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Principal Examiner Feedback

March 2012

GCSE Mathematics (2MB01)
Paper 5MB2H_01 (Non-Calculator)

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March 2012
Publications Code UG031139

GCSE Mathematics 2MB01
Principal Examiner Feedback – Higher Paper 2

Introduction

This paper gave candidates ample opportunity to demonstrate their understanding. Some very good attempts at the paper were seen.

Several questions on this paper (e.g. Q1, Q4, Q6 and Q7) highlighted the problems that many candidates have when required to divide one whole number by another.

Candidates are expected to know the rough metric equivalents of pounds, feet, miles pints and gallons. Centres are reminded that these are stated in the specification.

In algebra work, candidates need to be more accurate in their use of brackets. Marks were lost unnecessarily in Q13 and in Q17 through poor use of brackets. Many candidates seemed not to appreciate the need for brackets at all.

The use of three-letter notation to name angles was a weakness. In Q10 some candidates used single letters for angles, e.g. *B*, or double letters, e.g. *BP*. In Q12 many candidates marked angle *TPS* as 24° on the diagram although the question stated that angle *TPO* = 24°.

Candidates must take note when questions are starred to indicate that quality of written communication is to be assessed. They should always make sure that full working is shown to demonstrate their answer to the question set and present this working in a logical manner. When geometric reasoning is involved candidates must use the correct terminology.

Report on individual questions

Question 1

This question was answered well with the majority of candidates giving a fully correct answer or gaining two marks for using a correct method. Correct answers were often the result of multiplying by 2.5 and many candidates used a chunking method, e.g. 220 + 220 + 110. Inefficient methods such as dividing by 12 and then multiplying by 30 invariably produced rounding errors. Multiplication by 3 was commonly seen and wrong.

Some candidates worked out the amount of each ingredient needed for 15 scones rather than 30 scones but gained some credit for showing an otherwise correct method. Often, candidates seemed to find difficulty in structuring their working so that their methods appeared confused and error strewn.

Question 2

Part (a) was answered well. The most common explanation was that 271 cannot be a term in the sequence as it does not end in either 2 or 7

Some candidates successfully anticipated the nth term, as required in part (b), and explained that adding 3 to 271 gives 274 which is not a multiple of 5. Other reasoning proved difficult to explain and was often insufficient. Those who used 271 – 3 or said that 271 is not a multiple of 5 or that 271 is a prime number made correct but irrelevant statements.

Part (b) was also answered well with many candidates able to give the nth term of the sequence as $5n - 3$. Common incorrect answers included $5n + 3$, $2n + 5$, $-3n + 5$ and $n + 5$

Question 3

Overall, this question was answered very well and many candidates were able to find the coordinates of the midpoint of the line. Often, this was without any working out being shown. A common incorrect answer was (2, 1) which earned one mark for $y = 1$. Other errors included averaging the digits of each coordinate pair to give (1.5, 2) or treating the original coordinates as the decimals 1.2 and 4.0 and working out the average as 2.6, leading to an answer of (2,6).

Question 4

Many candidates did not seem to realise that the dimensions of the container and the dimensions of the box were given in different units and failed to convert m to cm or cm to m. Candidates who tried to convert the units for a volume usually failed – a typical incorrect conversion was $200\ m^3 = 20000\ cm^3$.

Those who converted a length were usually more successful. The most common approach to the question was for candidates to find the volume of the container and the volume of the box and to then divide the volume of the container by the volume of the box. A few candidates attempted the division the wrong way round, usually if their volumes were 200 and 40000, as they divided the larger number by the smaller. Working out $500 \times 1000 \times 400$ to find the volume of the container often resulted in an answer with too few zeros and the division by 40000 also caused problems. Many candidates attempted to give an answer of 5000 from incorrect working.

Some candidates did not find the two volumes but found the number of boxes that would fit into each dimension of the container and were then left with the relatively straightforward calculation, $25 \times 20 \times 10$. Candidates who used this method were generally more successful.

Question 5

There were many correct answers in part (a). When one mark was awarded this was usually for $8e$ with $8e + 11f$ being a common incorrect answer. The most common answer awarded no marks was $4e + 11f$.

Part (b) was also answered quite well. Common incorrect answers included $4(t + 2.5)$, $4(t + 6)$ and $2(t + 5)$.

Unfortunately many candidates did not understand what was required in part (c). Some added 3 to 2 and then multiplied $(p – 1)$ by 5 and it was quite common for candidates to treat the question as $(3 + 2)(p – 1)$ resulting in an expansion with four terms. Quite a few candidates did multiply 2 by $(p – 1)$. Some who obtained $3 + 2p – 2$ were unable to simplify it correctly or did not attempt to simplify it.

In part (d) full marks were rare but candidates often gained one mark for a partial factorisation.

Question 6

This percentage question was not answered as well as might have been expected. Incomplete methods were very common and usually it was division by 12 that was omitted. Few candidates had any difficulty working out 20% of 30 000 as 6000 but some gave this as the final answer. Many went on to subtract it from 30 000 but then gave 24 000 as the final answer, failing to realise that the question asked how much money John had left *each month*. Some candidates chose to start by working out John's monthly pay before deducting 20%. The division of 30 000 by 12 was often done incorrectly.

Question 7

The majority of the candidates who stated a correct conversion of 5 miles = 8 km or 1 mile = 1.6 km were then able to find 10 miles = 16 km and subsequently achieve one of the correct answers. Converting 10 miles into km was more popular than converting 60 km into miles. Some candidates who attempted the latter ran into difficulties when trying to divide 60 by 8. It was pleasing that the vast majority of candidates gave the necessary units with their answer. A significant number of candidates did not state a correct conversion factor (1 mile = 1.8 km was quite common) but many then went on to use their conversion factor in a correct method.

Question 8

This question was answered very well with many candidates drawing the correct straight line. An accurate table of values was often seen, but not always; substitution of negative values of x proved to be the most challenging. Some candidates plotted the points correctly but failed to join these up to produce the straight line required. Some candidates gained one mark by drawing a straight line through the point (0, –2) with an incorrect gradient (usually without a table of values) or by drawing a line with a gradient of 4

Question 9

Many candidates drew a net rather than a plan in part (a) and gained no marks. The fact that nets were so common suggests that candidates were not as familiar with the topic of plans and elevation as they should have been. When a rectangular plan was drawn, it was not uncommon for at least one dimension to be wrong.

Candidates were more successful in part (b) with many able to draw a correct sketch of the prism. Some candidates attempted to display more faces than could be seen from any one angle, thus distorting the sketch. Triangular prisms and pentagonal prisms were quite common among the responses awarded no marks.

Question 10

Many candidates were able to score the three marks for finding $x = 70$. The two marks for giving correct reasons proved more elusive as many candidates simply described the process they had used to reach 70 but failed to give any correct geometrical reasons.

Most candidates were not able to give full clear statements with the correct naming of the type of angles used. Some gained one mark for giving at least one correct reason (quite often this was 'opposite angles').

The minimal phrases that were often used, e.g. 'straight line' rather than 'angles on a straight line add up to 180°' and 'isosceles triangle' instead of 'base angles of an isosceles triangle are equal', were insufficient to gain any credit. Some candidates referred to '*F* angles' and '*Z* angles' instead of 'corresponding angles' and 'alternate angles' and this is not acceptable.

Question 11

In part (a) many candidates knew that $5^0 = 1$. The most common incorrect answers were 0 and 5.

Part (b) was answered less well with 9 being the most common incorrect answer. Some candidates knew that the power of $\frac{1}{3}$ indicates the cube root but failed to evaluate it and gave $\sqrt[3]{27}$ as the answer.

In part (c) many candidates were not able to interpret a negative index as a reciprocal. Common incorrect answers were – 8 and – 6

Question 12

Although 90° and 24° angles were often clearly marked on the diagram these were not always in the correct place. There was generally a good recognition of the 90° angle between a radius and a tangent. The question stated that angle *TPO* = 24° but a large number of candidates took angle *TPS* to be 24° and this resulted in 156 being a common incorrect answer. Some candidates gave angle *SOT* as 48° from incorrectly applying 'the angle at the centre is twice the angle at the circumference'.

Question 13

This question proved to be a good test of algebraic techniques including the use of brackets, expansion of brackets and working with negative signs. The most common approach involved attempting to subtract the area of the triangle from the area of the rectangle; here the use of brackets and negative signs was poor. The final mark for the quality of written communication could only be awarded if the candidate had clearly shown, with fully correct algebra, that the shaded area is $18x – 30$. Some candidates arrived at an answer of $18x – 30$ with working that was unclear or incorrect.

Question 14

A large number of candidates did not realise that the number given was a recurring decimal and a very common incorrect answer was $\frac{1}{4}$. Of those who used the correct decimal, the most successful candidates were those who used $100x = 25.5555\ldots$ and $10x = 2.5555\ldots$ leading to $90x = 23$. Those who used $x = 0.25555\ldots$ and $10x = 2.5555\ldots$ often made a mistake in subtracting and those who used x and $100x$ and subtracted correctly often left their answer as 25.3/99.

A considerable number of candidates used the incorrect decimal 0.252525… and scored no marks.

Question 15

This proved to be a very difficult question for candidates and fully correct solutions were rare. Relatively few candidates knew that the gradient of the perpendicular line is given by $-1/m$. Many of those who got as far as $y = 1/3x + c$ did not show the substitution of $x = 6$ and $y = 3$ to find the value of c.

Question 16

Many candidates had little or no understanding of surds. In part (a) those who multiplied the numerator and denominator by $\sqrt{5}$ scored one mark and many went on to give their answer as $15\frac{\sqrt{5}}{5}$ and scored the second mark. Some candidates attempted to simplify $15\frac{\sqrt{5}}{5}$, but these attempts were not always successful.

In part (b) relatively few candidates multiplied out the brackets to give four correct terms connected by addition signs. Some made careless errors, e.g. $1\times1 = 2$ and $\sqrt{3}\times\sqrt{3} = 9$. Most of the candidates who simplified the four terms to $4 + 2\sqrt{3}$ were able to identify the value of a and the value of b although some gave the value of b as $2\sqrt{3}$. A common error was for the expansion of the brackets to result in only two terms, 1×1 and $\sqrt{3}\times\sqrt{3}$

Question 17

This question was answered well by the most able candidates but proved too difficult for many. Those who appreciated the need for a common denominator were often let down by poor algebraic skills, expanding brackets incorrectly or leaving them out altogether. Those who used a correct common denominator and got further through the solution often cancelled incorrectly. Some candidates arrived at the correct answer but then attempted to simplify it and cancelled incorrectly. These candidates lost the final accuracy mark.

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Order Code UG031139 March 2012

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