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Examiners' Report/ Principal Examiner Feedback

Summer 2013

International GCSE Mathematics A (4MA0) Paper 3H

Level 1/Level 2 Certificate in Mathematics (KMA0) Paper 3H

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General comments

The demands of this paper proved to be appropriate; the vast majority of students were able to demonstrate positive achievement and many scored high marks. The majority of students gave sufficient explanation and showed their working clearly. However, on some questions testing the use of algebra, trial and improvement methods were seen; these were always awarded no marks.

The most able students performed well throughout the paper, including the more challenging questions towards the end.

On questions where there is more than one step needed to get to the final solution, students would be well advised to keep full accuracy until the final answer

Question 1

The question was well answered. The majority of errors from students who employed the correct method came from the evaluation of 13×0 as 13 rather than 0. The other common error was to obtain an answer of 2 from adding up the marks then dividing by 5.

Question 2

Part (a) was well done, but with some students then giving an incorrect answer of 0.4 in part (b). Those who got the answer wrong in part (a) sometimes then picked up the mark in (b) for rounding *their* answer correctly to two significant figures. Students who got the answer to part (a) wrong did not always show their working; those who did show working generally gained one mark for either the numerator or the denominator of the fraction evaluated correctly.

Question 3

Parts (a) and (b) were almost always correct. The most frequent error in part (a) was to give the answer as 6n – 2. Part of the requirement of part (c) was to show algebraic working; the majority of students followed this instruction. However, those who did not show algebraic working and just gave an answer scored no marks, whether or not the answer they gave was correct. One common error was to get as far as $5x = 3$ and then give the answer as $\frac{5}{3}$. Less able students started by incorrectly simplifying $7x - 3$ as $4x$.

Question 4

In part (a), in order to gain the available mark students had to identify x as a corresponding angle. 'Alternate angles' was a common incorrect answer. Answers that tried to explain that the angles were equal because they were in the same position on parallel lines or 'F' angles were not accepted.

Those who realised, in part (b), that they had to start with finding the sum of the interior angles of a hexagon (or work with the exterior angles) generally went on to gain full marks. However, having got as far as 720, some students then either only subtracted four of the known angles of the hexagon or made an arithmetic error in their subsequent calculation. Some started by working out 180×6, it wasn't clear if this error was because they thought that they were working with an octagon or if they believed that this was the correct method to work out the sum of the interior angles of a hexagon. A common incorrect method was to add the five known angles of the hexagon and then subtract 360. Some just added interior angles or, less often, exterior angles, gaining no marks. A fairly common error was to take the average of all of the angles in the diagram. Students who chose to use the exterior angles rather than the interior angles often reached the answer of 58^o and then forgot to subtract this from 180^o.

Question 5

Part (a) was well answered. One error seen was the incorrect substitution of 43 for x rather P. In part (b) the expression for the area of the rectangular section of the trapezium was usually correct. Many students wrote down a correct expression for the total area but then either ignored the instruction to give their answer as simply as possible or made errors in trying to do so. The most common error was to simplify $\frac{1}{2} \times 3x \times 4x$ incorrectly, usually giving $6x$ rather than $6x^2$. The formula for the area of a trapezium, which is given on the formula sheet, was rarely used and student responses were poorly simplified.

Question 6

The vast majority of students gave the correct answer to part (a). A small number subtracted 8% from the given amount. Students who used a build up method to find 8% were generally less successful in reaching a correct answer than those who used a calculator method. Those who used a multiplier generally gave the correct answer although the incorrect multiplier of 1.8 rather than 1.08 was occasionally seen. 600 was a common incorrect answer to part (b) but gained 2 out of the 3 available marks; students are advised to read the question carefully to ensure that they are answering the set question. The most common error seen was to increase 48 by 8% or to divide 48 by 1.08

Question 7

Part (a) was well answered. There was slightly less success in part (b) where some students gave all the letters (ie duplicated/repeated the letters a, e and u). However, some students confused the union and intersection symbols.

Question 8

The question referred to a solid cylinder but many students did not realise that the total surface area therefore consisted of the curved surface area and **two** circles. Many employed the correct method but omitted one of the circles. An equally common error, was to omit both circles and just give the area of the curved surface. Other common errors included using the formula for the circumference of a circle rather than the area or finding the volume rather than the surface area of the cylinder. Some students rounded the values of the individual areas and therefore resulted in a final inaccurate answer.

Question 9

Some students approached this question without difficulty, using either exact or appropriately rounded values, or gained full marks for an integer answer within the required range. A small number lost the final accuracy mark because they did not round their answer to an integer.

Question 10

The majority of students were able to gain full marks for this question. Some students evaluated the fraction and then rounded their answer **before** using the inverse cos function on their calculator; this generally resulted in a final inaccurate answer and the loss of the accuracy mark. There were some lengthier attempts, such as sine rule, or finding the other angle first, or using Pythagoras's theorem first; providing accuracy was maintained throughout the working, full credit was given.

Question 11

A common incorrect answer to part (a) was 9, usually coming from those students who tried to list factors rather than find the prime factors of each number. Some students, in error, gave the Lowest Common Multiple in (a) and the Highest Common Factor in (b). Quite a few found factors correctly in part (a) but were not sure what came next. A few gave their answer as a product of factors only. Those approaching (b) by listing multiples often did not notice 270 and gave 540 as the answer.

Question 12

This question was generally well answered with students showing a good understanding of cumulative frequency graphs and median. Some students plotted points at 55, 65, 75... rather than at 60, 70, 80... but, provided their method was shown to find the median, were able to gain full marks in part (b). In (b) some students found the half-way point on the x axis and read their 'median' off the y-axis.

Question 13

It was evident that some students did not understand the three letter angle notation. Some students incorrectly marked angle *ADB* as 39^o with some quoting 'alternate' angles; which was incorrect. When answering questions such as this, students would be well advised to either mark found angles on the diagram or refer to found angles unambiguously in the working space using three-letter angle notation. Angles of 77, 39, 103 were frequently seen on the diagram, but not always in the right place. Even where the angles were stated in the students' working, they were often not clearly labelled. Triangle ABD was sometimes taken to be isosceles. Other incorrect methods assumed that the opposite angles of a cyclic quadrilateral were equal rather than supplementary or assumed that triangle BCD was isosceles or that angle ABC was a right angle.

Question 14

In part (a) a common error was to include 10 instead of 24 in the product. The powers of p and q were sometimes given incorrectly as p^6q^5 by those students who multiplied instead of added the indices. Other common incorrect responses were $4p^5q^6$ and $24p^5 + q^6$. Common errors in part (b) included 15 or 5^3 instead of 125. The powers of x and y were sometimes given incorrectly as x^5y^7 by those students who added rather than multiplied the indices.

In part (c) $ab(9a - b)$, $(9a - b)(a + b)$ and $(9a - b)^2$ were fairly common incorrect answers. $(3a - b)^2$ and $(3a + b)^2$ were also seen fairly frequently; both of these responses gained one of the two available marks.

Question 15

In part (b) the most common method used was to find the gradient of the given line by rearranging the equation and then use the found gradient with the point (0, 10). A common error was to use the gradient as $\frac{2}{3}$ rather than $-\frac{2}{3}$ either following an incorrect rearrangement of the equation, or from using the slope of the line and omitting the negative sign. $y = \frac{2}{3}x + 10$ was thus a popular incorrect answer which scored 3 out of the available 4 marks. There were plenty of examples of fully correct solutions, with the more efficient method of going directly to $2x + 3y = 30$ being employed by a small number of students. It is worth noting that many students did not make their method of solution clear with equations being written all throughout the working space. It is important that students make their method of solution absolutely clear. Where there are multiple methods, no marks can be awarded unless the student's answer makes clear which method has been selected.

Aiming for $y = mx + c$ was the preferred method for the majority of the students. Success with vertical/horizontal was rare. The omission of the x in the final answer ie $y = -\frac{2}{3} + 10$ was more common than the omission of the '*y*='.

In part (c) the inclusion of any points with integer coordinates on any of the boundary lines meant that only one mark was scored. A common incorrect solution was to mark the points with integer coordinates that satisfied $y > x - 1$ but not $2x + 3y < 12$ or vice versa. Few students scored the full 2 marks. Numerous students lost both marks by including points in the correct region but with an x value of -1. Crosses at the intersection of the two lines were not uncommon, possibly related to (a).

Question 16

Part (a) was well answered, although a commonly seen answer was 11 arising from finding the difference between 8 and 14 as 6, and then adding this to 5. The common incorrect answer in part (b) was 28 from those students who used the linear scale factor rather than the area scale factor. There were some attempts to use ½ bh or ½ ab sin x for areas of triangles, often unsuccessfully.

Question 17

0.4 was a common incorrect answer in part (a) from adding rather than multiplying the probabilities together. In part (b) the most common error was to find the product of 0.8 and 0.9 or else to subtract 0.2 and 0.1 from 1. A number of students got part (a) incorrect but then part (b) correct.

Question 18

Students who did not fully understand how to apply the Sine Rule frequently worked out $\frac{2.9}{\sin 36}$ (not realising that they were incorrectly treating triangle PQS as right-angled) and gave this as their answer. Students who did understand how to apply the Sine Rule correctly generally gained full marks, although sometimes the accuracy mark was lost due to premature rounding. There were a few attempts to use trigonometry, treating PQS as right-angled. Other attempts, such as finding PQ and then using cosine rule, or by adding lines to create some right-angled triangles were also seen. These were often successful. It was fairly common to see an attempt at stating the Sine Rule with just 118^{o} and 36^{o} on the denominators (ie omitting sine).

Question 19

Giving the upper bound of just one side as the final answer was a common answer gained one mark. An incorrect method that gained no marks was to find the perimeter of the hexagon without considering bounds and then to give the upper bound of the answer. Some students got to the correct answer of 21.9 but then attempted to apply bounds again and so gave the final answer of 21.95 which lost the accuracy mark. Some multiplied by 5 (or other numbers) and others rounded incorrectly to 3.64 or 3.605 (amongst other values).

In part (b), an answer coming from 75÷11.5 from many students showed a lack of understanding of how to use bounds when dividing to find the lower bound. Some students found 80/12 and then rounded down the answer, and there were frequently other errors with bounds such as 79.5/12.05

Question 20

In part (a) students either started off by using $10 - x$ or $\sqrt{8^2 - x^2}$ as the width of the rectangle. Those using the former expression were generally more successful, as writing $\sqrt{8^2 - x^2}$ as $8 - x$ was a common error. Many convincing solutions were seen.

There were some solutions that ended with the correct statement, but the algebra used to get to the final line was less then convincing. Less able students felt that they needed to manipulate the given equation, with no obvious target, or to substitute values in it, or to solve the equation. Relatively few students could proceed beyond 2 marks; many did not get this far.

In part (b) there was a clear requirement in the question to show working clearly; any candidate who gave the correct answer without any working scored no marks. The most common mistake was -10 at the start of the formula. Students could still score 1 for the discriminant, but this working was often not shown. $\sqrt{172}$ was also frequently seen. Calculators clearly give answers as surds, which could be confused with evaluating the discriminant.

Question 21

The majority of students realised the need to divide the shape into two parts. However, from there, a number of errors were seen. The most common error was the use of 7 cm and 9 cm as the sides of triangle *ABC* rather than 7 cm and 16 cm. 150/360 was often used for the sector as well as other fractions, such as ¾. Some attempts to find AB using the cosine rule were seen, but this rarely contributed to successful answers. Some students split the triangle into ACX (with X on the circumference) and AXB giving correct areas of 15.75 and 12.25 after the use of the cosine rule to find AX. The question discriminated well, providing 6 accessible marks for good students but proving difficult for many others.

Question 22

Clearing the fractions correctly from the given equation proved difficult for many students. Those who did manage to clear the fractions correctly generally went on to gain full marks. However, some students rearranged the equation correctly, but then cancelled inappropriately and so lost the final accuracy mark.

This was another question that discriminated well. Quite a few students scored the first three marks to clear the fraction but then could not factorise the left-hand side to complete the arrangement. Attempts such as $3y/(x(x+4)) = 3$ and $(y + 2y)/(x + x + 4) = 3$ were common. The final mark was often lost by leaving the bottom as $x + 4 + 2x$.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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