Principal Examiner Feedback

March 2012

GCSE Mathematics (1380) Higher
Paper 3H (Non-Calculator)

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GCSE Mathematics 1380
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Introduction

Careless arithmetic still causes many candidates to lose marks; not only the long multiplication and division but very simple sums sometimes seem to be beyond many of the students. In Q6, for example, 2×175 was frequently given as 250. Evidence of poor arithmetic was also seen in Q2, Q3a, 3Qb, Q8 and Q11.

Candidates should be clearly aware of when it is inappropriate to attempt to further simplify algebraic expressions and formulae. It was common to see candidates attempt to simplify what should have been final algebraic solutions and therefore spoil correct answers. For example in Q1a attempts were made to simplify $a + 2b$, similarly in Q9.

When additional information is given for a geometry based question, for example Q11, candidates would be well advised to mark this clearly on the diagram.

Report on individual questions

Question 1

In part (a) the negative signs within the question were often used incorrectly. Careless arithmetic was another cause for the wrong answer to be produced. The correct answer of a + 2b was, at times, simplified incorrectly causing the loss of a mark.

More success was evident in the expansion in part (b).

Question 2

The majority of candidates realised the need to work out an estimate rather than the actual value. However, many candidates failed to round the given numbers to one significant figure and therefore ended up attempting a much harder calculation than necessary for example, the denominator was often rounded to 220 rather than 200. Those who did approximate to $\frac{60 \times 0.8}{200}$ then failed to evaluate this correctly with careless errors such as 60 × 0.8 given as 46 or 480 and 48 ÷ 200 being given as 2.4 or 0.0024 . Some candidates tried to simplify $\frac{60 \times 0.8}{200}$ incorrectly as $\frac{600 \times 8}{2000}$ multiplying each term in the numerator by 10 presumably to avoid the decimal but only multiplying the denominator by 10 . Some answers were left as a fraction rather than a decimal as required by the demand of the question. A small minority of candidates did, however, attempt to work out the actual answer rather than an estimate. This gained no marks.

Question 3

Following an incorrect answer in part (a), candidates who presented their work in an organised fashion were more likely to score method marks then those who worked in an unorganised and chaotic fashion. Too often the attempted method was unclear with numerous attempts at multiplication and/or addition scattered across the working space with no clear overall method. When the method of solution was clear then method marks were frequently awarded for the correct overall method. Candidates attempting the partition method of multiplication occasionally failed to score marks as they wrote £2.37 as multiplication by 2, 30 and 7 rather than 200, 30 and 7

In part (b) the vast majority of candidates were able to correctly calculate 10% of 85 however, the subsequent necessary subtraction was less well done. £77.50 was a very common wrong answer from £85 - £8.50. Other candidates were clearly attempting the subtraction but managed to end up with an answer larger than £85. A minority of candidates failed to do any subtraction and so gave the wrong answer of £8.50 but were still able to pick up one method mark.

Question 4

Part (a) was well answered.

The answer given in part (b) was just as likely to be the incorrect value of 85 as it was to be the correct value of 95. Full reasons were only given by a minority of candidates; more often than not just the reason ‘corresponding angles’ or ‘alternate angles’ was present which, by itself, was insufficient to gain the mark for reasons.

Question 5

The answers to part (a) were surprisingly varied for what should have been a very straight forward question on a higher paper. Some candidates attempted to multiply probabilities, others used 7 as the denominator rather than the numerator and there was also evidence of poor arithmetic resulting in the denominator being given as 11 rather than 12.

In part (b) those candidates that realised that there needed to be 15 counters in the bag were generally able to score both marks. However, some candidates failed to read the question properly and so gave their answer as the number of green counters that needed to be added to the bag or as a probability.

Question 6

Many candidates were able to score full marks on this question. The majority knew that 1.5 litres is equivalent to 1500 ml. From here, repeated addition or subtraction were more popular methods than division although arithmetical errors often meant that the final answer was given as 7 or 9 rather than 8. Very few candidates used the efficient method of taking the fraction $\frac{1500}{175}$ and then cancelling it down to $\frac{60}{7}$ then $8\frac{4}{7}$.

Question 7

The structure of a stem and leaf diagram was well understood with the vast majority of candidates scoring full marks in part (a). The most common errors were to miss out an item of data and to give the last stem as 100 rather than 10. Those candidates who found the median from counting on the diagram were generally more successful than those who used the number of data items. In the latter approach the most common error was to work out $\frac{n}{2}$ rather than $\frac{n+1}{2}$ and therefore find the 9^{th} rather than the 9.5^{th} value. A significant number of candidates did not realise that they could find the median from the stem and leaf without starting again and listing all the values again.

Question 8

Candidates who used an algebraic method in part (a) were more likely to give the correct solution than those who used a trial and improvement approach. The most common error was, for example, to show the intention to subtract one from both sides of the equation and then forget to do this to both sides but as long as the intention was clear then a method mark could be awarded.

In part (b) the most popular approach was to substitute -2 for *y* in both sides of the equation and show that the answer each time was -4. Some candidates did successfully rearrange and solve the equation to get $y = -2$ but many were unable to rearrange successfully.

Question 9

A variety of incorrect formulae were seen, the most common being $S = B + T$. Some candidates gave the correct answer of $S = 20B + 30T$ but then spoilt their answer by attempting to simplify and gave $20B + 30T = 50S$. A mark was deducted for the incorrect simplification.

Question 10

The ability to combine both bits of information was the key to success in this question. Those candidates who used either the true value of the coins or the fact that the 10p coin was worth two times as much as the 5p coin with the given ratio in the correct way generally scored at least one mark. It was disappointing to see so many candidates who had overcome this hurdle then ignore the instruction to give their ratio in its simplest form. Answers of 10 : 30 or 5 : 15 were seen as often as 1 : 3 as the final answer. The most common incorrect method of solution was to attempt to divide an amount in the ratio 2 : 3 rather than use this in the correct way.

Question 11

Many attempts at the correct method of solution whether or not these were successful generally depended on the candidate's ability to use the correct formula to work out the area of a triangle and correct arithmetic. Too often, base × height without the division by 2 was used for the area of a triangle and calculations such as 12 × 12, 54 ÷ 2, 9 × 6, 27 + 18, 144 – 45 were worked out incorrectly. Candidates do need to make their method of solution clear in questions like this where there are a number of calculations and would do well to present working in clear ordered stages. The unnecessary use of Pythagoras' theorem was occasionally seen. Many candidates failed to pick up marks for not labelling or identifying which sides had a length of 3, 6 or 9.

Question 12

Common errors seen in part (a) were to plot at the end of the interval rather than mid-interval and to omit the final point or fail to join the last two points. Points were sometimes plotted correctly but then not joined.

Part (b) was well answered.

Question 13

Candidates who were able to draw the correct graph (or any graph in (a)) frequently were unable to make the connection between (a) and (b).

The majority of candidates who drew a correct graph in part (a) did so without the aid of a table of values. Either plotting points directly onto the graph or using the properties of $y = mx + c$.

Question 14

Common errors in part (a) were to have the wrong number of zeros or to write the answer as 0.0000643 .

In part (b) those candidates that worked with the numbers in standard form were more likely to be awarded marks than those who attempted to first take both numbers out of standard form. It was common to be able to award a mark for 16×10^{-5} but then candidates were more likely to write their final answer incorrectly as 1.6×10^{-6}

Question 15

Success throughout this question was varied. Candidates who understood the instruction 'factorise' were generally able to score at least one mark by taking out one common factor correctly but not all recognised that $2x$ was a common factor.

It should be noted that part (b) of this question also appeared on the calculator paper 4H
There were many good attempts at the factorisation for part (b) and it was only a lack of confidence with signs which prevented a large number of candidates from scoring two marks for a fully correct factorisation.

Common errors in (d) included writing the answer as $5a^5b^2$, $6a^5b$, or $6a^5 + b^2$.

Question 16

A significant number of candidates failed to realise that they had to use the values given in the question to work out the upper quartile and attempted to draw a box plot with the given values. Other than this there were occasionally errors in plotting with 32 plotted at 34 being the most common.

Question 17

The most common error here was to add on two in part (a) rather than use an appropriate scale factor.

More able candidates were able to answer both parts of the question successfully, appreciating the fact that the sides of the triangles were in the ratio 2 : 3 and utilising this to answer part (b) correctly.

Question 18

In part (a) the majority of candidates were able to gain a mark for the correct fraction on the first lower branch. More often than not, the fractions on the remaining branches were incorrect.

Part (b) was poorly answered. Fractions were as likely to be added together as multiplied. Even when the intention was to multiply fractions, the resulting operation was addition. Most candidates who made some progress in part (b) recognised the need to use red, green as well as green, red but sometimes failed to carry out the final addition.

Question 19

There was plenty of confusion evident in this question as to which was the cyclic quadrilateral with many candidates incorrectly using *BODC* as a cyclic quadrilateral. An even more common error was the belief that BODC was a parallelogram and angle BOD was 130°.

Too often in part (b) numbers were just written down with no attempt to demonstrate which angles these referred to meaning that method marks could not always be awarded. When reasons are asked for in a question it is essential that these are given clearly. For example, writing 'angles in a cyclic quadrilateral add up to 180^o' was not sufficient to gain the mark for a correct reason in part (a), the fact that it is **opposite** angles that sum to 180^o had to be made clear. Most candidates ignored the instruction to give reasons. Too many candidates still use single letters to represent angles, e.g. B=D

Question 20

A common error from more able candidates was to confuse the graph of cos*x* and sin*x*.

Question 21

A common error in part (a) was to forget to multiply all terms by 2 when attempting to clear the fraction. Candidates who made this error but then went on to make the *x* the subject successfully were awarded one mark.

In part (a) only a few candidates realised that to isolate *x* they had to factorise the expression.

Only a very small minority of candidates realised that they had to find the area of the given shape for part (b). Of those who did appreciate this, the common errors were to forget to halve the area of a circle to find the area of the semi-circle or to omit brackets around $\frac{x}{2}$ and therefore end up with $\frac{x^2}{2}$ rather than $\frac{x^2}{4}$. This was the question that candidates found the most demanding.

Question 22

Candidates who were able to make a start by expanding the brackets were generally able to score at least one mark. Following a correct expansion, the use of $2\sqrt{2}$ for $\sqrt{8}$ was not seen that often although $\sqrt{2}$x$\sqrt{8}$ was more successfully given as $\sqrt{16} = 4$. However able candidates were frequently able to cope well with this question and gain full marks.

Question 23

In part (b) candidates do need to show their method of solution. When the answer was incorrect it was very often difficult to follow through working. Vector equations should be used to show how the required vector is being calculated.

Question 24

It was common for candidates to leave their answer in part (a) incomplete. The most popular method of solution was to substitute an integer into both expressions but then no conclusion was drawn from the answers with candidates happy to let the marker draw their own conclusion leaving statements such as 5=9. Similarly, those candidates who chose to expand $(a + 1)^2$ usually did so correctly (although some had +2 rather than +1) but then made no comparison with $a^2 + 1$.

Pythagoras's Theorem was seen in (b) for the smaller triangle but this was not always used with the larger triangle.

Correct answers were seen to part (c). These generally referred to the fact that one side would be odd and the other even but other explanations were seen.

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