Principal Examiner Feedback

November 2012

GCSE Mathematics (2MB01) Higher
5MB3H (Calculator) Paper 01

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GCSE Mathematics 2MB01
Principal Examiner Feedback – Higher Paper Unit 3

Introduction

Many students appeared well prepared for the paper and were able to answer most questions with confidence. There were a few who struggled to get marks on any of the questions. In general the standard of algebra was pleasing but there were too many candidates who wrote down clearly wrong answers without showing any sign of returning to the question. Formal algebra seems to be problem for some with too many resorting to trial and improvement.

Reports on Individual Questions

Question 1

A large number of candidates failed to see the significance of the word ' integer' and so gave a fraction or decimal as their final answer. Most candidates were able to reach a value of 3.6 or 3.7 by either solving the equation $3x + 5 = 16$ or dealing correctly with the inequality. Algebraic methods did not have to be used and some candidates, aware of the meaning of integer, simply substituted in integer values of x until the inequality became false.

Question 2

The number of those trying a formal algebraic approach and of those using ad hoc methods was roughly the same. In the algebraic approach, a common error was to give the age of Peter as $4x$ rather than $x + 4$. Some candidates did not really engage algebraically with the description and came up with $x + 4 - 2 = 26$, presumably from using just the 3 alphanumeric symbols they could see in the stem of the question. Candidates who set up a correct, but unsimplified equation such as $x + x + 4 + x - 2$ generally went on to score full marks for the question. Many candidates did not use any algebra at all. These ranged from dividing 26 by 3 and then altering the 8.7s to integers that satisfied the conditions for the ages. This often was successful as the 'target' number of 26 was small.

Question 3

This was a circumference of a circle question, set in context. A surprising number of candidates did not know the correct formula for working out the circumference. Candidates were expected to supply suitable units for their answer as none were given on the answer line.

Some candidates assumed that this was a question about bounds, despite the fact that no degree of accuracy was given. Thus, some used $\pi \times 19.5$ or $\pi \times 20.5$ depending on whether they interpreted the demand as ' What is the least length that it could be' or 'What length she should have to make sure'? Other candidates interpreted this as a lower bound of their calculated 20π answer, again failing to notice that there was no statement about the accuracy of the measurement of the diameter in the stem of the question.

Question 4

This question was well answered. Although the demand of the question was about total costs, most candidates chose to deal with the three individual costs (bread, milk and tea bags). If they did this and then stated Gordon was still not cheaper they were awarded the marks. Any sensible rounding up or down of individual prices was accepted. Some candidates made life difficult for themselves by laboriously finding 10% and then 5% and then subtracting. This often led to errors.

Question 5

Response to this straightforward question was not good. Many candidates measured the bearing from an East/West direction, producing a bearing of 020°. Other common answers were 110°, 160°, 200° and even 340°.

Question 6

Both parts were generally well answered. Candidates had been well drilled in how to solve equations.

In part (a), a few could not expand the brackets correctly but often were able to solve their resulting equation.

In part (b), most students could carry out balancing operations although sometimes with a lack of care.

Question 7

This standard Pythagoras question was well answered. A few candidates tried to use the cosine rule. They did not earn any marks until they had got to the equivalent stage to using the Theorem of Pythagoras.

Question 8

There were many excellent answers to this functional skills question. The best and most common approach was to see that there were 3 tins from Paint For You and 10 tins from Paul's Paints. The price, including VAT, for a 2.5 litre tin was then worked out and total prices from the two shops compared. A minority of candidates were not aware that they had to show that whole tins had to be bought and used a unitary type of method, for example by comparing the unit costs of paint from the two shops and then making a recommendation from these. Some candidates when working out the VAT equated 10% to 83p and 20% to £1.66 instead of the correct £1.67. A few took 20% off the £8.35.

Question 9

Most candidates attempted this by finding the sum of the areas of the constituent cuboids. The most common successful approach was $9 \times 2 \times 8 + 5 \times 5 \times 8$ although many also 'saw' a 7cm by 8 cm by 5 cm cuboid. Approaches which involved finding the correct cross sectional area were rarer. A common error was to find the volume of the bottom 7cm by 8cm by 5cm cuboid correctly, but then to confuse some of the measurements of the remnant 4cm by 2 cm by 8 cm cuboid. A minority of candidates simply worked out 9×7 as their cross-sectional area. A few confused volume with an attempt at the surface area.

Question 10

Part (a) was a straightforward reflection in the line $x = 3$. Common errors were to reflect in a line $x = k$ with k not equal to 3, or to reflect in the line $y = 3$. However many candidates had a transformation that was not even a reflection.

Part (b) was quite well answered although many candidates gave the sense as (90°) clockwise instead of anticlockwise.

Question 11

Most candidates were able to find the correct solution of $x = 3.3$. The most common error was to evaluate at $x = 3.2$ and at $x = 3.3$ and then state the answer as 3.3. Good candidates also tested at $x = 3.25$ and then made the correct decision between 3.2 and 3.3. Virtually all candidates were able to evaluate correctly the left hand side of the cubic equation for at least two or three values of x.

Question 12

There were two slightly different approaches to this question depending on whether the candidate treated the problem as involving the 'holistic' formula $\pi r^2 h$ or as an analogy with the prism formula 'cross-sectional area × length'. Not all candidates could convert $\frac{1}{2}$ litre to millilitres and hence cm^3. Many found the height correct to 1 decimal place by trial and improvement. This was acceptable for full marks. The most common errors were to use $2\pi r$ in place of $\pi r^2 h$ and to use the formula for the total surface area instead of the volume formula.

Question 13

This was a standard easily recognisable reverse percentage problem and many students were able to get the correct answer. Many others found 12% of 168000 and subtracted. It is remarkable that some candidates multiplied 168000 by 1.12 to get a larger answer without realising the implications of what that was telling them.

Question 14

Most candidates scored either 1 mark (for AB = 5 cm), or full marks for finding the length of AD correctly. It was very common to see the sine rule being used in the right angled triangle ABD, sometimes involving the right angle and sometimes the 54°. A few candidates used tan and Pythagoras in triangle ABD. Providing all the steps involved were logically correct, they were awarded the two method marks. Often this approach led to an answer outside the acceptable range, due to accumulation of rounding errors.

Question 15

It was nice to see the occasional ± to give a fully complete answer. Many candidates, however, interpreted $6m^2$ as $(6m)^2$ and ended up with $m = \frac{\sqrt{k}}{6}$. Some candidates were not careful enough with the placing of the square root sign so it was difficult to distinguish $m = \frac{\sqrt{k}}{6}$ from $m = \sqrt{\frac{k}{6}}$

Question 16

Many candidates could not give the correct answer to part (a). Although 2.5 is really the sole correct answer allowance was made for those who put down 2.5%, bearing in mind the context. Many who got part (a) wrong went on to score full marks for part (b), including some of those who did not use the given formula but worked it out year by year. In some cases this latter method led to an accumulation of rounding errors.

Question 17

Both parts were generally answered well. In part (b) a few candidates gave the answer directly in standard form and scored 1 out of the 2 available marks.

Question 18

There were many pleasing successful answers to both parts of this question. Part (a) was generally answered correctly, although in some cases the notation left something to be desired. A common minor error was to write column vectors as, for example $\left(\frac{2}{4}\right)$.

Candidates who were successful on part (b) usually found the coordinates of the points *M* and *N*, often with the aid of a sketch on the axes at the start of the question.

A less common, but also valid method was to note that the vector $\vec{MQ} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and the vector $\vec{QN} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ with the answer then being found by vector addition.

There was a great deal of confusion between vectors and coordinates by many candidates and when to subtract and when to add.

Question 19

Many students had been well-prepared for these two parts and were able to gain full marks.

On part (b) several students lost marks because they did not evaluate the terms in the cosine rule in the correct order. A small fraction of those that did evaluate in the correct order omitted to square root so they gave an answer that was greatly out of proportion with the other two sides.

Question 20

This proved to be a challenging question with its involvement of algebraic fractions and area scale factors. Many candidates were able to state a correct linear scale factor. Very few could then go on and simplify it. Candidates had to be able to realise that there must be an algebraic connection between a rather complex looking scale factor and the given expression of $x^2 + 2x + 1$. This required the ability to see the factorisation of $(x^2 - 1) = (x + 1)(x - 1)$ and of $x^2 + 2x + 1 = (x + 1)^2$

Question 21

This was a standard simultaneous/one quadratic equation question. Many candidates were able to take a first step of substituting in the second equation for *y*. They were often less successful in expanding the squared term correctly. It was surprising that many candidates who reached the correct $5x^2 + 20x = 0$ chose to use the quadratic formula rather than factorise. Many weaker candidates could not resist the temptation to square root the second equation to get $x + y = 5$

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