one mark. A few students demonstrated clear knowledge of how to calculate probability but wrote expressions which assumed that the counters were placed back into the bag, which is incorrect in parts (b) and (c).

Question 19

Most students were able to gain marks on this question, however few got full marks. A common error was that students did not notice there were 3 surfaces to deal with (the hemisphere, the curved surface of the cylinder and then the circular base) and in calculating the surface area of the hemisphere many students failed to divide by 2. The most common shape students missed was the circle and this was also the one in which the formula was most incorrectly misquoted, often appearing as $2\pi r$.

Question 20

Virtually all students could complete the table, plot the values accurately and join their points with a smooth curve. There were a number who used a ruler to draw straight lines between points. Attempts at using the graph to solve the given equation were not as successful, often with only one of the two possible values quoted.

For the remaining parts of the questions many students could identify m as 3. However, very few went on to draw the graph of $y = 3x$ to solve the given equation. Often nothing was plotted or if there was, it was very often the graph of $y = 3$. Of those who did draw the correct line, the vast majority went on to give the correct answer.

Question 21

Most students decided to solve the problem by means of a Venn diagram and then place the corresponding numbers from the problem into the appropriate regions. Some students did not understand that set B had 4 regions with 6, 3, 2 and 0 in them, but wrote the 11 in place of the 6. If they did this throughout the diagram then they scored no marks. If a correct Venn diagram was drawn students almost always went on to score full marks.

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Question 22

Most students could work out the side of the hexagon, which was crucial for gaining any marks at all. The most successful students then went on to split the regular hexagon into 6 congruent equilateral triangles and using $\frac{1}{2} \times 7 \times 7 \times \sin 60$ to work out the area of one triangle. Some students just worked out $\frac{1}{2} \times 7 \times 7$. Another frequently seen approach was to split the hexagon into a rectangle and two congruent triangles. There was more work to do this way; it is to the credit of many who did this that they could carry the calculation through to a successful conclusion.

Question 23

Part (a) was carried out very efficiently by the students and many legitimately showed the value of k to be 2. Most students could get started on part (b) by writing $y = \frac{x}{2x - 1}$ however incorrect attempts were seen in trying to isolate x. The approach $x = \frac{y}{2y - 1}$ as the initial step was also very popular and also suffered from the same type of difficulties in the isolation of y.

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