Principal Examiner Feedback

Summer 2014

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

Edexcel and BTEC Qualifications

Summer 2014
Publications Code UG039398

GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 2

Introduction

Many candidates were able to gain marks on the unstructured questions, whilst still gaining marks on questions which had a more traditional style.

To gain the highest marks candidates had to demonstrate high order thinking skills in a range of questions, not just in those questions towards the second half of the paper.

This is a calculator paper. It was evident from some work that candidates were attempting the paper without the aid of a calculator. This is not advisable, since calculation errors will cost marks. Premature rounding continues to cause problems for some candidates in multistep problems.
The inclusion of working out to support answers remains an issue for many; but not only does working out need to be shown, it needs to be shown legibly, demonstrating the processes of calculation that are used. In not all cases were numerical figures clear.

Some notes for centres:

- Be aware that in order to gain the highest grades proficiency must be shown across the whole paper, including the easier questions in the first half of the paper
- All candidates need to come to a calculator with a calculator
- In using a calculator answers should always be written to full accuracy, and continue to be used as such in multi-step problems, addressing requests for rounding only at the final stage, and after a completely accurate answer has been demonstrated.
- The inclusion of working out to support answers continues to need emphasis at a time when the demand for working out for some questions is increasing. Candidates should also ensure they write their numerical figures to be legible
- Centres need to continue practicing the solutions to unstructured questions and multi-step questions, and QWC questions which require a statement in additional to presenting working to problems.

Reports on Individual Questions

Question 1

This question was done well by a good number of candidates, however there were also a surprising number of incorrect answers. A common error which lost a mark was in giving the coordinate without the brackets. A small number of candidates listed the values between 2 and 6, and from 3 to 8 and “found” the midpoint by crossing off matching values from each end of their lists. For the most part, this was done successfully. The most common incorrect approach observed was to subtract the two coordinates and this gave an answer of (4, 5). A few candidates attempted to complete this question by labelling the axes despite the diagram being labelled as not to scale.

Question 2

The majority of candidates were able to correctly plot the two points accurately in part (a), and in (b) describe the relationship between the temperature and the units of gas used, although a significant number described the correlation between the variables.

The best way of answering part (c) was to draw a line of best fit on the diagram, and then to use this to read off the required value. Very few drew a line, some candidates joined point to point, and some lines with a positive gradient were seen. Nevertheless candidates in most cases were able to state a reasonable figure to gain the marks.

Question 3

This question was very well done by the majority, clearly well prepared for this. Some candidates did not appreciate the order of operations on the calculator and failed to get the accuracy mark provided they showed the substitution in to the expression. The candidates that were not well prepared often split the expression when making the substitution and so did not gain marks if the answer was incorrect. A few students did not give the answer to sufficient decimal places, but they were very much in the minority.

Question 4

The vast majority of candidates were successful with this question. A small number used the area formula rather than the required formula for circumference. Centres are advised to remind candidates to show their working because many students gave an answer of outside the required range without any working and so lost both marks. Those candidates who did not give the answer to the required accuracy were able to obtain a method mark if they showed the correct process. Some squared the diameter and a very small number squared π.

Question 5

A good number of candidates were able to collect two marks here. Where candidates obtained one mark this was often due to giving translation as the transformation, but then describing the movement rather than giving the vector, giving an incorrect vector or writing the vector incorrectly as a coordinate. Common errors with the vector were incorrect signs on the two elements and transposition of the two numbers. It was pleasing to see that a relatively small number of candidates described a completely incorrect transformation, however there were a significant number who gave more than one transformation, despite the instruction in the question, and therefore lost marks.

Question 6

This question was generally attempted with candidates usually scoring at least 1 mark but with many common errors. Differing units between times given in minutes and speed given in miles per hour being at the root of these errors.
A common error was to omit the 30mins rest time giving an incorrect answer of 1.45pm. Some candidates calculated the overall time correctly as 5 hours 15mins or 315mins but then gave this as their answer rather than working out the resultant time. All these errors could have been avoided by reading the question properly. Other errors relating to time included those candidates who calculated $\frac{240}{60} = 40$ but then used this as 4 mins or interpreted it as 40 mins (giving 10:19am or 10:55am), and weaker candidates who added the 20, 25 and 30, or failed at the final stage by writing 5.25 as 5 hours 25 mins. It was not speed that was the main challenge in this question, it was simple understanding and manipulation of time.

Question 7

Most candidates were able to achieve 2 marks for correctly calculating the angle as 54 degrees. However, many candidates were not awarded the mark for correct reasons for their chosen method. Frequently only one reason was offered, or the vocabulary used was ambiguous or not sufficiently rigorous for geometrical reasoning. It was not uncommon to see confusion between alternate and corresponding angles.

Question 8

In part (a) most candidates correctly identified 13, 11 and 5 as the relevant numbers and got credit for adding these. Some then went on to give the answer as 29 or $\frac{1}{29}$. Some allowance was made for those misreading the question as greater than 5 people, but otherwise accurate reading of the question and the table was required. A common incorrect answer was $\frac{13}{100}$, from those reading the question as the probability of 5 only. The calculation 11+13+5 was frequently evaluated to be 30 or 19.

In part (b) many correct answers were seen. Some calculated $\frac{1500}{13}$, some did 1500 x 13. Some incorrectly gave their answer as $\frac{195}{1500}$. A small number of candidates mistook the word estimate to mean find a rough answer rather than a calculation based on probabilities.

In part (c) the question was often well answered with candidates showing that they understood the problems with the sample. However some candidates were not explicit enough leaving their response open to interpretation. We were looking for reasons in context so no credit was given for responses such as "it's biased", "it's not varied" or "it's not random". Also, the two answers needed to be relating to different themes (eg, sample size, timing) so that "children will be at school" and "adults will be at work" would only gain one mark since both relate to the timing of the survey. Some candidates referred to the nature of the question (eg the question was too personal) which was not relevant.

Question 9

This question was a good discriminator. Many candidates labelled *AB* correctly and were awarded 1 mark. However, a common mistake was to think *DC* was 4 times longer than *AB* instead of 4cm longer, with $8x$ or $x + 4$ often seen on the diagram. Another common, though lesser seen problem appeared to be pupils becoming confused between the act of doubling a side and squaring it, leading to *AB* being labelled as x^2. Those taking the algebraic route usually attempted to add the 4 sides together and could simplify their expression. It was disappointing to see that so many candidates could not put together an algebraic argument and resorted to Trial and Improvement, usually stopping at an x value of 5.665. It must also be noted that many candidates used decimals and not fractions, but did not appreciate the difference between terminating and recurring decimals. Candidates need to understand that a recurring number is a perfectly acceptable answer and best left in fraction form $\frac{34}{6}$. or $\frac{17}{3}$ or $5\frac{2}{3}$. Rounding or truncating an answer does not always gain the accuracy mark.

Question 10

Parts (a) and (b) were usually well answers, the only common errors being the addition of indices in part (a). In part (c) most candidates earned the mark, but some failed to subtract 3 correctly from 9, or divided it. An answer of 2^6 was accepted. It was disappointing how many candidates were unable to see the way to finding the answer. Many attempted trial & improvement approaches, whilst for many it was knowing what to do with the 64, resulting in many divisions by 3, or failed attempts to find the cubed root on the calculator.

Question 11

This question proved good at differentiating the candidates with a range of marks being awarded. The first method from the mark scheme was definitely the more popular approach to this question. There were a good number of fully correct answers, although it was a little disappointing to observe the number of these which did not include the 0 in 186.20 which was not penalised on this occasion. The most common error amongst otherwise good responses was when inconsistent units were used to calculate the volume.

Where part marks were awarded there were a variety of different reasons for this. Common reasons for a mark of 4 were not rounding to 7 bags and making an error in an otherwise correct calculation at some stage. Marks of two and three were also commonly given. Three marks were often awarded for having found a volume using inconsistent units followed by carrying out the remainder of the calculation correctly. Two marks was a frequent score for calculating the cost of the gravel before discount for some number of bags and then calculating the discount correctly, this often followed on from calculations which gave areas rather than a volume.

A reasonable number of candidates lost a mark as they found 30% and then did not subtract from the original amount to obtain 70%. Despite this being the calculator paper, many candidates used a non-calculator approach to find the percentage. A disappointing number of candidates did not recognise the need for consistent units to calculate the volume or, where they did, were not able to correctly convert the depth of the driveway to metres.

Question 12

In part (a) most candidates were able to gain B1 by recognising that the sequence increased by adding 5 each time and hence writing 5n, but there was a significant number writing 5n+4 or even n+5. Candidates need to be encouraged to check their rule to see if it works for the next term in the sequence

In part (b) responses were generally poor. A small number of candidates tried to find the nth term from first principles, with little success. Those who did realise that the two sequences were linked, often failed to double both terms resulting in the expression $6n - n^2$, which was the most commonly seen incorrect response.

Question 13

Part (a) was usually attempted with full marks often awarded. The majority of candidates understood that integer values were required. There were a large number of candidates who either included by 0 and 5 or excluded by 0 and 5, possibly due to an uncertainty in the difference between inclusive and exclusive inequalities.

Part (b) was generally answered well, with candidates reaching a solution of 4.5 and scoring at least one mark. Many candidates continue to replace the inequality sign with a equals sign for solving with too many failing to return to the inequality sign for their final answer or just giving ‘4.5’ and so losing the accuracy mark. The majority of candidates who scored full makes carried out correct algebraic manipulations using inequalities throughout. The most common errors were those who multiplied out correctly (6x-12) but then made a mistake with their algebraic manipulation, e.g. 6x >3; multiplied out incorrectly, e.g. to get 6x-2; or multiplied out correctly (6x-12) but then left their answer as 6x-12>15 or 6x>27

Question 14

Almost all candidates attempted this question and almost all of those who did achieved at least one mark. This was generally for multiplying their number of boxes and packs by the correct price and totalling the cost. However, too many candidates were unable to find the first common multiple beyond 60, possibly as a result of not reading the question carefully. Those candidates who listed multiples and then used 96 or 120 rather than 72 were able to access some of the marks. Methods were sometimes confused, but examiners were able to credit sound working where this was shown. Again this highlights the importance of showing working.

Curiously, some candidates inferred from the word "least" that the question involved finding lower bounds. Where there was correct method shown again some lost valuable marks due to incorrect processing - seemingly not having access to a calculator. Most students however did achieve the final method mark. The correct answer on the answer line was often left as £25.8 without the zero which although wasn't penalised here is not good practice when dealing with money notation.

Question 15

In part (a) most candidates identified Pythagoras as the best way forward in this question and ended up with the correct answer. Some attempted to use trigonometry and this was generally unsuccessful. Many showed no working.

In part (b) few candidates were completely successful on this part. Many attempted to use trig ratios, although these were often incorrect. Those using the sine or cosine rule together with their answer from (a) were less successful. Some assumed the triangle was isosceles. Some seemed not to realise that one of the triangle angles was needed. Many did not appreciate which angle was needed and, since the angles were often not labelled, it was not always clear to which angle they were referring. It was clear that many students did not know how to find a bearing, with angles being subtracted from 180 or the acute angle being given. Since the question asked for a calculation of the bearing, measuring the angle gained no credit.

Question 16

There was usually some evidence of the correct calculation being performed, but frequent errors in writing the answer correctly as required. The most common error was in writing the answer as 18.75×10^7. A few candidates attempted to add the given numbers rather than multiply.

Question 17

Candidates generally scored full marks or no marks. Those who were successful usually worked out the scale factor, preferring to express this as 1.5 rather than $\frac{9}{6}$. Some did go on to use this incorrectly in part (b), multiplying by 1.5 instead of dividing. Using ratios of sides was rarely seen.

The most common error was to view the relationship as one involving addition and subtraction rather than a multiplicative relationship: the most frequent incorrect answers were LP = 8 and BC = 9. These results obtained from
9 – 6 = 3, and 5 + 3 = 8 and then for the second part 12 – 3 = 9

Question 18

In part (a) there were many different attempts at working out the answer. The most common error was to calculate simple interest for the second year as 1.5% of 200, rather than compound interest 1.5% of 206.60. A significant number of candidates scored M1 for £206.60 then made this error. This led to a common incorrect answer of 209.60. Less common errors included calculating a 4.8% increase on 200 (adding 3.3 and 1.5), and using 1.33 and 1.15, instead of 1.033 and 1.015, as multipliers or using $3\frac{1}{3}$% as equivalent to 3.3. Most candidates rounded to the nearest penny, with some failing to do so and giving £209.699. Too many candidates continue to find percentages using non-calculator “stepped” methods.

Part (b) was rarely completed successfully. A large number of candidates attempted to subtract 12.5% from 225 and 5% from 535.50 to find the original amounts, with others adding 12.5% on to 225 and 5% to 535.50. Whether this is due to a lack of knowledge of the required method or an inability to understand the question is unclear. Those candidates who did appreciate that the original amounts were 112.5% and 105% usually went on to gain full marks, with some failing to gain the C mark as values were simply stated and no comparison given.

Question 19

This question was not attempted by all candidates. Many attempting the question did not give co-ordinates in the correct order; usually Y and Z being reversed. Candidates using the correct method to determine the co-ordinate often lost the accuracy mark due to giving $1\frac{1}{3}$ as 1.3 instead of 1.33 ….. Many candidates failed to interpret the ratio 1:2 as meaning the line was divided into $\frac{1}{3}$ and $\frac{2}{3}$; often the coordinate of P was divided by 2 instead of 3, possibly from candidates assuming 1:2 as equivalent to $\frac{1}{2}$.

Question 20

There were relatively few good answers to this question. The most frequently seen incorrect method was 72 – 67.8 = 4.2 followed by 4.2 + 72 = 76.2. Candidates need to practice mean in a variety of situations rather than just rote learning of calculation of a mean from a total divided by frequency. It is important to know that there are three elements in mean calculations and reversing to find totals is essential. Those who gained partial marks usually found either 3960 or 1695 but then couldn't see how to complete the method, sometimes dividing by 55 instead of by 30.

Question 21

In part (a) most candidates were able to score at least 1 of the 2 marks. The most common errors were to combine -5*y* and -2*y* as either 3*y* or +7*y* or to give -2×-5 as -10. Confusion of multiplication and addition of directed numbers was apparent for a few candidates.

Part (b) was less well done. A large proportion of the candidates made no attempt at this part of the question. The fact that this was to be proved algebraically cannot be over-emphasised. A higher level candidate should be able to square a bracket and simplify an expression. The statement to prove has to be based on the algebraic factorisation showing that it was a multiple of 2 or 2n and hence must be even. Too many candidates substituted numbers rather than attempting an algebraic proof. Those candidates who did attempt to use algebra sometimes made errors in the expansion of $(2n+1)^2$ or forgot that $-(2n+1)$ gives -2n-1. A small number successfully obtained 2n(2n+1) and gave a convincing explanation that the expression was a multiple of 2 and so even.

Question 22

It was noticeable that those who had chosen to draw a probability tree diagram were much more likely to get the answer correct than those who hadn't. The majority of candidates showed some understanding of probability and were awarded 1 mark for P (tails) = 0.4 but many failed to cube "0.4" and multiplied by 3 instead, which highlighted a poor understanding of probability as their answer was greater than 1. A small number of candidates did not recognise that 0.064 was less than 0.1 and so came to an incorrect conclusion. There were many fully correct responses.

Question 23

In part (a) the vast majority of candidates were unable to communicate that a stratified sample is proportional in its nature. Many thought the essence of a stratified sample is purely about subdividing the population into groups. Common incorrect answers referred to taking equal amounts from each group or describing random or systematic sampling techniques. The quality of written communication was poor and candidates clearly found it difficult to express their understanding.

In contrast part (b) was well answered. In the cases where candidates only gained 1 mark this was either because they left their answer as 26.2 or rounded up to 27 people. Of those candidates who failed to score many of them often used the correct 3 values but reversed the order of division or multiplication.

Question 24

The responses to this question were mostly awarded full marks or no marks. A common misconception was to read the question as a direct proportion problem with many candidates giving 18 as an answer from (12 ÷ 4) × 6. Of those who started with the correct relationship most went on to achieve a correct answer although there were a significant number of candidates who failed to rearrange the formula correctly to find k. Those candidates who approached the problem by a numerical route gained 1 mark for 6 ÷ 4 (1.5) but often used the 1.5 as a multiplier rather than a divisor.

Question 25

Most candidates were able to identify a correct equation for one or both parts of the shape but there were many errors. The most common included failure to divide by 2 for the hemisphere, squaring instead of cubing the radius for the sphere and using 14 as the height of the cone. It was surprising how many candidates squared or cubed *pi*. Some candidates did not seem to identify any equation from the formula sheet. Occasionally early rounding of an interim answer resulted in an inaccurate final answer.

Question 26

The algebra required to solve these simultaneous equations was beyond the capabilities of most students, although the majority of students attempted the question. The first step was to perform a substitution into the first equation. Those who did this were often able to go on to expand their squared bracket, although a frequent error occurred with the squared term. Many students were able to simplify their quadratic equation into a form to be solved either by factorisation or by the use of the quadratic formula. Many students stopped at this point. It was pleasing to see a few go on to solve the quadratic, and to realise that their values for x and y needed to be correctly paired.

Question 27

This question discriminated well, even amongst the most able candidates. Of those who were successful the most common start to solving this problem was using the Sine rule to find the angel at D. In cases where candidates failed to score any marks attempts at Pythagoras or trigonometry for right angled triangles were commonly seen, of those who did recognise the need for formulas for non-right angled triangles they proceeded to misapply the values to the cosine rule or substitute the given values into the formula $\frac{1}{2}$ ab Sin C, showing a lack of understanding of the included angle.

Some clearly able candidates worked out the required information using trigonometry but then thought the area of the parallelogram was found by multiplying the two side lengths together. Premature rounding lost the accuracy mark in some cases.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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