# Examiner Report

# Principal Examiner Feedback

January 2017

International GCSE Mathematics
A (4MA0) 4HR

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**Principal Examiner's Report**
**International GCSE Mathematics A**
**(Paper 4MA0-4HR)**

## Introduction to Paper 4HR

This paper proved to be accessible to most students, allowing them to demonstrate their ability across the assessment criteria. They often failed to score marks on interpreting the histogram, solving equations by drawing extra lines on a cubic graph and some of the more challenging algebra. Adequate working was usually shown although it is an area some students would benefit from improving.

## Report on Individual Questions

### Question 1

A very well answered question with many students achieving full marks. Those that didn't tended to do the multiplication (e.g. 30 × 100) without then dividing or used a ratio method ($\frac{100}{24}$) which was rounded early resulting in a loss of accuracy in the final answer.
In part (b) we saw a number of misreads of 800 for 850 which gained the method marks but lost out on the accuracy. Students should be encouraged to underline important information to avoid losing accuracy marks in this way.

### Question 2

Part (a) was generally well done.
Some struggled with part (b) and many divided 0.45 by 2 rather than by 3. A few reached the 0.15 but then failed to read the question carefully enough and did not double their answer.
Part (c) was generally very well answered, but students should take care to give the answer that is required, i.e. 'how many times' rather than 'what is the probability'.

### Question 3

Many responses seen were given using percentages (1200 × (1 – 35%)) rather than the equivalent decimal which is essential in the calculation on a calculator. Correct answers were often seen, indicating the students had recovered but the working alone would not be worthy of marks. Methods involving 65% of 1200 and 1200 – 35% of 1200 were seen, however, the latter method sometimes was not followed through and 35% of 1200 (420) was given as the final answer; M1 was awarded in this case.

### Question 4

Most responses for this question were fully correct. Incorrect answers were usually the result of students using the formula for the circumference of the circle rather than the area.

**Question 5**

The majority of students at this level were able to correctly answer questions on the intersection and union of sets $A$ and $B$. Unfortunately, in part (b) we saw many incorrect answers to the question n($A'$), many answers just listing the members of the set $A'$.

**Question 6**

Most students answered this question correctly using Pythagoras' theorem. Few of those that tried to use trigonometry were able to follow this method through to the correct answer. Some early rounding led to loss of the accuracy mark.

**Question 7**

Overall this question was answered well with a very high level of success for parts (a) and (b), as one would expect on the higher paper. Part (c) was generally well answered but errors caused by incorrect multiplying of negative integers were seen. Part (d) was quite well answered, but some failed to simplify fully and left their answers as $\frac{w^{13}}{w^4}$ for which they gained a method mark. We also saw the common error of multiplying the indices on the numerator and then dividing the one on the denominator. Part (e) had a pleasing response with many correct answers. Those incorrect often scored 1 mark for one end of the inequality correct. Those scoring no marks often gave a range of values that $x$ could be rather than an inequality.

**Question 8**

When a correct equation was formed students usually followed it through with correct working to give a correct solution. Incorrect working usually arose from thinking that the two (not drawn to scale, but quite different looking) angles were equal, stating $160 - 3x = 7x - 20$ giving a common incorrect answer of 18. A few students just wrote down the correct answer of 10 and scored no marks because the statement 'Show clear algebraic working' was given.

**Question 9**

Most students realised this was a trigonometry question although some tried to apply the cosine rule or sine rule despite the presence of a right angle. Students for the most part used the cosine ratio and generally reached the right answer but a minority lost marks by not managing to inverse the function or by having their calculator in the wrong mode. Students who used convoluted methods involving sine rule and Pythagoras's theorem combined with a different trig ratio often showed muddled working which was fraught with errors.

Part (b) was done reasonably well, although it was clear that bearings are not well understood and taking from 180, 360 or adding the angle found in (a) to 180 were an assortment of incorrect responses seen.

Part (c) was poorly done and it was evident from the popularity of the responses of 109.5 and 110.5 that students thought that 110 was written to the nearest whole number rather than to 2 significant figures.

**Question 10**

Both parts of this question were poorly done with few students showing evidence of using 'an efficient method' of finding either the HCF or the LCM, i.e. very few used the indices alone, instead writing out all the multiples/factors. It seems that while students can find the LCM and HCF of two numbers where they need to do the prime factorisation, they do not fully understand what is being achieved and so given a different situation struggle with a method.

**Question 11**

The gradient calculation proved to be the biggest issue here with students obtaining either 0.5, −0.5 or 2. Those using $y = mx + c$ managed to get the intercept correct from the graph and this enabled them to pick up 1 mark. An alternative method often seen was to use $(y - y_1) = m(x - x_1)$, but this was often used incorrectly as $(y - 3) = m(x - 5)$ where it should have been $(y - 3) = m(x + 5)$; this approach was often less successful for this particular question.

**Question 12**

Parts (a) and (b) were often well done, even by students doing very little more of the paper. Part (c) was more challenging and only the more able students doing this paper were able to achieve full marks. Common incorrect answers occurred when students misread or misunderstood the question and gave the answer to Joaquim winning all 3 games. A small number took the answer to be 1 – Joaquim winning all 3 games, not understanding how to calculate winning exactly one game. Those adding to the tree given in part (a) managed to determine all of the correct combinations required. In other responses a few combinations were given incorrectly where two wins were considered; this seemed to be because students were not using the probability complement for losing the third game as 0.8

**Question 13**

A good number gained full marks for this inverse proportion question. The responses that were given incorrectly occurred because students did not use the **square** of $q$ or used direct rather than inverse proportion. Those students who gave a correct answer in (a) invariably gained the mark in (b), and generally those who didn't gained nothing in (b) although follow through was allowed for a formula in the form of inverse proportion with $q^2$.

**Question 14**

Parts (a) and (b) were very well answered with students that realised they needed to work with a scale factor generally gaining full marks. A large number of students in part (c) did not square the scale factor and so gained no marks. A small number did reach the 20.5 (area of small pentagon) but they forgot to subtract from the whole area and so gained just one method mark.

**Question 15**

Many correct answers were seen and the main incorrect answer was to write the signs the wrong way round in the brackets; M1 was awarded for this. A few students went on to 'solve' their factorisation; we ignored this and so long as the correct factorisation was seen awarded full marks. Part (b) was quite well done. Mistakes usually involved failing to multiply both the $e$ and the −3 by 5, resulting in $5e - 3$ rather than $5e - 15$.

Part (c) was often correct but common mistakes were made involving the fact that this was a subtraction instead of an addition simplification; $-2(x + 1)$ was frequently given as $-2x + 2$ rather than $-2x - 2$, generally causing the loss of 2 of the 3 marks available.

**Question 16**

Around half of the students taking this paper gained full marks for part (a), but we frequently saw frequency rather than frequency density plotted. Some students also incorrectly thought that the bar should go to the end of the 'height' axis rather than just to 2.72. If the bar was of the correct height and incorrect width or we saw the frequency density of 40 written we awarded M1. Part (b) eluded many students with 10 a frequently seen incorrect answer.

**Question 17**

This question was not particularly well answered with many students unsure of the correct circle theorems to use. Part (a) was more often correct than part (b) with many trying to use the correct theorem, but many incorrectly halving the 260 rather than the 100. There were a variety of methods that could be used for part (b) and many students decided on a method involving triangles and were successful. A minority recognised the alternate segment theorem and were often successful when they did. Some incorrectly found the size of *CAO* rather than *CAD*.

**Question 18**

Part (a) was more often correct than part (b) but students often did not show evidence of reading from the graph – we awarded full marks for a correct answer with no markings on the graph for part (a). For part (b) we insisted on working and seeing either $-5x$ in the working or the graph of $y = -5x$ drawn. We saw few correct responses with students choosing to draw incorrect lines or rearranging the equation incorrectly and drawing $y = 5x$. A few tried to use an algebraic method which was then abandoned. A few students had drawn a completely new graph with a table of values rather than drawing a suitable straight line as requested.

**Question 19**

A good number of students gained full marks for this question but many were limited to just 3 marks because they did not consider the cone as solid and forgot to add the surface of the circular base. It was good to see pupils using Pythagoras' theorem to find the height, however a few used the slant height as the perpendicular height. The majority used the correct formula for the volume as indicated on the formula sheet.

**Question 20**

For part (a) students with some understanding of surds usually scored at least one mark unless they made an error expanding the brackets. After the expansion, several students could not gain either of the values required. In part (b) we saw many students struggling and not being able to deal with a negative power or cube root of a square, with many using a square root and cubing.

**Question 21**

Part (a) was generally well answered although some students massively overcomplicated the responses needed by attempting to generate an equation for $x$ to then solve. Some appeared to be trying to find the volume of the box and went on to show evidence of good skills in manipulation of algebra although obviously this could not be credited.
Part (b) was generally done well if students used the expression ($x$ – 52) rather than the frequently seen incorrect expression of ($x$ – 2). A small number gave 0 as a possible solution and students should check the viability of their results – especially as the question asks for ‘the value’.

**Summary**

- Students might benefit from learning more than one method for finding the HCF and/or LCM and understanding, for example, the difference adding a multiple of a number makes;
- For questions that ask for clear algebraic working, marks are unlikely to be awarded unless they show such method;
- More practice with fractional and negative indices is needed;
- Remember that in Histograms, frequency density rather than frequency is plotted;
- Students should be reminded to retain full accuracy when working through multi-step calculations;
- Ensure calculators are in degree mode before the start of the examination.

**Grade Boundaries**

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

http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html