Principal Examiner Feedback

Summer 2016

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Calculator) Paper 2H

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GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 2

Introduction

Students did appear to have been well prepared for the examination, and were able to attempt all questions at their particular level. This was a calculator paper and it was pleasing to see that very few candidates seemed not to have access to one. However, there were many candidates who employed non-calculator methods in some questions which often resulted in errors. This was particularly in evidence in questions requiring percentage calculations, Q6c and Q15.

Once again a common feature of this paper was the premature approximating of values computed on a calculator. This inevitably denied candidates accuracy marks, since answers given were often outside the required boundaries. Centres are advised to remind students to maintain accuracy throughout multi-step calculations, only rounding their final answer.

Students' responses to questions assessing Quality of Written Communication were generally good with the great majority fully explaining their findings when required.

Report on individual questions

Question 1

In part (a), stem and leaf diagrams were usually accurate. However many students failed to provide a key. Keys drawn were usually correct, although some were spoiled by "students" being written as the unit. It was noticeable this year that very few unordered diagrams were seen. One common omission was the value of 48

In part (b), very few students offered a probability in an unacceptable form. The greater majority of answers were correct; $\frac{9}{28}$ and $\frac{11}{20}$ were the most common incorrect answers although both did gain credit for being partly correct. Students should be encouraged to leave answers as fractions; when conversion to a decimal is attempted errors can occur.

Question 2

All parts of this question were answered well. In part (a), $3a5b2c$ was a common error, whilst $9y$ and $18y$ were the most common errors in part (b). Expansion of the brackets was usually correct in part (c) with incomplete expansions such as $x^2 - 3$ being the most common error.

Question 3

A correct answer of 9.25 was often seen resulting from either algebraic or numerical methods. Many used trial and improvement methods but rarely was the correct value trialled. The most common error by those attempting algebraic methods was in deriving and solving the incorrect equation $x + x + 4 = 45$

A number of students got as far as $4x = 37$ and then gave an answer of $x = 9$ thus losing the final accuracy mark.

Question 4

This was a familiar type of question to students and results were very positive with the great majority scoring at least 3 marks. Although there were a variety of approaches seen, the most popular methods were those exemplified in the mark scheme. Many students who worked out the cost per bag of crisps only failed to score maximum marks if they rounded their value of 4 ÷ 18 to one significant figure. (There was a common misunderstanding that 0.2 recurring is equal to 0.2). Students dividing the number of bags by the cost per pack usually carried out the arithmetic correctly but then often incorrectly selected the "medium" size pack as the best buy, showing a lack of understanding of the units of their results. As in previous series, the ticking or circling of the diagram was insufficient in this Quality of Written Communication question; a written explanation was required.

Question 5

Very few students failed to score at least one mark for correctly finding the sum (0.45) of the required two probabilities, although 0.4 + 0.15 = 0.19 was not uncommon. However, students who showed their working: 0.4 + 0.15 = 0.19, then 1 – 0.19 = 0.81 were able to access a method mark. Many students having found 0.45 then proceeded to divide by 4 instead of 5, using an incorrect ratio between the green and red counters. It was not uncommon to see an answer of 0.9 for those who did divide 0.45 by 5, often followed by 0.9 × 4 = 0.36 this gained credit only when 0.45 ÷ 5 was seen.

Question 6

The first mark in part (a) was simply for a correct substitution of 50 and 1.57 into the given formula; however many ignored the power and 31.8….. was a common incorrect answer seen. Some, not understanding powers, multiplied 1.57 by 2 before dividing. In part (b), students who used inverse operations correctly usually got the correct answer, however many rounded to an answer of 68 without writing down the number (68.04) from their calculator. These were denied the accuracy mark. The most common reason for failing in this part was the use of trial and improvement methods; 68.04 was never likely to be trialled.

Many students tried to find 45% of 1.80 before completing the method, often using ‘build up’ methods in part (c). This earned credit if the method was fully explained however there were many errors in finding 5% of 1.80. A number of students found 245% and subsequently lost the accuracy mark. Some students worked in centimetres and failed to re-convert for their final answer. Students should be encouraged to use their calculators to work out percentage problems on a calculator paper.

Question 7

This was another very familiar type of question and was answered well with most students gaining at least 2 marks for correct trials within the required boundaries. As always however, many were unable to offer complete and correct solutions. Many students still fail to trial a value to two decimal places (eg. 3.75), content to say that one value is closer to the required value than the other. Centres must realise that this is not mathematically correct. A number of candidates who demonstrated in a trial of 3.75 that the result was less than 34 still did not identify that the solution to 1decimal place must be 3.8 because of this and gave an answer of 3.7

Some students failed to give their answer correct to one decimal place as required.

Question 8

Although students gained credit for a correct ratio in part (a), many failed to fully simplify their answer. Some gave the reverse ratio but this had to be fully simplified to gain any credit. In part (b) although the correct answer of 480 was the modal answer, many students chose to divide 720, and sometimes 540, in the ratio 3:2 with 288 being a very common incorrect answer.

Question 9

The greater number of students gained at least one mark in this question for identifying a correct angle, usually angle *FED* = 56^o or angle *AEB* = 70^o. Many progressed to correctly find the angle *x*. Full marks were not as common as many students still fail to give acceptable forms for their reasoning. Confusion between alternate and corresponding angles and/or a failure to write “**vertically** opposite angles are equal”, were the major causes for the loss of the loss of communication marks. Centres need to make it clear to students that ‘alternative’ angles does not gain credit when used instead of alternate angles.

Question 10

Evidence from this paper suggests that this type of question is now being answered much better than in the past. The most common errors were the use of values at the end of each interval. A number of students having correctly found $\sum fx$ then divided by 5 instead of 50. An answer of 7.92 seen and rounded to 8, still gained full marks, provided 7.92 was seen. Weaker students still tried to find the mean of the 5 frequencies.

Question 11

For students correctly finding the cost of a 180-mile journey, failure to gain full marks was usually a result of prematurely approximating their calculated values. For example, 180 ÷ 45.2 = 3.9823… was often rounded to 4 gallons. The correct method often followed but accuracy of final results was impossible. Some estimated the 4 gallons used without showing their working, subsequent work was credited but some method marks were lost. Many failed to gain full marks by never considering the full 180 miles travelled in a 5-day week, through mixing units of cost or failing to add on the weekly car park charge. Many approaches were seen and most resulted in some credit being given.

Question 12

The mark for a correct interior angle of the pentagon was often the only mark achieved by many students; other angles were sometimes incorrectly labelled 108^o. As usual, many gave 72^o as the interior angle. Although many correctly used the properties of the lines of symmetry, which did gain credit, few correctly completed the solution to find the angle x. Some students gave 72^o as the angle between the two lines of symmetry given.

Question 13

Both parts of this question were answered well with at least two correct values in the table seen on very many occasions. The usual error was in the substitution of $x = -2$
Although the correct plotting of the correct 5 points was often seen, many joined their points with line segments, thus failing to draw the correct graph hence losing the accuracy mark.

Question 14

Many students failed to correctly find the area of the cross section of the bar, usually by incorrectly finding the missing dimensions; 15 × 2 + 15 × 2 + 12 × 2 (= 84) was a common error. Students successfully finding the area of the cross section usually then found the correct volume. Failure to complete the solution correctly was usually a result of dividing their volume by the density instead of multiplying. Some students used their area of cross section as the volume and failed to gain any further credit. A few students lost the final method and hence the accuracy mark for not correctly converting to the right units.

Question 15

Far too many students were using long winded ‘build up methods’ to work out percentages which often led to errors. Although many gained full marks, common errors included; finding 82% of £15000 after correctly working out 77% of £15000, finding 59% (23 + 18 + 18), using a ‘simple interest approach throughout’ and some students either stopped after 2 years or continued beyond 3 years. It was pleasing to see fully explained reasoning from those who gained both method marks.

Question 16

In part (a), the correct answer of 128 was the modal response. 30, 130 and 36 were common errors. A significant number of candidates read off their median at cf = 28.5 or 29. In part (b), whilst many students did achieve full marks, it was clear that many had no idea about quartiles. Some just offered one quartile, usually the lower quartile of 122.

Question 17

Many students employed inappropriate methods in their attempts to find the unknown angle x. Pythagoras’ theorem was often applied to triangle ADC or to triangle ABC with AB taken as 10.4 cm. Some students assumed triangle ADC to be isosceles and came close to the correct answer by taking DC equal to 10.4 cm. Other incorrect methods involved the incorrect use of the sine or cosine rules again in triangle ADC. Those using the sine rule correctly often gave angle ADC as an acute angle. This did gain some credit but no marks were awarded for subsequent working which sometimes led to the correct answer by incurring further errors. Students who took the direct route to find angle ACB usually gained full marks, however at times premature approximation resulted in the loss of the accuracy mark. Another common successful approach was to find BC using Pythagoras’ theorem and then use trigonometry to find the required angle.

Question 18

The correct answer of $10a^5b^4$ was the modal response in part (a) although 7, a^6, b^3 and surprisingly $10a^5 + b^4$ and $10a^5\ 2b^4$ were common errors seen. In part (b), those students who realised the need to square both sides of the formula usually completed a fully correct rearrangement. The most common mistakes with the initial step were to multiply both sides by 5 or to subtract x from both sides. Students generally scored full or no marks here.

Question 19

The correct answer of either 10 or 11 was frequently seen. A few failed to round their answer of 10.89... to a whole number and so lost the final mark.

Question 20

The usual mistakes were made in using the given quadratic formula to solve this equation. The most common error was in substituting 2 instead of –2 for c. Many students failed to place the dividing line correctly and there were a number whose denominator was incorrect. Some students attempted to solve the equation by trial and improvement methods, often finding one correct root (0.29) but rarely the second. This method gained no credit unless both correct roots were found.

Question 21

This question was poorly answered by all but the most-able students. It was common to see 5(14 – 8.7) being evaluated followed by attempts at finding an upper bound.

Some students showing some understanding of bounds found the difference between both upper bounds. Many students are still unhappy to accept 14.5 and 8.75 as upper bounds and insist on writing 14.49 or 8.749. This was only given credit if students made it clear that the 9s were recurring. Many students who correctly found both upper and lower bounds for both values still chose to work with both upper bounds losing both the method and accuracy marks.

Question 22

It was disappointing to see so many students confusing radius and diameter of the given sectors. A significant number attempted to find the shaded area. Both these efforts gained no credit. Some students correctly found the arc lengths and then either failed to add on the two straight edges or decided to find the difference between them, confusing the perimeter with area demands. Many ignored the 75° and assumed they were dealing with quadrants.

Question 23

Although there were many bar charts and frequency polygons drawn, it was pleasing to see many students attempting, with some success, to deal with the concept of frequency density. Sometimes however the absence of a scale let them down. Although some students did refer to a unit of area, providing a key, the most popular approach was to calculate frequency densities for each group.

Question 24

A correct answer in part (a) was rare, with the great majority of students, who did make a good start, failing to deal with either negative signs or the fraction; $\frac{1}{3x+4}$ and $3x + 4$ were common incorrect answers seen. It is clear many fail to appreciate that $(x - 3)$ is the same as $-(3 - x)$.

Part (b) was answered considerably better with many gaining two marks for correct fractions with a correct common denominator. Some students having found the correct answer then tried to simplify it further and lost the final mark through algebraic errors. Some students lost the final accuracy mark by not dealing with the two negative signs correctly in the numerator.

Question 25

For those students making an attempt to answer this question, the most popular approach was the use of $\text{Area of a triangle} = \frac{1}{2}ab\sin C$. However, many students were confused with the particular angle they had found. Many students stopped at this point, but when the correct angle of B was used, the majority of students then went on to correctly apply the cosine rule and gain further credit. When using cosine rule there are still a number of students using the incorrect order of operations to evaluate their expression.

Students who drew and correctly calculated a perpendicular height, often went on to gain credit for accurate trigonometry of right-angled triangles.

Summary

Based on their performance in this paper, students should:

- avoid the use of non-calculator methods when making calculations on a calculator paper
- use values to a greater degree of accuracy than the question demands. Premature approximations generally result in the loss of accuracy marks
- set out working in a clear and organised way
- avoid trial and improvement methods in solving algebraic equations; they usually lead to incorrect answers
- use 3-letter angle notation correctly. In geometric reasoning questions, it is important to clearly relate reasons to working.

Grade Boundaries

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