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Examiners' Report/ Principal Examiner Feedback

January 2013

International GCSE Mathematics (4BM0) Paper 02

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General Introduction

The two papers, which comprise the assessment of 4MB0, enable candidates to show that they have understood the basic building blocks of mathematics in a series of short questions (Paper 1) and extended questions (Paper 2). Success on these two different styles of papers prepare candidates well to progress to the next level of study.

Introduction to Paper 02

Overall, the standard of presentation and clarity of work was high.

Centres are advised to encourage their candidates to answer the questions within the examination paper booklet and should candidates continue their answer to a question either in another question's answer space or on an additional answer sheet they must indicate that they *are* continuing the question on another page *and* indicate that page number and then clearly identify the question on that page.

In particular, to improve performance, centres should focus their candidates' attention on the following topics (followed by the question numbers), ensuring that examination questions are read carefully:

- Subsets (Q1)
- Intersecting chord theorem and similar triangles in circles (Q3)
- Volume scale factors (Q4b)
- Histograms and associated probabilities (Q6)
- Attempted division of a vector by a vector (Q8(c) and Q8(d))
- Trigonometry (Q10)
- Matrix transformations (Q11(e) and Q11(f))

Report on Individual Questions

Question 1

It was clear from the candidates' responses to this question that subsets are challenging to most. Many candidates thought that a Venn diagram was involved and so sets with a, b and c and other letters of the alphabet appeared and also with numbers.
Candidates who indicated some awareness of subsets usually omitted $\varnothing$ and/ or {a, b, c} from their answer.

Question 2

Q2(a) was answered very well with the majority of candidates scoring full marks. A few candidates lost marks by not labelling their answers as 'salt' and 'sugar'.
Q2 (b) gave mixed answers. Some candidates scored full marks, while others gained the first B mark for adding to their values of sugar and salt. Many candidates then went on to give proportions of salt and sugar out of 190 without stating a ratio in the correct form. Other candidates used the '10' and '30' to form a ratio, for example, 3 : 1, without considering the previous amounts of salt and sugar.

Question 3

Very few candidates scored highly on this question. The use of Pythagoras' Theorem was common in both parts of the question. An incorrect intersecting chord theorem statement was commonly seen and thus meant that many candidates scored 0 marks. Some used the formula for tangent rather than extended chords, whilst others incorrectly stated $ED \times DC = AB \times BC$. Another common mistake was for candidates to decide that *BC* = *DC* (incorrect use of intersecting tangents) leading to an answer of *AB* = 8 – 6 = 2.
The use of Pythagoras' Theorem in Q3(b) was seen frequently. Of the others, some candidates spotted similar triangles but unfortunately incorrectly stated the relationship between the sides (matching the wrong sides of the triangles). Those who used the cosine rule often did not go far enough to gain the M mark.

Question 4

Q4(a) was generally done very well with most candidates scoring full marks.
In Q4(b), many candidates did not take capacity as a measure of volume so did not use 20^3 with many thinking that 30 $\times$20 = 600 ml was the correct answer, gaining no marks. Candidates found Q4(c) challenging. Most attempted some type of scale factor reduction with 64/20=3.2 seats being given as a common incorrect answer.

Question 5

Q5(a) was generally done well but the demand in the question was not always followed. Some candidates added the brackets together and others omitted to simplify their expansion as required, losing the A mark. The differentiation in Q5(b) was generally done well. Some candidates 'started again' by trying to differentiate the brackets. Some candidates attempted the product rule but not successfully so as to score any marks. In Q5(c), many candidates correctly set their derivative from Q5(b) equal to 2 – 4*x* and attempted to solve. A common error was to set their derivative equal to 0 and then try to solve for *x* . Of those that ended up with a 3 term quadratic equation, most showed that they knew how to solve such an equation.

Question 6

Candidates found this question challenging. Many thought that they were dealing with a bar diagram and so 30+40+35+7=112 was seen very often in Q6(a) (B1 B0 B0 B0), followed by 42/112 (M1 A0) in Q6(b) and then in Q6(c) some candidates did not adjust the total number of candidates (M0 M0 A0) as required, although many did and so collected the method marks.

Question 7

The most common error in Q7(a) was to not subtract 132 from 300. Q7(b) was incorrectly executed, with many candidates substituting in a single value of t (usually t = 15). Some who attempted a subtraction used the wrong values of t, usually calculating the answer for the 16th minute or the first 15 minutes. In Q7(c), many candidates again substituted t = 5 into the original equation. Of those who did differentiate, many scored full marks. Some incorrectly subtracted getting an answer of -8, or giving the positive value of 12, rather than the correct – 12 as their final answer. Many candidates in Q7(d) attempted to use the quadratic formula, with many scoring full marks. Common mistakes were incorrect rounding and substituting the wrong numbers in the quadratic formula.

Question 8

Q8(a) and Q8(b) were usually answered well. Most candidates in Q8(c) realised that $\overrightarrow{BC} = \frac{5}{4}\overrightarrow{AB}$ gaining one mark, but then proceeded to divide $\overrightarrow{AB}$ by $\overrightarrow{BC}$ losing the answer mark. Unfortunately, in Q8(d), the error of dividing a vector by a vector was repeated by many candidates who had successfully arrived at $\overrightarrow{ED} = \frac{2}{3}\overrightarrow{OA}$, gaining 3 method marks, but then divided $\overrightarrow{ED}$ by $\overrightarrow{OA}$ losing the final mark.

Question 9

Many candidates collected most of the marks for Q9(d) to Q9(f). For the candidates in Q9(a) who did not spot the right angled triangle, many attempted the use of the cosine rule. Many of these candidates obtained the correct answer of 90^o but some did not and went on to use the ½ ab*sin*C formula for the area in Q9(a)(ii) using their incorrect angle and therefore losing this B mark as well as that for Q9(a)(i). Candidates found Q9(a)(iii) challenging. A number of candidates collected the 2 marks available in Q9(c) regardless of their performance in Q9(a) and Q9(b). Incorrect rounding meant that many candidates lost a mark in Q9(d). The graphs were generally good, with careful plotting. Some candidates left out the line segment between 0 and 0.5, and some points were clearly plotted incorrectly, particularly that at x = 3.4. Relatively few candidates scored nothing for their graph. Most candidates obtained the mark in Q9(f) for their maximum value of V.

Question 10

The most common error seen in this question was the mistaken use of Pythagoras' Theorem and/ or trigonometry for a right angled triangle. Many candidates did not apply the sine and cosine rule that was printed at the end of the question. Of those candidates who did not use the properties of right angled triangles, common errors were the incorrect simplification of the cosine rule in Q10(a) (for example $100 - 96\cos 20 = 4\cos 20$) and the incorrect use of the sine rule in Q10(b), Q10(c) and Q10(d) with wrong angles/sides being paired. In Q10(e) an extra side was needed to calculate the required area. Often candidates used $\frac{1}{2} \times 7 \times 8 \sin(\angle ABD)$ or something similar. Fortunately Q10(a), Q10(b) and Q10(c) were usually well attempted and many candidates picked up at least the method mark for $\angle BEA = 45^o$ in Q10(d). For a number of candidates, an early rounding error (for example in Q10(a) or Q10(b) - 40.9^o was a popular incorrect answer for Q10(b)) usually resulted in the loss of the subsequent accuracy marks.

Question 11

Many candidates collected most of the marks for Q11(a) to Q11(d). Points were plotted and labelled well, and matrix multiplication was demonstrated by a large proportion of the candidates. Q11(e) and Q11(f) were found challenging by the candidates. Some candidates stated a combination of two transformations, with others stating an angle in the wrong direction. Others omitted the centre of rotation and others did not state that the transformation was a rotation.

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