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January 2012

International GCSE Mathematics A
(4MA0) Paper 2F

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International GCSE Mathematics A
Specification 4MA0
Paper 2F

General Introduction to 4MA0

January 2012 hosted for the first time, the winter session of the International GCSE Mathematics A. All previous sessions had taken place in November. The total number of candidates rose to slightly over 2550, the highest entry for a winter session. Foundation entries, which had been decreasing, recovered to nearly 450 (from 300 in November 2010). Candidate entries for the higher tier were just over 2100.

Most of the 480 Foundation tier and 2200 Higher tier candidates took the opportunity the papers gave them to show what they knew.

Paper 2F

Introduction

The questions on this paper made appropriate demands of candidates and were generally accessible. Average candidates scored well on the first half of the paper but only abler candidates gained full marks on some of the later questions, especially Question 18(b) (Ratio) and Question 23 (Inequalities). Most candidates showed their working clearly and neatly.

Report on individual questions

Question 1

This bar chart question was a straightforward start to the paper. There were few errors on the first three parts and, although the final part proved more demanding, it was still answered correctly by the majority of candidates.

Question 2

The number topics tested in parts (a) to (f) appear regularly and most candidates scored well. The only incorrect answers which appeared often enough to be noticed were in part (c), where ‘tenths’ and ‘hundreds’, were sometimes given as the value of the 4 in the number 2345. Many candidates found part (g) – converting 1920 millimetres to metres – much more difficult, 19.2 and 192 being the popular wrong answers.

Question 3

In the first part, the majority scored the marks for ‘isosceles’, or some recognisable variant of the word, and for drawing the line of symmetry. The second part was much harder but, nevertheless, many candidates gained full marks, usually for a kite or an isosceles trapezium. A sizeable minority drew a triangle, instead of a quadrilateral.

Question 4

All but a handful of candidates gained full marks in parts (a) and (b), finding the next two terms in the sequence and explaining the need to subtract 3 from the previous term. Parts (c) and (d) proved more demanding but were still well answered. In part (c), 5, the 16th term, was the most popular wrong answer. In part (d), there was a pleasing number of good explanations, mostly based on the idea that, because 2 is followed by −1, zero cannot be a term. The next most common explanation used the idea that the terms of the sequence are not multiples of 3.

Question 5

Most candidates scored well on all three parts of this question on fractions. In part (a), the simplest form of $\frac{30}{45}$ was almost always correct. In part (b), 1 mark was occasionally lost through premature approximation, when $\frac{5}{6}$ was initially converted to a decimal or a percentage and, in part (c), the minority who were unsuccessful in their attempt to convert $\frac{7}{8}$ to a decimal gave a variety of answers, such as 87.5, 7.8 and 0.78.

Question 6

In general, rotational symmetry is less well understood than line symmetry. The order of rotational symmetry is part (a)(i) was usually correct but responses to the other three parts were much more variable.

Question 7

Place value caused problems for many candidates in part (a), 'tenths' being the most popular wrong answer. Most candidates successfully ordered the decimals in part (b), although it was noticeable that, when the answer was incorrect, 0.1 was almost always either the first number or the final number in the candidate's list. Success rates in the remaining three parts were commendably high, particularly the conversion of 0.07 to a percentage in part (e). The only error which appeared with any frequency was 2.7 in part (c).

Question 8

The majority of candidates accurately calculated the mean, although there was occasional confusion between mean and median.

Question 9

All three parts were well answered. Errors were especially rare on part (a), although both 77 (32 + 45) and 7 (5 + 2) appeared occasionally. The presence of a negative number and a decimal in part (b) made it more demanding and there was a range of incorrect answers. The most regular of these was −2, the result of incorrect evaluation of −12 + 14. Much less frequent but much more surprising was 5.5 $(-12+5\times3.5)$. Part (c) was accessible to the majority of candidates, who gained the first mark for a correct substitution. A good number went on to rearrange this correctly and solve the resulting equation to gain full marks. However, a significant number of candidates made an error with the signs in their attempt at rearranging, $9=3d+24$ often becoming $3d=24-9$. There was also frequent sight of −15 as a final answer, which was the value of 3*d*, rather than *d*. Another recurring wrong answer was 51 $(3\times9+4\times6)$, the result of misinterpreting the question.

Question 10

It was pleasing to see many fully correct solutions to part (i), with clear use of correct, stated units. It was, perhaps, surprising to see how many chose to convert both measurements to centimetres, rather than work in the units of one of the given measurements. Inevitably, there was also much confusion over conversion between millimetres and metres; candidates were at least able to gain one method mark for division based on an incorrect conversion. The accuracy mark was lost if candidates did not give the integer value for the number of paperclips. On the whole, candidates found greater difficulty with the concept of part (ii), although many clear solutions were seen. Common errors were simply using the decimal remainder from part (i) as the answer or subtracting the number of paperclips from the original length of the wire.

Question 11

The majority of candidates evaluated $\frac{6.7-2.5}{2.8\times0.4}$ accurately.

Question 12

Many candidates were able to work out an unknown angle in both an equilateral and an isosceles triangle. This often led to full marks but the final mark was sometimes lost through candidates' lack of familiarity with capital letter notation for describing an angle. Other candidates found either 60° or 51° but not both. Beyond this, attempts were variable and often based on the false assumption that the diagram had 2 lines of symmetry.

Question 13

Only a minority of candidates gained full marks; not all those who found 1, 7, 7 correctly then found the range. Some left 1, 7, 7 as their answer while others gave the range as 7 or 1-7. Of those who did not obtain 1, 7, 7, many scored 1 mark for 0, 7, 8 or for three positive integers with either a sum of 15 or a median of 7.

Question 14

A high proportion of candidates started correctly with $\frac{135}{180}$ and many of these went on to use this quotient to find the correct time, although a substantial number gave answers of 0.75 or 75. Some successfully applied more intuitive methods, such as working out that the aeroplane travelled 3 km each minute and then used this fact. Candidates who gained no credit generally used either $\frac{180}{135}$ or 135×180, the former often leading to answers of 80 or 90 and the latter 24 300 or 405.

Question 15

Generally, candidates appreciate the need to show algebraic working and many did this sufficiently well to gain full marks. A few scored just 1 mark for a first step towards a solution before errors, usually involving difficulty with the relevant positive and negative signs, crept in. The award of 2 marks was rare; those who could progress correctly to that stage were almost always able to give the correct solution, although a small minority did obtain the solution $x = \frac{4}{7}$ from $4x = 7$.

Question 16

Although the context of dominoes had not been used before, most candidates demonstrated a sound knowledge of probability, including notation, and applied it successfully on both parts of this question, especially the first. In the second part, many correctly calculated the sum of $\frac{3}{8}$ and $\frac{2}{8}$, although some found the product of these two fractions and others just stated both fractions.

Question 17

There was wide variation in the quality of attempts to draw the graph. Some lines were fully correct; some were based on plotting just two points but there were others where candidates had worked out and plotted all the integer coordinate pairs for the given x values. On the whole, working out and plotting a series of points led to greater success. The scale on the y-axis caused some problems and a substantial number of candidates were unable to attempt this question.

Question 18

There were many correct answers to the first part of this question on ratio, although some candidates found $\frac{32}{8} = 4$ and left this as their answer, which gained 1 mark out of 2. Others found $\frac{32}{7}$, which scored no marks.

The second part proved far less accessible and was often not attempted. It generated much arithmetic, in which almost every combination of the given numbers with all four mathematical operations was seen. The most popular wrong answer was 101.25, the result of either $\frac{45}{32} \times 72$ or $45 \times \frac{72}{32}$, usually performed in two separate steps, and the working $(72 - 32) + 45$ was also sometimes used. A few candidates found a multiplier, either $\frac{72}{32}$(2.25) or $\frac{32}{72}$, which, on its own, received no credit and it was never used correctly. Candidates who scored full marks invariably found the real length of the lorry $(45 \times 32 = 1400 \text{ cm})$ and then divided it by 72.

Question 19

In part (a), as always when candidates are required to describe a *single* transformation, combinations of transformations, which receive no credit, appeared regularly, especially combinations of rotations and translations. A fair number of candidates gained full marks and many scored 2 marks out of 3, often losing the third by wrongly describing the sense of the rotation as ‘clockwise’ or by omitting either an angle or information about the centre of rotation.

Approximately half the candidates translated the triangle correctly in part (b), many of those who failed to score being unable to make an attempt. Those who made an unsuccessful attempt were often one square out, either horizontally or vertically.

Question 20

Many candidates were able to make inroads into this question by the use of a factor tree or repeated division, which were often fully correct. Some of these went on to score the final mark but others sacrificed it by giving their answer as a product of prime factors $(2 \times 2 \times 2 \times 5 \times 5)$, instead of as the product of *powers* of prime factors ($2^3 \times 5^2$).

Question 21

The majority of candidates correctly gave c^7 as the answer to the first part, although c^{12} had some support.

About a quarter of candidates achieved some success on the second part. They used a variety of approaches, ranging from the formal construction and solution of equations to more informal inspection methods. The most frequent error was to ignore the *y* in the denominator. Thus, answers of 3 (from $n + 3 = 6$) and of 2 (from $n \times 3 = 6$) appeared more often than the correct answer.

Question 22

In part (a), working out the area of a triangle using base × height only was probably as common as using the correct formula and many ignored the fact that there was more than one triangle in the total area of the rhombus. Consequently, incorrect answers of 96 and 24 were at least as common as the correct answer. A surprising number instinctively used Pythagoras' Theorem to work out the length of *AB*, going on to use this in a variety of inventive, but doomed, methods. Adding all the lengths given on the diagram was not an uncommon approach.
The use of Pythagoras' Theorem to find the length of a hypotenuse is understood well by most candidates and many gained full marks. There seemed to be less evidence of candidates losing a mark for giving their answer to less than 3 significant figures, although this does continue to occur. There were occasional attempts to use trigonometry but these met with no success.

Question 23

In part (i), an algebraic solution to the inequality was beyond all but the strongest candidates, although a minority was confident with the notation and found this question straightforward. The double ended inequality defeated many, who tried to manipulate it in a variety of ways, often involving 14 (8 + 6), especially $4x \leq 14$, which led to an answer of $x \leq 3.5$.
A little more success was achieved in part (ii), where occasionally a fully correct answer was seen. Some candidates scored 1 mark out of 2 for listing three correct values and omitting one, usually 0.

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