# Examiners' Report/
# Principal Examiner Feedback

Summer 2016

Pearson Edexcel International GCSE
in Mathematics A (4MA0) Paper 4HR

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## Introduction

Some good solutions were seen to all questions on this paper. The most able students performed well throughout the paper, including the more challenging questions at the end of the paper.

It is essential that students show clear algebraic working when asked to do so and also show working on fairly straightforward questions where they could make a small slip and end up with no marks at all. Premature rounding caused some inaccurate answers, especially with 3D trigonometry and students must be persuaded to retain full accuracy until the end of a question. Giving the correct degree of accuracy on a question was a problem for some students on the percentage question (Q 3a) and the quadratic equation using the formula (Q 16) where they lost marks for too few decimal places or significant figures.

## Report on Individual Questions

### Question 1

(a) If incorrect, most students enlarged the shape successfully but did not draw it in the correct position, this was awarded 1 mark, as was a correct enlargement of scale factor 3.

b) Very few students were able to gain the mark in this part as they were unable to correctly give all three aspects that described the enlargement. Lots of different words were used instead of ‘enlargement’ such as shrinkage and reduction. The scale factor was also often given as −2 instead of 0.5.

### Question 2

(a) The majority of students gained full marks on this question, showing at least $4t = 14$. A few students showed all the t terms on one side and all the numbers on the other side of a correct equation, even though they were unable to simplify this correctly. Very few students gave a correct answer without any algebraic working which was pleasing – any that did this were awarded no marks as they had been asked to “show clear algebraic working”.

(b) This was well answered. Almost all students could expand correctly to 4 terms gaining them M1 A small number then incorrectly added the 6 and −8 to get 14. Also another common error was to incorrectly over simplify to $4y – 1$.

(c) This was answered well by the vast majority of the students. There were a few instances of only partial cancelling and some incorrect arithmetic leading to, for example, $\frac{w}{4}$.

**Question 3**

(a) Many students were able to answer this question correctly, but some ignored the requirement to give their answer correct to 1 decimal place and gave 83% so they forfeited the accuracy mark. The students who showed no working and only 83% gained no marks at all. Some students did $\frac{2.1}{1.75}\times 100$ instead of $\frac{1.75}{2.1}\times 100$, misunderstanding what was required. This question was one where it was essential to show clear working and to read the question very carefully.

(b) The majority of students gave the correct answer. Quite a few rounded prematurely and this denied them the accuracy mark. Some students worked in pounds to find the difference and forgot to convert back to Dirham, the currency in which the answer was required.

(c) A large proportion of students gained full marks on this question, of those who did not most gained B1 for conversion to hours or minutes, or M1 for 5522/7.24, a common error. Those who worked in minutes often forgot to multiply by 60 to give an answer in kilometres per hour.

**Question 4**

(a) We saw many correct answers here, but there were a number who subtracted just 111 and 90 from 360 and rather than subtracting 2 × 11 and 90. Some students worked successfully by dividing the kite into 2 triangles, but some who attempted this method forgot to divide the 90° angle by 2.

(b) This was well answered by most, although quite a few did not realise the whole angle was 111° and was the same as in part (a).

(c) Most who gained full marks used the pentagon, 540° approach. Very few spotted the isosceles triangle with y at the apex, which was probably the simplest calculation. Quite a few recalculated '111°' to something else and used this to gain the wrong value for *y*. Some assumed there was symmetry to the shape with the angle adjacent to *y* being 21° also; an incorrect assumption. Overall, this part was not answered well by a large number of students.

**Question 5**

Most students dealt with finding points and drawing the graph well A common error was to see 5 instead of 7 for the first value coming from incorrectly squaring –1. Most students correctly plotted the points, although some errors were made plotting 7 as 9 or not plotting either points with y- coordinate −1 carefully enough. Nearly all students correctly joined the points with a curve. Those who drew a good parabola generally found the correct value in part (c), although a number misread the scale to give an answer of 4.2. A number of students gave both values, or the negative value, ignoring the requirement for the value to be greater than 0.

**Question 6**

Most students obtained fully correct answers. A common wrong answer for $x$ was 8, ie when told that the median was 8, some thought this meant that 8 had to be one of the values. For those that gave 8 for $x$, they often gave 27 for $y$. Such responses lost both accuracy marks for this question, but the method mark was awarded. The method mark could also be awarded for working that showed the student knew that the total of the values was 44.

**Question 7**

The majority of students gained full marks in this question, those that didn't usually gained M1 for $\pi \times 3^2$

The main error was to use $\pi \times 2^2$ rather than $\pi \times 5^2$ for the second circle.

A few students used the formula for the circumference rather than the area and some used Area = $2 \times \pi \times r^2$.

**Question 8**

There was a lot of confusion with this question arising either from not realising that consideration of the different units involved was needed or an inability to convert units correctly. It was not uncommon to see 10 or 1000 used to convert between metres and centimetres. Many students simply calculated 80 ÷ 50 in part (a) or forgot to convert 72 metres to centimetres in part (b). Some forgot the need to question the reality of their answer to (b) with models of planes significantly longer than 100 metres or 1 kilometre.

**Question 9**

Although many students found the correct answer of 113.75 (often rounded to 114) there were many who simply added the two means, ignoring the different numbers of apples in the bag and the box. Some divided the mean of the box, by the number of apples in the box, and the mean in the bag by the number of apples in the bag and added these values. Students should always consider how reasonable an answer is for the mean weight of the 40 apples, since 30 weighed on average 120g and 10 weighed on average 95g, so the combined mean should lie between these values.

**Question 10**

Most students negotiated this question successfully, preferring to eliminate $x$ first. Those who chose a substitution method often substituted correctly but then made errors in simplifying their complicated equation and lost the accuracy marks. Some common wrong methods included simply adding the two equations together, or failing to multiply all the terms in an equation by the constant.

**Question 11**

The majority of students gained M1 for correctly calculating $SR = 8$, but many continued to use the incorrect trig ratio.

A number calculated the third side but again often used the incorrect trig ratio.

Many students seemed confused by the fact that 90° was not on the base.

**Question 12**

(a) The cumulative frequency table was completed accurately by the majority with very few errors seen.

(b) The plotting of the cumulative frequencies was extremely well done, with the majority plotting end points accurately and joining with a smooth curve or line segments. Very few plotted mid points and only a very small number of students drew a ‘squashed ‘cumulative frequency curve. A very small number drew histograms.

(c) Many students were able to gain the mark for the median, but fewer were successful in finding the interquartile range. Some who drew lines at 25 and 75 misread the graph; others used incorrect figures such as 20 or 30 and 70 or 80. However this was quite rarely seen and overall the question was well answered.

**Question 13**

(a) The majority of students were able to correctly write the number in standard form.

(b) Many students understood the need to find the cube of the radii working with the volume formula for a sphere, and there were a large number of correct answers. Common errors were to use the formula for surface area or simply to divide one radius by another. Even among the better students there is a reluctance to work with numbers in standard form, instead trying to write out very large numbers. This often led to errors later and answers of 132 or 1.32 were not uncommon.

**Question 14**

(a) This question was done well by a good number, but it was common to see students failing to multiply the first term ($2y$) by 4, when they multiplied the other terms correctly.

(b) Most students identified the need for two linear factors, with the coefficient of $x$ in one to be 3. Those who correctly recognised the type of factorisation required generally got the correct factors of $(3x + 4)(x - 1)$. A few made sign errors. Those who did not recognise the form required generally factorised *x* from the two terms in *x* leading to no marks.

(c) Most students gained M1 for multiplying out the first bracket correctly, although some gave the second term as 12 not 12x. Fewer students successfully multiplied out the second bracket, many failing because they tried to subtract the expression in one stage of working, giving a final answer of +9. It was quite rare to see a fully correct answer.

**Question 15**

Many students scored full marks on both parts of this question. The most common errors in part (a) were to work with 10 not 8 tiles in the second bag, or to find the probability of both tiles red only. Some students added rather than multiplied the probabilities for red in both bags, seemingly untroubled by the answer exceeding 1. In part (b) the correct value of 22/51 was often seen, although many unnecessarily converted this to a decimal. This was not penalised, but does lead to an approximate, not exact answer. The most common errors included incorrectly totalling the number of red tiles, or not using the correct fraction for the second tile being red, giving it as 12/18 or 11/18 or 12/17. Again some added the two probabilities, resulting in an answer greater than 1

**Question 16**

Only a few students lost marks by simply writing two correct solutions with no working. Substitution was generally done well, with the occasional omission of a complete square root line over the whole of the discriminant and sometimes the division line did not extend across to $-6 \pm$ .... The main cause of lack of marks was the incorrect rounding of 0.6339745... which was required to 3 significant figures and not the 2 significant figures that was frequently seen.

**Question 17**

Many students are happy to deal with trigonometry in 3D but often their solutions lacked clarity as lengths were rarely labelled. Too often examiners had to guess what lengths were being found, although some students helpfully labelled the diagram. 10 was often seen only on the diagram and the use of x, y theta etc in the working but with no reference to the diagram was far too common. Many students also wrote 20sin30, but then labelled RQ as this. Although many students having found two sides of the triangle MRL then correctly used basic trigonometry, many overcomplicated things by using the cosine rule. A number of students worked with lengths to only 3 significant figures. If they used MR and RL their final answer was often inaccurate due to this.

**Question 18**

There were very few correct answers in (a) or (b). The errors were diverse suggesting that most students did not have a working knowledge of set theory. In (b) many students presented a list of numbers, again suggesting that they did not understand what was being asked.

**Question 19**

A large number of students did not understand vectors, with many blank answers, or answers such as **ab**. A number gave the answer as 4**a** + 2**b** not realising they needed to divide by 2.

Of those who got the answer to part (a) correct many went on to gain M1 in part (b), but very few indicated that they had a common point.

Of those who did not gain a mark in part (a) a number gained M1 in part (b) for a correct follow through; clear working was essential for this.

**Question 20**

Quite a few students ignored the need for clear algebraic working and gained no marks despite finding the correct answer. Mostly, these students used a table of values approach. Many though were successful in finding the step by step method to the correct answer. A good number of the students got full marks and followed the first method on the mark scheme. The few who attempted to substitute ($y$ – 10) for $x$ often made a mistake with the rearrangement of their equation. Some students seemed to be able to find the $x$ coordinates successfully but were then unclear how to progress next in the context of the question. Some found the coordinates of $A$ and $B$ but could not then get the answer. Some felt that (3, 13) was the answer required. Generally well answered by the students it was targeting.

**Question 21**

Many blank pages were seen for this final question. Although a good number found the correct answer working with the parametric equation for $x$ to find an expression for $t$, and then substituting into the equation for $y$, many did not see the need to eliminate $t$ or they started from the expression given for the answer with $p$, $q$ etc in the equations. Many students who found answers close to the true values made mistakes through careless working in going from one step to the next eg $\left(\frac{x}{2a}\right)^2$ often became $\frac{x^2}{2a^2}$ or similar.

**Summary**

Based on this performance on this paper, students should:

- Maintain full accuracy throughout a calculation only rounding the final answer;
- Read the degree of accuracy required for a solution and not give less than this;
- Show clear working;
- Become more familiar with set notation.

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