Principal Examiner Feedback

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GCSE

GCSE Mathematics (2MB01)

Higher Paper 02

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1. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 2

1.1 GENERAL COMMENTS

1.1.1 On the whole, the paper was well attempted with most candidates showing some working on the questions worth more than 1 mark.

1.1.2 Arithmetic errors were in abundance. It is strongly advised that calculators are put away when teaching this unit to encourage students to develop skills in basic arithmetic. The errors were much in evidence in questions 4, 6, 7 and 8

1.1.3 Whilst candidates have, in general, shown all their working out, they do need to be encouraged to set it out in a logical fashion and not to put "bits" in the margin or in any odd space they can find. In many questions the candidate's ability to set out their work clearly had a big impact on the accuracy of their calculations.

1.1.4 The two questions with many 'blank' responses were Question 13(b) and Question 16.

1.1.5 Candidates need to be given practice identifying efficient non-calculator methods. They should look carefully at values given to spot short-cuts and simplifications rather than relying totally on complicated written methods.

1.1.6 Some of the questions were less structured, and centres need to be aware that candidates need to have practice to develop these problem-solving skills.

1.2 REPORT ON INDIVIDUAL QUESTIONS

1.2.1 Question 1

Part (a) proved to be a good starter question with nearly all candidates being able to provide the next term in the sequence.

In part (b) the most common incorrect answer was ($n + 4$). Those who scored 1 mark tended to write $4n$ on its own.

1.2.2 Question 2

This proved to be a straight forward question with 83% of candidates scoring both marks. Just under 11% failed to score. A few realised that Candice's share was a half and simply divided the amount by 2. The most common error was 300 ÷ 2, 300 ÷ 3 and 300 ÷ 5 leading to 150, 100 and 60. Had candidates checked these they might have realised that these values do not sum to 300. Occasionally, some incorrectly added 2 +3 +5, but were still able to get the method mark if evidence was seen.

1.2.3 Question 3

Many candidates were not sure how to approach this question. Perhaps many were used to more guidance in class (e.g. draw up a table of values). Where students provided a table of values, most showed they understood the equation and completed the table well. However some candidates failed to deal with the substitution of the negative values of x into the equation as demonstrated by the calculations around the question. Many took values outside the given range of $x = -3$ to $x = 1$. This was not necessary and created some difficulties with the larger negative numbers. It was good to see that over 44% of the candidates provided the correct straight line for values of x between –3 and 1. However, a few candidates plotted the correct points and then failed to join them up. There were some candidates who used the m and c values to draw the graph without plotting any individual points but many of these confused the gradient and intercept values and drew the graph of $y = 3x + 2$ rather than the required $y = 2x + 3$.

Candidates appeared well equipped and the majority of lines were ruled rather than hand drawn.

1.2.4 Question 4

It was pleasing to see how well candidates coped with this question. Nearly ¾ of the candidates scored all 5 marks with a further 11% scoring 4 marks. Most candidates were clearly aware of the need to find a common multiple of 24 and 40 but many had difficulty adding 24 successively to produce a list of multiples. This led to some very extensive searches as 120 was missed. The few who used factorisation or factor trees usually completed the question well showing their understanding of LCM and HCF. Once 3 packs of rolls and 5 packs of sausages (or multiples of these) were found, most could then go on to find the correct number of hot dogs. However a substantial number of candidates then either doubled their 120 or halved their 120 losing the final accuracy mark.

1.2.5 Question 5

Clear organisation of working helped the most successful candidates in this question. Nearly all candidates made an attempt at this question with nearly ¼ of the candidates scoring all 4 marks. A further 15% scored 3 marks, generally losing a mark for either incorrect units (or no units) or for missing out one area of one of the rectangular faces.

Some candidates found volume rather than area and a significant number performed more haphazard calculations involving the various side lengths. In these cases no method marks or accuracy marks could be awarded. Other candidates multiplied or added all the lengths together.

The triangular faces proved the most problematic. Many forgot to divide by 2 but most had made inroads into the question. Some students drew the net of the prism which helped them visualise the correct lengths of each side. This was encouraging and could perhaps be made more high profile in solving problems of this type.

Candidates appeared well prepared to give units and most doing so did provide the correct cm^2 for area.

1.2.6 Question 6

Many candidates calculated the external angle of the polygon correctly but some then divided 180 (instead of 360) by 20 to get 9. The most common incorrect answer for (a) was 200 where candidates calculated the reflex angle instead of the exterior angle. These candidates often started again to get 360 ÷ 20 and the correct answer of 18. Some candidates scored 1 mark overall, generally for writing 40° in part (i) and then 9 in part (ii) where a follow through method mark could be awarded.

1.2.7 Question 7

Nearly 40% of the candidates successfully provided an answer of 36 from correct working. Most candidates attempted to use the formula for the area of a trapezium. Although the formula is on the sheet, many tried their own incorrect versions, often omitting the ½ or multiplying the two lengths instead of adding.

The weakest answers seen included only adding lengths together or merely doing base multiplied by height. Some otherwise correct answers were spoilt by poor arithmetic eg 5 + 7 = 14. Those candidates who used a rectangle and two triangles to find the areas were seldom successful, almost invariably using a base of 2 for the triangle instead of 1.

1.2.8 Question 8

Nearly all candidates were able to access this question by scoring at least one mark. However, the element of functionality proved very difficult for many candidates with very few fully correct answers seen with just under 10% scoring all 6 marks and just over 7% scoring 5 marks. Although many had a basic idea of what to do, there were too many variables that caused them problems. Centres need to be aware that they need to be developing these skills. The vast majority of candidates scored 2 or 3 marks, generally for selecting the correct week, demonstrating they had calculated for 7 nights and either finding 20% discount for Park Palace or 15% discount for Dubai Grand.

Unfortunately there were many poorly presented solutions with scribbles all over the two pages including in the margins. This sometimes made it difficult for examiners to award marks.

Some confusion was caused by the wording “discount for each child”. It was quite common to see 2/5 or 30% calculated – doubling the discount as there were 2 children. Many struggled with the arithmetic with many candidates unable to divide by 5 or add or subtract correctly. Others thought one fifth was 25% or 5%. Where candidates did find the discount, many then failed to subtract this discount from their adult total. Errors also occurred when trying to work out the cost of 2 adults with 810 × 2 + 80 × 2 (instead of 4) frequently seen.

1.2.9 Question 9

Many candidates knew that there was a relationship between speed, distance and time with the formula triangle diagram often seen although sometimes with speed or time at the top of the triangle. The most common error was either multiplying 30 by 8 or dividing 30 by 8.

Over half the candidates failed to score on this question even though it was seldom left blank. A third of the candidates did score 1 mark generally for successfully calculating 960 km/h but then progressed no further. The conversion from kilometres to miles was not well known. Many who wrote 5 miles = 8 km or 1 mile = 1.6 km often did not know how to apply this knowledge. Just under 10% of the candidates reached an answer of 600 miles per hour. In this type of question candidates should be encouraged to use common sense and to check that their answer is of a reasonable size for the vehicle being considered.

1.2.10 Question 10

Even though the coordinates of the end point rather than the midpoint was required, 36% of the candidates provided fully correct answers. Others that had used the correct method (eg applying 3, 9, 4) , managed to get a method mark for getting 2 of the 3 coordinates correct.

Frequently answers were given with no working shown. Some candidates just doubled (–1, –4, –2) to find answer whilst others gave (–3, –9, –4) or (3, 9, 4) as their final answer.

1.2.11 Question 11

Multiplying the first term in the bracket only and leaving the second unchanged, ie $3x + 2$, was the most common incorrect answer and $3x + 5$ was often seen. A few did not score the final accuracy mark by continuing to 'simplify' their final answer, writing $3x + 6 = 9x$. Very few answers reflected no understanding of the algebra involved.

In part (b) most students found some common factors and divided well. Candidates need to ensure that they find the highest common factor, particularly for the number part of each term. They need to look at the terms left in the bracket to see if anything is still a factor. Candidates should be encouraged to check their answer by expanding as answers such as $6xy(2x^2 - 3xy)$ were occasionally seen.

In part (c) This question was well answered with a majority of candidates familiar with the need to find four terms and many also correctly dealing with the signs and simplification of the answer. 43% of candidates could expand and simplify correctly with a further 24% able to provide 4 correct terms (ignoring the signs) or 3 correct terms with the correct signs. The most common errors were incorrect signs, incorrect product of $2x$ and x, an incorrect simplification of $-3x + 8x$ or a constant term of +1

In part (d) it was pleasing to see that nearly 60% of the candidates obtained the correct answer with a further 12% scoring one mark for obtaining 2 correct parts of the expression $10x^7y^5$. The most common error was to add the coefficients with $7x^7y^5$ frequently seen. Others left multiplication signs in their answer or occasionally an addition sign.

1.2.12 Question 12

In part (i) 7 and 0 were the most common incorrect responses.

In part (ii) many candidates did not know how to deal with the negative index. The most common incorrect response was –5.

In part (iii) This part proved to be the most challenging with only 34% providing correct answers.

1.2.13 Question 13

In part (a) half the candidates could provide an equation of a straight line parallel to the given line with some enjoying providing unusual, but correct answers such as $y = 5x + 123456789$
The most common incorrect responses were simply to swap the 5 and 6 over, doubling and writing $y = 10x + 12$, omitting $y =$ or writing $y = -5x + 6$

In part (b) there were hardly any fully correct answers (< 4%). Many had no idea what to do, with 86% not scoring at all. Around 9% scored 1 mark for a correct gradient seen. However many wrote $-1/(5x)$ rather than $(-1/5)\,x$. Substitution of $x = -2$ and $y = 5$ into any equation was seldom seen. A significant number of candidates did not attempt this question at all whilst others attempted to draw a sketch and got no further.

1.2.14 Question 14

Just over two thirds of the candidates did not understand that factorising was required and so could not make any inroads into the simplification. Many of these candidates attempted to simplify by 'cancelling' the terms in x^2 and/or the terms in x. 32% of the candidates were able to make a valid attempt at factorising both expressions but 9% of these either made sign errors in their factorisation or failed to simplify by cancelling the common factor thereby losing the final mark.

1.2.15 Question 15

This was another question that required organisation as well as basic algebraic skills. There were many instances of addition and multiplication being confused and brackets being omitted leading to incorrect expansions. The majority of candidates attempted this question, with varying degrees of success. Over 38% of candidates were able to score at least 1 mark and often 2 marks. These 1 or 2 marks were generally awarded for finding at least one correct expression for a cross-sectional area or for a volume (brackets could be ignored) and/or for finding a correct expression for the total width of the shape or the height of the middle of the H.

Those who had a correct strategy for calculating the volumes were let down by their algebraic skills. Brackets were often missing when they were essential.

It was rare to see a complete method leading to a correct formula. Methods chosen were varied from working out the cross section by dividing it into separate areas or working out the surrounding area and subtracting the "missing bits". Working with the area seemed to be preferred to working out volumes.

1.2.16 Question 16

This was undoubtedly the question where candidates were least successful. 95% of candidates failed to score with 4% scoring 1 mark for one correct statement that could lead to the proof. Many incorrect arguments were based on tangents meeting radii at right angles (true but irrelevant) or the intersection of *AC* and *DB* at *E* forming four right angles (false). The weakest responses included "stories" of how you could join up *A*, *B*,*C* and *D* and it would be a rectangle, and statements like *AD* = *BC* without any justification. Some candidates did gain one mark for stating either *AE=ED* or *AE=EB* or for the rule that tangents from an external point are equal in length. This mark was also available via annotation on the diagram or a statement of triangle *AED* or *AEB* being isosceles. However, very few candidates gained any further credit. Many candidates were unable to formulate any kind of argument/proof preferring just to write lists of circle theorems and/or rules about angles in the hope that one or more of them would be relevant. The common confusion between the meaning of equal and parallel was also seen. A minority stated such gems as Theorem 7 or Theorem 5 and one candidate in desperation wrote 'The angle between the tangent and the radius is 90°, but there isn't a radius.

1.3 GRADE BOUNDARIES

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