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Principal Examiner Feedback

Summer 2015

Pearson Edexcel GCSE
In Mathematics B (2MB01)
Higher (Non-Calculator) Unit 3

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

Introduction

Students appear to have been able to complete the paper in the time allowed.

Many students set out their working clearly and this often led to the award of partial credit where final answers were incorrect.

The paper gave the opportunity for students of all abilities to demonstrate positive achievement.

Students often relied on trial and improvement methods when other methods would have been more appropriate.

Student's presentation on QWC questions was generally good and their working out was usually easy to follow and award marks easily.

There was evidence to suggest that almost all students had calculators though perhaps were not always choosing to use them or knew how to use them correctly, especially in question 12.

Able students were sometimes demonstrating fully correct methods but then lost out on accuracy marks due to premature rounding in their working.

Report on individual questions

Question 1

This question was very well attempted by most students with many gaining the full marks. A common response was £71.4 which, on this particular question, they did not lose the accuracy mark but for other questions this could have led to lost marks. Weaker students were misreading the question and wrote 12 × 41.65 = £ 499.80, having not seen that 7 calculators cost £41.65. There was also some evidence to suggest that not all candidates had a calculator as the correct calculations of 41.65 ÷ 7 × 12 were seen but then an incorrect answer was written, however, as they had written down their working, they did gain the method mark. Only the very weakest students gained no marks, usually due to writing an incorrect answer, sometimes nearly correct, but with no working out. A handful of students wrote £71.04 as the answer having misinterpreted their calculator screen but those that had wrote down their working out did at least gain the method mark.

Question 2

Many students correctly calculated 4.5% and then either added up lots of £13.50 or divided £50 by 13.50 to gain full marks but the large proportion did not read that the question stated 'simple interest' and, having used using compound interest instead, only gained one method mark. It was rare to see computational errors on this question.

Question 3

Students were most successful in part (a) and incorrect responses were rare. Of those who did not gain full marks most gained the method mark for correctly expanding the bracket but then failed to correctly do (19 − 12) ÷ 4 usually forgetting to use inverse operations.

Students were less successful in part (b) than in part (a) although many gained full marks for p> 7.5. Those that gained one mark either used '=' rather than '>' or having solved the inequality correctly then wrote p = 7.5 or just 7.5 on the answer line. The weaker candidates subtracted 8 from both sides or unsuccessfully attempted a trial and improvement method and gained no marks.

Students were least successful in part (c) though blank responses were rare and many did gain full marks. Most students were using factorisation to solve the quadratic equation though a few stopped short of the complete method, writing (x − 3)(x + 5) as their final answer, to only gain two marks and few wrote (x + 3)(x − 5) gaining just one mark. Some attempted to use the quadratic formula, though those that did were considerably less successful, often only gaining one mark for the substitution. The weaker candidates tried to solve the quadratic equation by isolating the x, leading to e.g. $x = \frac{15-2x}{x}$ or similar incorrect rearrangements of the quadratic equation.

Question *4

This question was well attempted by all students and blank responses were rare. The most successful students were those who calculated the price per gram for each jar and in almost all cases these students gained all four marks. The second most popular method was to calculate grams per pound, though some of these students lost the communication mark as they failed to realise that the greatest answer was the best value. Other common and equally successful methods were to find the price of 25g or to convert the prices of the 150g and 200g jars to their equivalent 275g price. Weaker students tried to solve the problem by finding the differences between the prices of the jars and gained no marks. Calculation errors were rare but lost of accuracy and careless recording of answers in more complex methods often lead to lost marks.

Question 5

This question was well attempted by all students and it was rare to see incorrect or blank responses. Where students did not gain full marks, it was usually due to an error in calculating the y value for -3 or, less often, 0. Very few students who correctly calculated the coordinates lost marks in part (b) though some did incorrectly plot the points, usually those with negative values. A few students incorrectly joined the plots with straight lines and lost one mark.

Question 6

This question was well attempted and many gained full marks. Most set up the equation 7b + 22 = 2 (5b + 2) and correctly solved it however, many were complicating the problem by solving it using the simultaneous equations 7b + 22 = 2x and 5b + 2 = x or by setting up the equation 7b + 22p = 2 (5b + 2p). Despite these more complex methods students still gained full marks by correctly eliminating the x or by realising that p = 1. Weaker students were unable to solve their equations but usually scored M1 or resorted to a trial and improvement method hence either scored zero, one mark for the expressions or full marks if successful.

Question 7

This question was well attempted by most students. It was rare to see incorrect responses but the most common incorrect response was an answer of 20 tickets from 240 ÷ 1.2 = 200, 200 ÷ 10 = 20. Nearly all students realised that 28.8 meant that you could only buy 28 tickets and an answer of 29 was very rare.

Question 8

This question was well attempted by most students who, although did not always use formal construction methods did often managed to gain full marks. Weaker students usually gained a mark for an arc drawn of radius 7cm, centre D but made no attempt at drawing a perpendicular bisector of AC.

Question *9

This question was well attempted by students with blank responses rare but as many students scored one mark as scored full marks. Students tended to use the 'big to small' ratios of rectangles rather than the ratio of the sides in each rectangle but both methods were equally successful. Weaker students usually scored one method mark for correctly calculating the side lengths of the rectangle PQRS but then demonstrated a lack of understanding of the concept of similarity and calculated the area of the rectangles or the perimeter. Some of the better students failed to simplify their ratios sufficiently to demonstrate, clearly enough for QWC, that the scale factors were not equal.

Question 10

This question was well attempted by most students and blank responses were very rare. Students regularly gained full marks. Those that gained two marks usually lost the final mark for either forgetting to indicate the direction, clockwise, or for writing an incorrect coordinate for the centre of rotation. Weaker candidates confused their transformations e.g. rotations in a line or translated about a point so scored zero.

Question 11

This question was well attempted though some candidates struggled to know what was required and often only gained one mark for correctly calculating the area of the cross-section of the saucepan or the volume of the soup can. It was very rare to see students attempt to use a scale factor of $\frac{12}{7}$ or $\frac{7}{12}$ when solving this problem and those that did often did not square their scale factor. Weaker students were confusing area, volume and surface area formulae of circles and cylinders. The more able candidates where efficiently working with multiples of π.

Question 12

This question was well attempted by students and it was rare to see blank responses. Most gained full marks though some, having correctly calculated the answer of 7500 000 000, forgot to write it in standard form. Weaker students were usually gaining one mark for either 21 000 000 or, more often, for an answer beginning 75. Only the very weakest were scoring zero. There was also evidence on this question to suggest that, either students had no calculator or were unable to use the standard form key, as many were converting numbers back to ordinary numbers before subtracting and then attempting to divide. Other candidates were not using their calculator correctly or were forgetting to get the answer for the numerator first showing a lack of understanding of the order of operations.

Question 13

This question was well attempted and blank responses were rare. Despite the circle most candidates realised that Pythagoras was needed to find the diameter and then went on to find the circumference though a few stopped after finding the diameter forgetting that the question required them to find the circumference. As in question 11, students were confusing circle formulae and some were finding the area or misremembering the formula completely. The small number of students lost one mark due to premature rounding of their value for the diameter. Only the very weakest students were failing to score any marks usually due to not using Pythagoras at all.

Question *14

This question was well attempted but only the most able gained full marks. Many did however, gain two marks for correctly finding that x = 49º but failed to correctly state the reason 'Alternate Segment Theorem', whilst some correctly quoted 'Alternate Segment Theorem' but forgot to accompany it with another relevant reason. The weaker students, having realised that PAQ was a tangent, were then incorrectly labelling and using BAQ = 90º leading to an answer of 34º. The very weakest were drawing 'Z' shapes on the diagram and stating 'alternate angles' or 'corresponding angles' as one of their reasons.

Question 15

This question was well attempted by students and many gained full marks but others, probably due to not reading the information carefully enough were calculating 75% and adding it on. Some students chose to work in cm, which would have been ok had they then converted their answer back to meters but as they did not they lost the accuracy mark. A few stopped one bounce short, however a more common error was to calculate the height after four bounces.

Question 16

This question was well attempted but only the most able students were gaining full marks. Most gained one mark for indicating y × (x + 5) but then either did not expand the bracket or were able to isolate x correctly after expanding the bracket. Lots of poor and incorrect algebraic manipulation was seen in student's responses.

Question 17

This question was well attempted by students and it was rare to see blank responses, though the weaker students often gained no marks as they were unable to correctly find a useful angle. Some of these realised that they needed to use $\frac{1}{2}$ab sin C but were incorrectly calculating $\frac{1}{2}$ ×6 × 6 sin 54 or $\frac{1}{2}$ × 6 × 6 sin 60. Although many were successful when using trigonometry to find the height and base of a triangle and then $\frac{1}{2}$ ×base × height to find the triangle's area, this method frequently led to lost marks, sometimes just the accuracy mark due to premature rounding and sometimes all but the first method mark, due to assuming the edges of the pentagon, and hence the base of the triangle, was also 6m.

Question 18

This question was well attempted by students but only the most able were gaining full marks and even able students were missing the inverse in the question and writing y ɑ $y \alpha x^2$ or $y = kx^2$ whilst others missed the squared and wrote y ɑ $\frac{1}{x}$ or y = $\frac{k}{x}$. Some of the better students having found k = 375 then stopped so only gained two marks.

Question 19

This question was well attempted but many candidates were only scoring one mark usually for using 0.15 in their calculation or for 45 ÷ 0.25 leading to a common wrong answer of 180. Attempting to use recurring numbers was rare. Many were trying to find both upper and lower bound but often confused methods. Common incorrect answers were from use of 0.25 and 40.5. The weakest students simply divided the two values given.

Question 20

Students were equally successful in parts (a) and (b) though many did not gain full marks. Many students did not realise the connection between parts (a) and (b) and even those who gained full marks in part (a) often lost the mark in part (b). Likewise, students who were unable to gain full marks in part (a), sometimes even scoring zero in part (a), then wrote in a fully correct coordinates for their answer to part (b). In part (a) weaker students were often able to write $(x - 4)^2$ or wrote $p = 4$ to gain one mark and slightly more able students correct completed the square, writing $(x - 4)^2 - 10$ or equivalent but then gave the answer $p = -4$ with $q = -10$.

Question 21

Part (a) was generally well attempted though blank responses were seen. A very common incorrect response was to translate the graph right rather than left. Other incorrect responses were to translate the graph vertically or to invert the graph. The weakest students were plotting points or drawing lines.

Part (b) was also generally well attempted but there were more blank responses seen than in part (a). The most common incorrect response was to write $y = g(-x)$ or y = some function of x^2.

Question 22

This question was well attempted by students and they were gaining the full range of marks. The weakest candidates often gained a mark for finding an angle but usually could not see how to proceed to find TR with many drawing in extra lines to create what they assumed to be right-angled triangles or made assumptions that their lines had bisected angles and so led to incorrect final answers. The slightly more able usually correctly used the Sine Rule to find the length of AR but were unable to then correctly use the Cosine Rule or tried to apply the Sine Rule again so only gained three marks. The most able students were able to correctly apply both the Sine and Cosine rule but some lost the accuracy mark due to premature rounding in their working out.

Question 23

This question was well attempted but blank responses were seen and more students than not gained zero or part marks. Those that only gained part marks were usually able to correctly find the vector $\overrightarrow{OM}$ for two marks but then incorrectly found $\overrightarrow{ON}$ to be $\frac{3}{5}\overrightarrow{OM}$. Some students were able to write the vector $\overrightarrow{AB}$ as $\underline{\mathbf{b}} - \underline{\mathbf{a}}$ for one mark but were unable to find the vector $\overrightarrow{OM}$. The weaker students were writing out the cosine rule, sine rule or Pythagoars's Theorem.

Summary

Based on their performance on this paper, students are offered the following advice:

- read the question carefully
- display full working
- check final answers for appropriateness.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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