Examiners' Report
Principal Examiner Feedback

Summer 2017

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

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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.

It was evident that not all students were cognisant of the properties of quadrilaterals; eg. angles of a rhombus. Students should be advised to read each question carefully and ensure that their answer does answer the question as set. For example, there was evidence in question 6b that many thought the question just asked for Ahmed's age rather than the range of the three ages.

1 Whilst many students gave the correct answer there were a significant number who had $\sqrt{5}$ rather than 5 on the denominator following their substitution; providing this was the only error they gained one of the two available marks. Some of those who did the correct substitution then used a truncated value for $\sqrt{5}$ and thus lost accuracy.

2 It was disappointing to see some students getting as far as $4x = -2$ and then giving the incorrect answer of -2. Others made earlier errors in their algebraic manipulation and so failed to gain any method marks.

3 Recalling the properties of quadrilaterals correctly caused difficulties for a surprising number of students. The biggest misconception regarding the properties of a rhombus was that angles of the rhombus were 62^o; another common error was to subtract 2×62 from 180 rather than 360. Using the parallelogram, a significant number thought that opposite angles of a parallelogram were supplementary rather than equal.

4 Part (a) was invariably correct. Part (b) proved more demanding with some multiplying by $\frac{52}{119}$ rather than by $\frac{119}{52}$. In part (c) the conversion of time to a decimal still proves a problem for many with division by 2.24 rather than by the correct 2.4 being a frequently seen error. Students who worked with 144 minutes often forgot to multiply by 60.

5 Two common errors were seen in part (a); the use of the formula for the area rather than the circumference of a circle and the use of the 2.5 m as the radius rather than the diameter. The common error in part (b) was to multiply by $\frac{2.5}{4.7}$ rather than by $\frac{4.7}{2.5}$. Some thought that they needed to convert units and this often resulted in an answer of 188 or 0.188 rather than the correct 18.8 cm.

6 Provided students appreciated the need to multiply 21 by 3 rather than 2, the correct answer was generally obtained in part (a). Students who were successful in part (a) generally went on to find the correct age for Ahmed in part (b), a common error was to assume that because the eldest was 25 and the median 20 , a difference of 5 then the youngest was 20 -5 = 15. However, a significant number missed the instruction to find the range. The fact that the median was 20 was frequently ignored in their attempt to answer part (b).

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7 This question was well done with working shown as required in the question. A surprising number of students, having found the correct prime factors, just gave a list of the factors rather than giving a product.

8 Some candidates rotated about (2, 0) or (0, 0) rather than (0,2), others rotated in an anti-clockwise rather than a clockwise direction.

9 Errors in part (a) included adding rather than multiplying 2 and 5. Part (b) was done very well with few errors seen.

10 Working with 9.4% proved demanding for some students with 0.94 rather than 0.094 seen. Another error was to increase rather than decrease the price by 9.4%. Others divided by 607 by 90.6 instead of multiplying. There were two very common incorrect answers in part (b) $1584 from those who increased $1320 by 20% and $1650 from those who though that $1320 was the amount left after a 20% decrease and so divided $1320 by 0.8. Students who realised that they had to use a 'reverse' percentage method in part (b) almost inevitably went onto gain full marks.

11 It was not uncommon to see just one set of branches added to the incomplete probability tree diagram in part (a) rather than two; provided the additional set of branches had the correct probabilities attached one mark could be awarded. Despite having an incomplete probability tree diagram in part (a) students who made this error frequently went on to score full marks in both (b) and (c). Surprisingly despite the information in the question that Emeka put the first counter back in the bag, some students worked with non-replacement. Having made this error they were able to gain some, but not all marks, in the subsequent parts. Some students added rather than multiplied the probabilities in (b) and (c).

12 Parts (a) and (b) were generally very well done. In part (c) some got as far as showing 25 in the working space but then failed to use this appropriately on the graph to take a reading for the lower quartile. In part (d) many correct answers were seen but it was disappointing to see a number of inaccurate readings taken from the graph using an age of 52 with some reading from 51 rather than 52 as well as making errors when reading from the cumulative frequency axis. Some students then gave an answer in the range 66 – 68 without going on to work out that percentage of 1 200 000.

13 A surprising number of students drew the line $x + y = 9$ or $x + y = 11$ rather than $x + y = 10$ – possibly confused by the sight of an inequality. The common error from those who drew all three lines correctly was to shade in the wrong region. The majority of those who identified the correct region opted to just shade the correct region; shading in or out were equally acceptable.

14 A number of different methods of solution were seen for this question. Whatever method was used, the first step had to be to find the size of an interior angle of a pentagon. Following this, many used the cosine rule to find the length of *AD*. This value along with one of the angles in triangle *ACD* or in triangle *AXD* was the used to find the height of the pentagon. Occasionally, candidates worked with Pythagoras's theorem along with the length of *AD* to find the height but this was seen less often. One common error seen was to assume that AD bisected angle *EDC* and so work

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using incorrect angles in triangle *ADC*. Another common error was to use the area formula incorrectly with *AD* being found but then used as the height of triangle *ADC*.

15 A number of completely blank responses were seen to all three parts of this question. Those who knew how to differentiate usually gained full marks in part (a). The common error in part(b) was to substitute $x = 2$ into the original equation rather than the derivative. In part (c) it was disappointing to see a significant number of students equate the derivative to −12 but then fail to simplify correctly to get as far as $6x^2 - 6x = 0$. Of those who did get this far a number failed to solve this relatively straightforward quadratic equation successfully.

16 Whilst most students realised that they had to multiply the left hand side of the given formula by $cx + d$ not all multiplied both terms by y. Many other algebraic errors were seen but those who realised that they had to isolate all the terms in x and then take out x as a factor gained partial marks.

17 The case of the intersecting chord theorem where the chords intersect outside the circle was not well understood by students. Some did get to the correct answer but others found the correct value for *AC* but then gave that as their final answer rather than subtracting 9 to find the value of *BC*.

18 Many solutions were either fully correct or completely incorrect. Some students gained 5 marks out of the available 6 by failing to pair up the values of x and y correctly in their answer. Those who gained partial marks usually failed to gain full marks due to algebraic errors whilst trying to eliminate one of the variables or in the resulting algebraic manipulation after a successful elimination of a variable.

19 A number of students either used an incorrect formula, usually a formula for surface area, or copied the correct formula incorrectly. Another common error was to find the volume of a sphere rather than a hemisphere. Having equated the sum of the volumes to $2\pi r^3$ a common error was to divide by 2π and then take the square root rather than the cube root.

20 The most common method of solution was to expand $(2^p - 1)^2$; errors were frequently seen in the expansion, for example, seeing $2p$ rather than 2^p and 4^{2p} rather than 2^{2p}. Following a correct expansion some were able to get as far as $2^{2p} - 2\times 2^p$ or $2^{2p} - 2^{p+1}$ but were then either unable to take out 2^{p+1} as a common factor or didn't realise that this was the next stage. A minority of students started with $k^2 - 1$ and used the difference of two squares before substituting $2^p - 1$ although, once again, it was the final step that was beyond many.

21 Correct substitution into the Cosine rule was seen relatively frequently but the subsequent algebraic manipulation to get as far as a quadratic equation proved more difficult. Some gained just the independent mark for realising that the area was equivalent to $2BD^2$.

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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

- learn the properties of quadrilaterals

- practise converting time in hours and minutes to hours

- check carefully scales used in graphical questions

- learn the intersecting chord theorem

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