# Principal Examiner Feedback

November 2015

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

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## GCSE Mathematics 1MA0
## Principal Examiner Feedback – Higher Paper 1

### Introduction

Performance was polarised mainly at the lower end of this tier, with those who were clearly aiming to achieve a pass at grade C. There was also a much smaller group at the upper end of this tier. There was some evidence of a concerted effort to gain marks on certain questions, whilst there were some topics where performance was very weak, and a significant failure to even attempt questions relating to these topics would suggest that decisions might have been taken not to prepare students for them.

Performance on unstructured questions was better near the front of the paper, but much weaker in the later parts of the paper however, there were too many attempts that resembled trial and improvement approaches.

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. There were too many instances in this paper where working out was set out in such a disorganised way that it was difficult to identify a chosen route of solution by the candidate, in order to award method marks. This was particularly the case with working out presented on additional sheets.

It was disappointing to see marks lost through poor arithmetical skills, particularly relating to knowledge of simple times tables.

### Report on individual questions

### Question 1

Some students were unclear on the overall method and struggled to make any progress. Others, with some idea, often failed in their attempt to find 15% of 720, with very few attempting either $\frac{15}{100} \times 720$ or $1.15 \times 720$. The vast majority opted to find 10% then 5% of £720, often without showing any method and many lost marks because of errors. Alarmingly, many could not cope with the division of their total by 12, with a significant number believing that they could do so by dividing by 10 and then by 2.

### Question 2

Both parts were affected by mis-placed values. Part (i) was answered well, with only a few giving the wrong answer, usually 194.4 but in part (ii) there were more errors, with the incorrect answer of 1944 or 194400 being given.

## Question 3

Most students attempted this question. Where students did not earn full marks in part (a) they typically wrote $5n+6$, or $n+6$. There was evidence also that students thought that terms were increasing by 7 each time, so poor arithmetic skills even at this basic level.

In part (b) students who were most successful listed all the terms up to 119 and 125 to come to the correct conclusion. Errors included those who thought that they needed to substitute 121 into their expression from (a). In other cases, students got as far as a correct equation = 121, but then could not use inverse operations correctly to find $n$. There were also a lot of empty spaces on this question, where students did not know how to begin solving the problem.

## Question 4

In part (a) attempts at working out the missing probability required in part (b) were seen. Other errors were common, such as calculating the number of pens out of 100 and not 200, or calculating the wrong colour of pen. Many answers were spoilt by an inability to calculate $200 \times 0.3$.

In part (b) many students arrived at the correct probability of 0.1 but then went on to multiply this by 200 to give a number of pens rather than a probability. Similar errors were seen as in part (a), such as giving the number of green pens rather than the probability, and giving each colour of pen the same chance.

## Question 5

Many numerical errors in finding multiples were common and students struggled with division, especially with non-whole number answers. Very few students failed to attempt the question but the majority of students who were awarded 1 mark found the amount of ingredients needed for 16 biscuits and then stopped because they thought they could only work in multiples of 8. Few students managed to gain full marks but those that did tended to be able to display their working in a clear and methodical manner**.** Also, many responses only worked out the number of biscuits that could be made based on how much butter they had (answer of 22). A build up method worked best for those that scored full marks on this question.

**Question 6**

Those who marked the values of the angles on the diagram tended to gain more marks than those who tried to identify the angles by name, as it was not always clear which angles they were referring to.

Those who recognised that it was an isosceles triangles often gave $x$ as one of the equal angles giving $x = 70$. A significant number of students gained 3 marks as they correctly calculated the values of the angles but failed to give all the reasons. Some students did not attempt to give any reasons; some gave a list of reasons which didn't relate directly to the calculations and some were confused especially between corresponding and alternate angles.

**Question 7**

This was a well answered question. In part (a) lack of a time frame was a very common correct response. The fact that there was no response box for never was often highlighted, others focused on the fact that the responses boxes were vague. Some incorrect responses just said not enough boxes. In part (b) many gave an appropriate question with a time frame. The most common problem with response boxes was either missing zero (never) or having an overlap at the top end. Some did not give a time frame in the question but within the response boxes; when this was consistent full marks could be awarded.

**Question 8**

Many correct answers, which were more likely to be successful if a two-way table was used. There were many arithmetic errors, most surprisingly 22-15=17 instead of 7. There was also a clear misunderstanding seen, where some just tried to add up all the numbers given and subtract that answer from 100. Where students found 2 values missing they tried dividing the missing amount by 2, and then rounding up or down to get a value. A few students got a completely correct two-way table, but then were careless in reading the question and gave a final answer that was not the one requested.

**Question 9**

Answers to this question varied widely. There were the well-structured calculations with annotations and a reasoned answer at one end of the scale and at the other a mass of calculations with no or yes and no further explanation.

One of the biggest errors was in place value when multiplying $30 \times 50 \times 40$ for the volume or dividing for the number of bottles. Hence common incorrect values of 6000, 600000, 2, 200 or 2000 were seen. A significant number of students just gained 1 mark for $30 \times 40 \times 50$ seen. There were many attempts at repeated subtraction rather than division when $60000 \div 3000$ should be accessible at this level.

Most students started by finding the volume but some did try to work out the surface area or a partial surface area accounting for only 3 of the sides. Adding the three dimensions was also seen a number of times. Incorrect methods also included volume × 3000 and volume × £3.50

**Question 10**

Part (a) was well answered, with most students gaining the mark.

In part (b) most students were able to correctly expand one or both brackets with $3(y + 2)$ proving the easier of the two. Common errors often involved $3y + 5$ and $4x – 1$. Collection of terms proved more of a problem and answers such as $7xy + 2$, $3x + 4y – 2$ were common.

In part (c) quite a few correct answers were seen. There was evidence that some students had never had to deal with two sets of brackets before so there were some empty responses. A lot of arithmetic errors were seen, especially when dealing with the negative numbers, both multiplying them and adding them when simplifying.

In part (d) partial factorisation was common for M1. There were students who tried to factorise the expression using two pairs of brackets. There were also students who thought factorise meant simplify and worked the answer out to be $20x^3$.

Of those students who made a good attempt at part (e) (those that recognised the need for two brackets) many got full marks. There were a lot of answers that were correct but the addition and subtraction signs were the wrong way round. There was also a significant number who had (y-y) in one of their brackets as well as $(y-1)(y+1)$ or $(y-2)(y+2)$ given as answers.

**Question 11**

There were very few correct answers in part (a). Many students gave answers of 330° or 30° without working. Working accompanying 30° came from 360°- 330°. Very few students drew a diagram; those who did often left out one of the north lines.

In part (b) many students tried to break down the distance and speed obtaining 1 hour for 120 miles and trying to find the time needed for the remaining 80 miles. Unfortunately this method was often unsuccessful due to arithmetic errors. One mark was awarded for 200 ÷ 120 but this often resulted in an incorrect decimal (eg 1.8) which was converted incorrectly. However some marks were available when time conversions were done correctly. Some students tried to use the speed, distance and time formula but used 10 as the time. This often resulted in (10 × 120) ÷ 200. Another common error was to calculate 200 × 120. A small number of students spoiled an otherwise correct response by failing to give an actual time of arrival, giving instead the duration.

**Question 12**

Some good work was evident in part (a), but also a lot of errors with substituting both positive and negative values into the quadratic expression. There were many instances where no response was seen at all.

In part (b) students were usually able to plot the points they had created from the table. Most likely errors were those that included a zero value. Some students did not plot any points at all. There was obviously a lack of understanding about the shape of a quadratic graph, as those who plotted the correct points sometimes failed to join the points at all, or joined them with straight lines, and failed to go beneath the $x$ axis at the bottom of the curve. Other students joined their points together with line segments as well as curved sections. Students do need to take more care to ensure their curve passes through the plotted points more accurately.

Part (c) was done least well. Most students did not give any answer at all. Those who did were typically trying to solve the given equation algebraically, but with little success. Even the few students who drew any type of line across $y=4$, usually failed to write the negative solution at all.

**Question 13**

There were a significant number of students who did not answer this question at all. Others saw the word "mean" so just added up all/some of the numbers given in the question and divided the total by the number of values added. Misconception errors included some who thought they should divide 18 by 10 rather than multiply, or who added 180 + 420 before dividing by 12, rather than subtracting their two figures. Many students subtracted the 2 means and gave a final answer of 4.

**Question 14**

There were a significant number of students that did not attempt this question. However, many students did manage to gain a mark for calculating the exterior or interior angle of one of the polygons. It seemed like most students focussed on the pentagon rather than the octagon. There was often confusion between interior and exterior angles, which was evident from their diagrams. Where such contradiction was evident, method marks were lost. A common error was to consider the angles at the point Q rather than the isosceles triangle. There were many arithmetic errors seen, especially in division.

**Question 15**

In part (a) most students correctly worked out the correct values. The odd numerical error was evident and some students thought they needed to give a running total of the upper ends of the intervals.

As is always the case in part (b), there were a lot of students plotting in the middle of each interval or drawing bar charts. The vast majority, however, recognised the need to plot at the end of each interval and good curves were seen throughout.

Most disappointingly in part (c), students knew what they were doing (as indicated by vertical and horizontal lines on their cumulative frequency graph) but failed to give a reading. There were some that thought the cumulative frequency axis was an indicator for percentage, however most students who attempted to find the upper quartile were able to calculate the value as 60 and take a reading. It was good to see students take a reading for 3.4 and then calculate what percentage this would be (helped by taking a reading of 56). Students are still finding it difficult to formulate a meaningful but concise statement about what they have found.

**Question 16**

This was another question which was often left blank. Those who did attempt it seemed to understand what was meant by perimeter and gave correct expressions for both shapes. If they simplified the perimeter of the trapezium they often put +4 instead of -4 and some left the number out completely. The perimeter of the rectangle was sometimes given as $9x + 5$, because the candidate had only considered the two labelled sides of the rectangle.

A significant number of students found the perimeters of the trapezium and rectangle but rather than equate them, they set them both to zero or 360 and tried to solve which resulted in two values for $x$ and nowhere to go from there.

Once the correct equation was formed, most students were able to solve it to find a value for $x$ but some failed to substitute this value into $5x + 5$ to find the length of ST. Cases of trial and improvement were also seen.

**Question 17**

This question, with its fractional value, took a vast number of students by surprise. Many non-attempts here and for those that did attempt, there were a lot of numerical errors. Students struggled to multiply a fraction by an integer, the majority multiplying both numerator and denominator. If students were in a position to subtract their two equations, many failed to spot the clash of signs. If students did all of the aforementioned correctly and managed to eliminate $y$, there was still the added complication of the fractional value of $x$. There were very few correct answers and few attempts using the method of substitution.

**Question 18**

Many who appreciated the need to multiply numerator and denominator by $\sqrt{5}$ went on to simplify their expression correctly. A significant number replaced $\sqrt{5}$ with 2.5 to reach a final answer of 4. If they did get M1 they often left their answer unsimplified.

## Question 19

Many students failed to attempt this question. Even when an attempt was made it was common to award no marks due to the presentation of incomplete or incorrect method. Some were able to start and substituted $h = 10$ into the correct formula but were then often unable to rearrange their expression to find the radius. It was common to see 270 ÷ 3 and 270 ÷ 10 and many could not cope with the multiples of $\pi$. When a value of the radius was seen it was common to see 3 or $\frac{3}{\pi}$. Those students that attempted to find the volume of the hemisphere often squared the radius, despite having the correct formula for a sphere, and they often forgot to halve their volume at the end.

## Question 20

For many students this question was too challenging and the vast majority of them scored no marks on this question. Many attempts involved angles and parallel lines. For those who made some attempt at vectors, a few were able to pick up one or two marks for identifying another vector.

The award of one mark was often given for labelling **BA** = **a** on the diagram. If a candidate earned the third M (Method) mark they usually went on to pick up the A (Accuracy) mark and sometimes the C (Communication) mark. Algebraic errors with signs or incorrect collection of terms were the most common causes for the loss of the A mark.

## Question 21

In part (a) few marks were gained. Obtaining a common denominator proved difficult for many and denominators of $2 - x^2$ and $-2x^2$ were common errors. When the denominator was correct the numerator caused problems as errors with the signs were very common. Those students that got this far without error usually went on to simplify the numerator correctly and gained full marks.

## Question 22

A significant number of students did not attempt this question. Of those that gained marks the majority were for stating that the two triangles both contained the same angle or for recognising that the opposite angles of a cyclic quadrilateral add up to 180. The difficulty for students was the recognition of an angle in the quadrilateral being the same as an angle on the straight line and how this linked with proving similarity. As with question 6, students were unaware that knowledge of three letter rule to denote angles makes life so much easier when it comes to describing what is going on. Some thought CB and CD were tangents and therefore of equal length.

Summary

Based on their performance on this paper, students should be advised:

- that working needs to be presented legibly and in an organised way on the page, sufficient that the order of the process of solution is clear.
- that 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.
- to spend more time on more basic topics of work to reinforce non-calculator skills, particularly knowledge of times tables.
- to spend more time ensuring they read the fine detail of the question to avoid giving answers that do not answer the question.
- to ensure a full range of equipment needs to be brought to the examination: in this case including a ruler, a pair of compasses and a protractor.

**Grade Boundaries**

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