Examiners' Report
Principal Examiner Feedback

Summer 2017

Pearson Edexcel International GCSE
In Mathematics A (4MA0) Paper 3H

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Students who were well prepared for this paper were able to make a good attempt at all questions.

Working was generally shown but it was not always easy to follow through. Arithmetic errors were a cause of lost marks for a significant number of students particularly when working with negative numbers or with standard form on a calculator.

1 The first two parts of this question were well done with only the occasional error seen. The expansion of brackets was generally correct for at least one term in part (c); the most common error being $2p^2 -5p^2$ Those who got both terms correct then sometimes attempted inappropriate simplification by attempting to combine the two terms. The correct terms were usually seen in part (d) although careless arithmetic in combining the terms in x ($-3x + 7x$ simplified incorrectly as $-10x$ or $-4x$) resulted in the loss of the accuracy mark for some students. Part (e) was invariably correct although a few students were careless in copying the given expression and so evaluated 2^2 rather than 2^3 or subtracting 9 from 14 and giving the answer 6.

2 A significant number of students had difficulty with using the centre of enlargement correctly; shape Q was generally drawn the correct size but was frequently in the incorrect position. Students had more success with drawing shape R but some errors occurred here as well; the common error was to use a clockwise rather than an anti-clockwise direction.

3 Part (a) was well done with the majority of students opting to find the scale factor of 2.5, others used various equivalent ratios from 300g for 4 persons, 600g for 8, 150g for 2, giving a total of 750g for 10 people. Whilst many correct answers were seen in part (b), it was also common to see students find the correct scale factor of 8 but then give that as the answer without then multiplying by 4 to find the number of people. In part (b) some students used the 300g or the scale factor of 2.5 from part (a) rather than the 115g.

4 The modal class was identified correctly by the vast majority of students; very occasionally 14 was given rather than the class. The correct method to find the mean was well understood although the end of interval values rather than mid-interval values was sometimes seen as was division by 5 rather than by 40.

5 It was extremely rare to see an error in part (a). There was uncertainty from a minority of students over how to round to 3 significant figures with 6.30 and 6.309 seen as an incorrect rounding to 3 significant figures of 6.30875 in part (b). The common error seen was due to students rounding to 3 decimal places instead of 3 significant figures.

6 Drawing the graph of $y = 2x + 4$ was well done although a small minority of students continue to plot correct coordinates and then fail to draw in the straight line. Many errors with coordinates came with the negative x values and it was surprising that when one point was off course, some students failed to recognise this could be an indication of an error as they didn't know to expect a straight line.

7 Many correct solutions were seen, including methods other than using cos22. Some worked with sin68 whilst others calculated the length of BC and then used

Pythagoras's Theorem. There was evidence that some students had their calculator in a mode other than degrees; provided the method was shown they were able to gain the two method marks. Some students got as far as $\cos 22 = \frac{14.9}{AC}$ but then followed this with the incorrect AC = 14.9cos22.

8 Part (a) was well answered. However, there were some students who, having worked with 668.8 and 640 without working out the increase in pay, arrived at 104.5 or 1.045 and gave that as the answer rather than 4.5. Some students did divide by 668.8 rather than 640 and thus arrived at an incorrect value of 4.3. There were two very common incorrect answers in part (b) - $702.24 from those who increased $668.8 by 5% and $635.36 from those who decreased $668.8 by 5%. Students who realised that they had to use a 'reverse' percentage method in part (b) almost inevitably went on to gain full marks.

9 Whilst many angle bisectors were constructed correctly, it was clear that some students were unable to recall the correct method for a construction. Some gained a mark for a bisector drawn without arcs but a significant number of students either attempted to construct the perpendicular bisector of line *QR* or just used their compasses to draw random arcs.

10 The main source of errors in the solution of the simultaneous equations came from either the selection of the wrong operation to eliminate a variable or inaccurate arithmetic. A number of candidates used a substitution method, although many of these then made errors in manipulation, often linked to the fractions involved. A common error was $31 \times 5 = 115$. It was disappointing to see a significant number of students fail to carry out arithmetic involving negative numbers correctly. As the question asked for clear algebraic working to be shown, any student who gave the correct answers without any supporting algebraic working gained no marks.

11 Part (a) was generally well done although it was surprising to see some students fail to gain any marks, often leaving their answer as the number of adults over 50 rather than as a probability. The cumulative frequency table was also generally correct. Whilst many correct cumulative frequency graphs were seen, there are still students who lose a mark by plotting at mid-interval values from the frequency table rather than end of interval values. There were, however, a number of instances were a cumulative bar chart was drawn rather than a cumulative frequency graph. There was good use seen of the cumulative frequency graph to answer the final part of the question although some students forgot to subtract their reading taken from the graph from 90.

12 Part (a) was usually correct although 4.51×10^4 was seen but infrequently. Part (b) was also well done; errors here were usually made as a result of moving from an ordinary number into standard form. 3.25×10^{-9} and 325×10^7 were the most commonly seen incorrect forms although at least the latter error did reflect the correct number. Those who decided to convert the given standard form numbers and then work with ordinary numbers did, on occasions, write 2.4×10^{-4} incorrectly as 0.0024 and thus had an inaccurate answer. A few students gave an answer correct to 2 significant figures which, if the complete answer had not been shown in the working, lost at least 1 mark.

13 It was extremely rare to see an incorrect answer in part (a) although on occasion some students attempted to subtract the difference from the sides to find the missing side rather than using proportion. On the other hand, in part (b) the incorrect answer of 240 from the use of the linear scale factor rather than the volume scale factor was frequently seen. Another successful method seen from a few students was done by taking the cube root of the volume of A, multiply this result by the scale factor and then cubing it to get the required volume.

In part (b), a few students tried to adapt the fraction 12/9 which had worked in the preceding part. There were a few students who, having found the volume scale factor, used it incorrectly which resulted in cup A having a smaller volume than cup B. It is always disappointing when this sort of error occurs as it shows a lack of consideration of the likely size of the answer. Despite there being no information about the shape of the cups, other than they were similar, some students attempted to use the formula for the volume of a cylinder in part (b). Part (c) proved a good discriminator for those aiming for the highest grades. A correct linear scale factor of $\sqrt{\frac{p}{q}}$ or $\sqrt{\frac{q}{p}}$ gained the method mark but having successfully got thus far, a significant number were unable to find the necessary volume scale factor.

14 A common incorrect response for part (a) was $4x$. Those who multiplied both terms of the equation in part (b) by 3 generally went on to gain full marks although there were a minority of students who having got as far as $10x = 9$ then gave the answer as $\frac{10}{9}$ rather than the correct $\frac{9}{10}$. A common error was to multiply just one of the terms on the right hand side of the original equation by 3; providing all other algebraic manipulation was correct this error led to the award of two out of the available four marks. In part (c) the fact that g appeared in two terms did cause confusion for some students who failed to realise that the correct method of solution was to isolate terms in g and then take out a common factor.

15 Students who started with a correct equation $P = kr^3$ usually went on to gain full marks. Some students failed to write down any initial equation and just attempted to combine the numbers without an equation; this approach gained no marks. A few students misunderstood the demand and gave their answer with r as the subject.

16 The majority of students who made a start to this question were able to gain a mark for correct partial expansion of brackets. A common error was to arrive at $-e$ rather than $-e^2$ when expanding the brackets. Following the expansion of the brackets, the majority were unable to make any progress. Those who realised the need to equate the rational and then irrational parts of the expression on each side of the equals sign, generally went on to gain full marks. Those students who attempted to use actual values from their calculator instead of surds usually gained no marks.

17 Those who understood how to work with vectors found (ai) and (aii) routine but (aiii) proved more problematic and was frequently incorrect. The lack of brackets was a common source of errors in (aiii), for example, writing $\mathbf{a} + \frac{1}{2}\mathbf{b} - \mathbf{a}$ rather

than $\mathbf{a} + \frac{1}{2}(\mathbf{b} - \mathbf{a})$**.** When reversing vectors, a good number of students failed to apply a negative sign. Working was seen both using vectors in the working space for (b) or directly with coordinates on the diagram. In many cases students put 'significant values' on the axes, for example 7 on the *x* axis and 3 on the *y* axis, but often it was unclear to which point on the figure these related to.

18 It was clear that there was a lot of misunderstanding regarding the information given using set language. It was not uncommon to see the numbers 50, 4, 5 and 9 transferred directly onto the Venn diagram. Another common error was to see 5, 4 and 9 on the inside regions with 32 outside. Students who made these errors could gain follow through marks in part (b) but this was rarely seen. Those that had the correct Venn diagram frequently gave 41 rather than 45 in (bii). Some students used these numbers as members of the sets rather than how many numbers, so for (bii) got (40,1, 5)

19 Those who understood how to find an inverse function were generally successful in part (a) although some poor algebraic manipulation did cause marks to be lost. In part (b) the majority of those able to make progress worked with fg(a); it was not uncommon to see the correct initial equation of $\dfrac{4}{\frac{a-2}{a}-3} = 1$ but then no further progress. It was pleasing to see some make the link with part (a) and so work with the fact that g(a) = $f^{-1}(1)$. Another successful approach seen was to solve f(g) = 1 to get g(a) = 7 and solve that. It was clear in this part that some students do not understand composite functions with fg(a) rather than gf(a) used or, in some instances, an attempt to multiply f by g was seen.

20 Students who made the error of just taking two balls scored no marks. Those who worked with 3 balls tended to be more successful if they worked with blue, blue, not blue rather than blue, blue, red and blue, blue, green. Many students were not able to arrive at 3 ways of taking blue, blue, not blue, often just assuming 1 way. Some used replacement rather than no replacement but were nevertheless able to score a maximum of two marks.

21 The main problem in this question was to identify the correct angle. A significant number of students attempted to work out angle *VCD* rather than angle *VCM*. A second common error was to work in the correct triangle but calculate the size of angle *CVM* as the answer. Many candidates were awarded just 1 mark for finding *MC* or *VC*.

22 The absence of brackets was the main reason for errors in algebraic manipulation in this question. Students who factorised the quadratic denominator before attempting to find a common denominator were generally more successful then those students who used $2(x + 6)(x^2 - 2x - 48)$ as a common denominator. A major loss of marks for these occurred when they failed to take into account the negative sign during the simplification of the numerator. Some students failed to simplify fully and gave their final as $\dfrac{x+6}{2(x+6)(x-8)}$; thus losing the final accuracy mark. Surprisingly, some

students went from $\frac{x+6}{2(x+6)(x-8)}$ to $2(x - 8)$. Students who just ignored the denominator, for example by multiplying through, could only get a maximum of one mark.

Summary

Based on their performance in this paper, students should:

- ensure that they read the question carefully and check that their final answer does answer the set question; at times the answer given while worthy of some method marks did not answer the set question
- use brackets around two term expressions in algebra
- ensure that full accuracy is maintained throughout multi-step calculations, only rounding the final answer
- practise working with standard form on their calculator
- get into the habit of sketching or marking up on the diagrams
- practise dealing with fractions in algebraic expressions

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