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Examiners' Report/ Principal Examiner Feedback

January 2013

International GCSE Mathematics (4MB0) Paper 01

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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 01

Candidates found this paper challenging as evidenced by the number of questions that scored no marks. In particular, to improve performance, centres should focus their candidates' attention on the following topics, ensuring that examination questions are read carefully.

- Mensuration
- Bearings
- Statistics: median
- Symmetry
- Defining a range for a given function
- Circle geometry
- Percentages
- Probability
- Constructions: locus and using rulers, compasses and protractors
- Significant figures

The methods identified within this report and on the mark scheme may not be the only legitimate methods for correctly solving the questions. Alternative methods, whilst not explicitly identified, earn the equivalent marks. Some candidates use methods which are beyond the scope of the syllabus (such as the vector cross product for the area of a triangle) and, where used correctly, the corresponding marks are given.

Report on Individual Questions

Question 1

The concept of prime numbers caused a challenge for many candidates and, as a consequence, a third of candidates scored no marks for this question.

Question 2

Candidates fared better on this question with many scoring full marks as they correctly substituted the given coordinates (M1) to arrive at the required answer of 7 (A1). Incorrect substitutions or leaving their response as $p = \frac{6x-4}{y}$ led to a small minority scoring no marks at all.

Question 3

Good work was seen in this question as many correct methods (M1) leading to an answer of 270 (A1) were seen. There was evidence, however, that some candidates were confused between LCM and HCF as the answer of 3 was seen.

Question 4

Candidates found Q4 challenging and did not apply the demand that was asked in the question of stating *the number of lines of symmetry* or *the order of rotational symmetry*.

Question 5

There was a mixed response to this question as some candidates did not apply the meaning of the word 'irrational'. As a consequence, many answers of the form $\sqrt{25},\ \sqrt{1},\ \sqrt{\frac{16}{25}}$ were seen earning no marks at all. Indeed, $\sqrt{\frac{16}{25}}$ proved to be a popular, but incorrect, addition to an answer line along with two correct values. Approximately half the candidates achieved full marks on this question.

Question 6

Candidates achieved no marks for this question if they gave the bearing as 112° (from 180° - 68°) or as 292° (from 360° - 68°). Nearly 40% of candidates did however either subtract 112° from 360° or add 68° to 180° (M1) to arrive at the required answer of 248°.

Question 7

Candidates found this a challenging question. The question required that candidates should show their working clearly. Writing down the answer of $10\sqrt{5}$ earned no marks at all. An initial breakdown, for example $\sqrt{500} = \sqrt{100 \times 5}$ (M1), was required to earn the second mark for $10\sqrt{5}$ (A1).

Question 8

Two thirds of candidates identified an answer of 30° and therefore scored one mark on this question. Recognising that there was a second answer (150°) in the given range was identified by some candidates with only about 40% of candidates achieving this second mark.

Question 9

In Q9(a), many candidates were able to write down the next two terms in the sequence correctly (B1, B1). However, many candidates were unable to score the available mark in Q9(b) as they seemed to have difficulty in expressing clearly the pattern in the differences between successive terms. To say '*it was doubling'* was a very common mistake.

Question 10

The majority of candidates did not apply the concept of a range and simply tried to solve $x^2 - 12 = 0$, others made lists of $f(x)$ with x = 0, 1,2,3,... Although the appearance of '-12' did earn the first mark (M1), very few, (under 10% of candidates), realised that $f(x) \geq -12$ was required for the final mark (A1).

Question 11

Good work was seen in this question as candidates demonstrated algebraic techniques. Two thirds of candidates scored the first two marks for isolating the term in u (M1, M1). Some candidates lost the final mark as a consequence of an arithmetical slip but over half of the candidates achieved the final mark (A1) for $u = -\frac{3d - vt}{2t}$ (or equivalent).

Question 12

This mensuration question was found to be challenging by candidates. Very few noted that a correctly substituted $C = 2\pi r$ (M1) was required here. Many instead, used formulae for the volume or surface area of a sphere or the area of a circle. Many candidates did not convert their units from metres to kilometres (M1 ind) as required or thought incorrectly that 1 m = 1000 km and ended up with an answer too large. As a consequence, a third of candidates achieved the required answer of 12756π (A1).

Question 13

Q13(a) was done well with many correct answers of 23.95 (B1) seen. The requirement in Q13(b) to write their answer to Q13(a) in standard form proved challenging. It was not uncommon to see answers such as 2.395×10^{-3} or 2.395×10^{3} rather than the required answer of 2.395×10 (B1). Candidates fared little better with Q13(c) with many believing that 23.95 rounded to 3 significant figures was 23.9 or 24 rather than the required answer of 24.0 (B1).

Question 14

The majority of candidates correctly identified the required answer to Q14(a) the elements f and g (B1) and Q14(c) the element h (B1) but Q14(b) proved to be more problematic with many candidates missing out the element h. About A third of candidates identified correctly that the elements required for $(X \cap Y)'$ were a, b, c, f, g, h (B1)

Question 15

The correct matrix (B1) was identified by the majority of candidates in Q15(a). The method of matrix multiplication was understood in Q15(b) but a significant number of candidates calculated AB instead of BA. Consequently, the incorrect matrix of $\begin{pmatrix} -11 & -22 \\ 11 & 22 \end{pmatrix}$ was seen on a significant minority of scripts. Just over half of candidates did arrive at the required correct answer of $\begin{pmatrix} -10 & -7 \\ 30 & 21 \end{pmatrix}$(B2).

Question 16

This question, based on the formula for the area of a parallelogram, was found challenging by candidates with less than 20% of them achieving full marks. Rather than an answer of $7\times 6=42\ (\text{cm})$ (B1) in Q16(a), the majority of candidates mistakenly thought the area was $7\times 8=56\ (\text{cm})$.There were incorrect applications of Pythagoras' theorem to Q16(b). As a consequence, it was uncommon to see $42\div 8=5.25\ (\text{cm})$ (M1, A1).

Question 17

Over three-quarters of the candidates scored two or more marks on this question showing consummate algebraic skills. Many correctly removed the denominators and, except for an error in the left hand side numerator (+ 3 instead of -3), showed a correct method (M1, M1). A correct answer of $-\frac{7}{8}$ (A1) appeared on half of the scripts. As a result of the sign error already mentioned, an incorrect answer of $-\frac{1}{8}$was seen on approximately a quarter of scripts.

Question 18

Candidates were asked to show their working in this question. As a consequence, those candidates who just substituted and then wrote down the required answer earned no marks here. The minimum requirement for full marks was an attempt to substitute and add two fractions (M1), followed by a division (M1 dep). A resultant isolation of *b* in the form $\frac{17}{6}\times\frac{12}{35}$ (or equivalent) (M1 dep) was seen on about half of the scripts. 40% of candidates obtained the required fraction of $\frac{34}{35}$ (A1).

Question 19

In Q19(a) there were many non-responses and of those that did write something down, few realised that $2AD^2 = 26^2$ (M1) with many incorrect statements of the form $2AD^2 = 26$ or just *AD* = 26 seen. A common incorrect answer seen was 3.61 cm with the correct answer being 18.4 cm (A1). Q19(b) had only a minority of candidates demonstrating how to calculate the area of a sector (M1). Without this method, candidates could not achieve method for subtracting from the area of the square (M1 dep). An answer of 72.4 cm^2 (A1) was, as a consequence, only seen on about one-fifth of the scripts.

Question 20

This question on simultaneous equations was well answered with nearly three-quarters of candidates gaining full marks. The work was generally well set out with candidates demonstrating excellent techniques in balancing equations (M1), eliminating either *x* or *y* (M1) to arrive at *x*= -19 (A1) and *y* = 14 (A1).

Question 21

Most candidates were able to score some marks on this Venn diagram question by the appearance of 3 (B1) in the region $(T \cup C)'$. Writing 18 and 16 in the sets *T* and *C* lost the other mark in Q17(a) where $18-x$ and $16-x$ were expected (B1). Where the value of 3 was missing from the diagram in Q21(a), a special case method mark was given in Q21(b) for $(18-x)+x+(16-x)=32$ Just over half of the candidates were able to write down the correct equation of $(18-x)+x+(16-x)+3=32$ (M1) with the majority of these candidates arriving at the required answer of 5 (A1).

Question 22

This question on vectors was found challenging by candidates. A significant number of candidates did not apply the factor of 5 and others treated the vectors as fractions. As a consequence, few candidates provided the correct answer to Q22(a) as $\begin{pmatrix} -15 \\ -20 \end{pmatrix}$ (M1, A1). Many candidates, however, recovered in Q22(b) by correctly using Pythagoras (M1) to arrive at a follow through answer (A1).

Question 23

In Q23(a), rather than dividing £5000 by 0.8 (M1), many multiplied by 0.8 and either left their answer as £4000 or added their £4000 onto £5000 to give an incorrect answer of £9000. As a consequence, few correct answers of £ 6250 were seen. In Q23(b), many candidates used their answer to Q23(a) rather than the value of £5000 (the price Ahmed bought the car for). As a consequence, 31.2% proved to be a common incorrect answer. Other candidates converted the loss of (£5000 - £4300 = £700) to a percentage thus giving an incorrect answer of 7%. Some answers of 14% (M1, A1) were seen.

Question 24

Many candidates found it challenging to separate the given inequality into the two separate inequalities $-7 \leq 3x$ (M1) and $2x \leq 5$ (M1). Of those candidates who did score at least one of these marks, many were able to isolate *x* correctly (A1) but few were able to list the required integer values (A1).

Question 25

Candidates found this a challenging question. Q25(a) saw many evaluate $\frac{1}{4} \times \frac{2}{5}$ or interpret *either brown or green* as neither colour and write down $\frac{35}{100}$. It was rare to see $\frac{1}{4} + \frac{2}{5}$ (M1) = $\frac{13}{20}$ (A1). Q25(b) saw candidates writing $\frac{25}{100} \times \frac{24}{99}$ instead of $\frac{25}{100} \times \frac{40}{99}$ (M1) as the opening part of the calculation. An answer of $\frac{1}{5}$ followed a method of replacement and this was awarded (M1, M0, A0). Few candidates correctly doubled $\frac{25}{100} \times \frac{40}{99}$ (M1) to arrive at the required answer of $\frac{20}{99}$ (A1).

Question 26

Except for the occasional arithmetic error, Q26(a) was answered well as the majority of candidates showed how to calculate the mean as 117.4 (M1, A1). Q26(b), writing down the mode, also proved to be done well as 117 (B1) was seen on about two-thirds of scripts. Q26(c) was seen to be more challenging as many candidates thought that the median was $\frac{108+124}{2}$ giving an incorrect answer of 116. Candidates who attempted to write down an ordered list earned the method mark (M1). A correct ordered list led about a third of candidates to the required answer of 117.5 (A1).

Question 27

Some candidates demonstrated the idea of an angle at the centre and an angle on the circumference and a doubling of one angle. Unfortunately, this led some weaker candidates to $\angle AOC = 20^\circ$ rather than the required 80° (B1). Candidates with an incorrect $\angle AOC$ were unlikely to pick up any further marks in Q27(a). However, candidates with the correct value for $\angle AOC$ arrived at the required answer of 50° (B1) and gave at least one suitable geometric reason (B1). Q27(b) proved to be more challenging to candidates. Many assumed, without any semblance of proof, that *AOCD* was a cyclic quadrilateral and wrote down an answer of 100°. To gain full marks the candidate was expected to identify that either $\angle DAO$ or $\angle DCO = 90^\circ$ with a suitable reason (B1).

Question 28

Two-thirds of candidates scored no more than the first two marks on this question by correctly (and accurately) constructing the perpendicular bisector of *AB* (M1, A1). A significant number of candidates did not accurately place the position of *C* (B1) as the incorrect interpretation of *the distance of C from AB is 6 cm* led to many constructions showing *AC* = *BC* = 6 cm. Whilst there were a number of correct arcs of radius 4 cm drawn from *C* (M1) and correct arcs of radius 6 cm drawn from *B* (M1), a small number of candidates were then able to complete the task successfully and shade the correct region required (A1 ft).

Question 29

Q29(a) and Q29(b) were well answered with the majority of candidates identifying the correct trigonometrical ratio of tan (M1) leading to the required angle of 36.9° (A1) in Q29(a). A correct use of Pythagoras' theorem in Q29(b) (M1) led many to the required answer of 25cm (A1). Q29(c) proved to be challenging for most candidates as the area of *ABCD* was found rather than the required area of *ABD*. Some candidates did manage to obtain a mark for correctly determining AD = 17.3 (M1) but only about one-fifth of candidates successfully used the formula of $\frac{1}{2}bc\sin A$ correctly (M1 dep) to arrive at the required answer of 199 cm^2 (A1). Some candidates did not answer to the required degree of accuracy in Q29(a) and Q29(c) and, as a result, lost one mark.

Grade Boundaries

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