Examiners' Report/ Principal Examiner Feedback

January 2013

International GCSE Mathematics (4MA0) Paper 4H

Level 1 / Level 2 Certificate in Mathematics (KMA0) Paper 4H

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General Introduction

January 2013 saw a significant increase in numbers, in comparison to any other previous winter session, both at foundation and higher level. At foundation level, numbers rose from a figure of around 400 to nearly 3500. At higher level, numbers rose from around 2000 to nearly 4500. Much of this expansion was fuelled by increasing numbers entering the Edexcel Certificate.

Introduction to Paper 4H

The demands of this paper proved to be appropriate; the vast majority of candidates were able to demonstrate positive achievement and many scored high marks. The majority of candidates 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 stronger candidates performed well throughout the paper, including the more challenging questions towards the end.

Report on Individual Questions

Question 1

The majority of responses for Q1(a) were correct. When such an instruction as 'write down all the figures on your calculator display' is included in the demand of a question, it is sufficient to write down the figures given on the initial display. 10.12857 was a common mistake from $(8.7 + 2.8/1.4^2)$
A follow through mark was given in Q1(b) if Q1(a) was not correct and the candidate's answer to Q1(a) was correctly rounded to two significant figures. There was less success in rounding the answer to two significant figures with 5.87 and 5.8 being popular incorrect answers.

Question 2

Candidates who used the correct formula for the circumference of a circle generally went on to gain full marks. However, a significant number of candidates incorrectly used either πr^2 or $2\pi d$. Candidates are advised to show their working and their initial un-rounded answer. On occasion an answer of 23.8 was given without any supporting working shown. As the guidance given in the question was for an answer correct to three significant figures, an unsupported answer of 23.8 gained no marks.

Question 3

A number of candidates started off the process correctly by multiplying each mark by its frequency and then finding the sum. However, they then divided by 5 (the number of marks) rather than 20 (the number of students). Some candidates added the given marks and then divided by 5 which gave an answer of 8 (the correct answer being 8.1). Candidates who gave 8 as the answer without supporting working gained no credit.

Question 4

Candidates found this question accessible. Common errors were either to go on once the correct answer had been found and subtract from 1 or to multiply rather than add the given two probabilities.

Question 5

Success in both parts of the question was varied. The majority of errors in both parts stemmed from the fact that candidates had not recognised the importance of the universal set and so included odd numbers in their answers. From candidates who realised that 4 and 8 had to be two of the numbers in the set in Q5(a), common errors were to include another member of set A, include more than one other even number not in A or to include an odd number within the answer. {2, 6, 10} was a common incorrect answer. Q5(b) was answered more successfully than Q5(a) with the main error being to include odd numbers. Some candidates showed correct Venn diagrams in their working but failed to extract correct answers from them.

Question 6

Candidates found this question challenging. Many candidates were unable to make a start to the question and unable to gain a mark for working out that the fraction of females was $\frac{4}{9}$. The most common errors were to attempt to add or divide the given two fractions. The success rate in Q6(b) was slightly higher than in Q6(a). A number of candidates used tree diagrams in their working.

Question 7

Candidates recognised the need to split the given shape in order to find the area. It was common to see candidates either adding or multiplying the given lengths thus showing little understanding of the concept of area. Many of those who were able to find the area of a rectangular part of the whole were then unable to find the area of a triangle or a trapezium correctly. Errors were made in finding the side of the triangle with 6 being a common incorrect base and 5 a common incorrect height. Some candidates confused area with perimeter.

Question 8

Q8(a) was well answered. In Q8(b) a common incorrect answer was $12x + 3$ which came from the incorrect expansion of the second bracket with a final term of $+12$ rather than -12. Also $2x - 3$ was sometimes seen, coming from $-15-12$. In Q8(c) many candidates only gave two terms when expanding the brackets. Those who used the correct method of expansion generally went onto score full marks although the final term was often given as 9 rather than 14.

Question 9

This question was well answered with candidates showing all the necessary working. Common errors included omitting to take the square root as a final step or, more frequently, squaring and adding the two sides rather than squaring and subtracting.

Question 10

The majority of correct answers given came from an algebraic method. Answers that did not use the algebraic method scored no marks. Candidates were able to gain one method mark by demonstrating some correct algebraic processes. Common incorrect answers were 3.4 and 3 rather than the correct −3.

Question 11

Candidates who used the method of dividing the given amount in the ratio 5 : 9 to find the solution generally went on to gain full marks. Some candidates successfully found the total amount of £80 and then divided that in the ratio 5 : 9 : 6. A common incorrect answer was £16.80 which came from dividing the given amount in the ratio 5 : 9 : 6

Question 12

Candidates who knew how to construct an angle bisector generally gained full marks. Some candidates were able to gain a mark for a correct first arc drawn. A common mistake was to draw intersecting arcs from points A and C. In all construction questions, arcs used for the construction should be left and not rubbed out.

Question 13

There was clear evidence of *x* and *y* being confused in answers to this question. Similarly, the wrong inequality signs were often seen with ≤ used instead of the correct ≥ and vice versa. In particular, candidates could not use pairs of inequality signs, so attempts such as y < 1 >3 were seen. Incorrect values were occasionally read from the axes with 4 or 5 being used in place of 3 when writing down the inequalities in *y* being the most common of this type of error. Some candidates resorted to the use of coordinates and written descriptions.

Question 14

Candidates who knew how to deal with the fractions on either side of the equation generally went on to score full marks. Some candidates were unable to carry out a correct algebraic process to clear the fractions. A common error was to multiply the numerator of each fraction by the denominator of the same fraction rather than cross-multiply. Some candidates scored no marks even though they attempted the correct manipulation of the numerator as they had errors manipulating the denominators. A number of candidates thought that they were required to produce a single algebraic fraction (which was incorrect) rather than solve an equation. This led to errors in the denominator with consequent loss of marks.

Question 15

$5x^7y^{10}$ was a common incorrect answer from candidates who used the index laws incorrectly. Candidates who applied the index laws correctly scored full marks in Q15(a). A common error was to write the answer as either a quotient or the sum of two terms. In Q15(b) $2n^7$ was a common incorrect answer. Answers of $2n^{12}$ and $8n^7$ both which gained one mark were seen as commonly as the correct answer of $8n^{12}$.

Question 16

Correct answers were seen in Q16(b) following a correct cumulative frequency table in Q16(a). Some candidates who plotted the point (5, 132) proceeded to draw their graph correctly but neglected including the point. The point at (5, 132) was often plotted incorrectly. Several candidates plotted (5, 12) correctly but then their curve missed this point. From a correct cumulative frequency graph the majority of candidates were able to score full marks in Q16(c). It is important that candidates show clearly the method that they used to find the median.

Question 17

The most common error in all three parts of this question was the incorrect pairing of sides between the two triangles. Candidates who realised, for example, *CE* corresponded to *AC*, generally went on to score full marks in the first two parts of the question. In Q17(c) there were many methods that could be used but the most common one was to find the area scale factor. Unfortunately, many used the length rather than area scale factor so a common incorrect answer was 16.8 cm^2. Several candidates erroneously tried to use Pythagoras and/or trigonometry in Q17(a) and Q17(b).

Question 18

When solving a quadratic equation using the formula, candidates are advised to show all their working as instructed in the demand of the question. Many candidates did show their initial substitution but then went straight to the answers which were sometimes given to the wrong degree of accuracy and hence lost a mark. Some candidates completed the square to solve the equation but this was usually seen to given an incorrect solution.

Question 19

Candidates who gave the correct answers of a=25, k=11 or a=1, k=3 usually obtained these through a process of trial and error. The correct answers of a=5, k=7 were the more usual pair given and these generally came from the expansion of the brackets in the original expression. Many candidates correctly expanded the brackets and simplified the LHS but did not realise that they only needed to compare the rational and irrational parts to find the required values.

Question 20

The concept of taking a disc from one box, placing this in a second box and then taking a disc from this box proved challenging for many candidates. The probability of $\frac{2}{4}$ rather than $\frac{3}{5}$ was frequently used for taking the second disc. Some candidates who gave the two correct probabilities then added rather than multiplied. In Q20(b) candidates who understood the overall concept generally went on to gain full marks. There was, however, some evidence of incorrect arithmetic when multiplying the correct fractions.

Question 21

Those who used the correct initial formula $t = kf^2$ in Q21(a) generally went on to score full marks in both parts of the question although, in Q21(b), some candidates omitted to take the square root and hence lost a mark. Some candidates tried to set up an equation but used t directly proportional to f or $\sqrt{f}$ rather than f^2.

Question 22

In questions involving the use of geometry candidates should be advised to show clearly the size of any intermediate angle found. Often the number 152 or 2×76 was shown in the working space without being linked to angle *AOB*. Likewise, incorrect statements such as *PB* = 90° could not be credited with any marks. Angles must be identified correctly either in the working space or placed correctly on the given diagram if part marks are to be awarded. Candidates must use 3 letter notation to describe angles. Statements such as (angle) *O* = 152° are ambiguous and cannot earn marks.

Question 23

Answers should always be fully evaluated. In Q23(a) an answer of $\frac{1}{1.25}$ was sometimes given, this did not gain the mark for this part of the question. In Q23(b) those who used the functions in the correct order generally scored both marks although a number of candidates were unable to simplify $(\sqrt{x+1})^2$ correctly and so failed to gain the final accuracy mark. Candidates who left their answer in a correct but un-simplified form also forfeited the accuracy mark.

Question 24

80% was a popular incorrect answer (which did score 1 mark) from those candidates who had worked out the multiplier rather than the final answer to the question. There were a number of approaches seen included assigning a value to the distance and original speed and an algebraic approach using multipliers. 25% and 75% were common incorrect answers.

Question 25

Candidates who realised that the problem initially involved the application of the sine rule in triangle *ACD* generally went on to score full marks. A minority of candidates who made a successful start to the question were only able to get as far as finding the value for *AC* or *BD*. Many candidates tried to use right angled trigonometry (usually tan) in triangle *ADC*. Candidates were awarded 1 mark for identifying either 21° or 149°.

Question 26

Any correct answers that were not supported by correct algebraic working scored no marks. Some candidates who got as far as the correct quadratic equation then made errors in their substitution into the quadratic formula, or factorised incorrectly, both of which led to the loss of the final three marks. A minority of candidates stopped after finding the values of x (or y), omitting to then substitute to find the values of the other variable therefore failed to gain the final mark. A common error seen was $y^2 = 9x^2 + 4$ and $x + y = \sqrt{20}$.

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