Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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Pearson Edexcel International GCSE
Mathematics A (4MA1)
Paper 1H

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International GCSE Mathematics
4MA1 1H
Principal Examiner's Report

The beginning of the paper was accessible to all students with a good amount of working shown over most of the paper. Some questions, towards the end of the paper, were not as well answered by students but this was due to the differentiation and ramping of the questions.

Students should carefully read both the values used in the questions and their own handwriting; this was a problem for some students who lost marks unnecessarily because they miscopied numbers.

Students were less successful with trigonometry (Q10), writing inequalities from a graph (Q8b) and using ratios in areas and volumes (Q23). Finding probabilities in a context and using conditional probability, circle theorems, arithmetic sequences and manipulation of algebra in later questions, proved to be challenging for many. Reverse percentage in a context, (Q6) also caused difficulty for less able students.

There were some instances where students failed to read the question properly; an example being question 19. Here some students either did not realise they had to use the formula for the sum of an arithmetic series, but instead used the formula for the *n*th term.

Generally, problem solving and questions assessing mathematical reasoning were tackled well at the beginning of the paper.

Comments on individual questions

Question 1

All three parts of the question were answered very well. It was relatively rare to see an incorrect response in any part of this question. However, in some case students took set A to contain the elements 7, 9, 11, 13 only. It was encouraging to see students could interpret the sets $A \cap B$ and $(A \cup B)'$.

Question 2

(a) This part was generally well answered although the expression was occasionally partially factorised rather than fully factorised.

(b) Many students set up an equation by finding the sum of y, $3y + 7$ and $2y – 5$ and equating this to 56 resulting in $6y + 2 = 56$. Once they had arrived at the equation then it was a simple matter of rearranging for y to find the value of 9. Many students obtained the correct answer of 13 zinc bars. A minority of students omitted the y gold bars to form $3y + 7 + 2y – 5 = 56$ and then went on to find 16.6 or 17 zinc bars. Credit was given to some of the students who followed this route. The weaker students, having been given the total of 56, attempted trial and improvement methods, substituting numbers into the expressions in order to try to get a total of 56 when added. Weaker students often attempted to multiply $(3y + 7)$ by $(2y – 5)$.

Question 3

Many students gained full marks on this question. Most of the students worked out the total amount that Nina has to pay, (17 700), and then subtracted 12 500 from this value to find the profit of 5200. Using the values of 5200 and 17 700, the students went on to find the correct answer of 41.6%.

Some common errors were to write $\frac{12\,500}{17\,700}$ or $\frac{5200}{17\,700}$ thus leading to an incorrect answer. Others, with the correct approach, stopped with an answer of 141.6 or 1.416 as they failed to realise what was meant by a percentage increase.

Question 4

(a) Many students understood that the probabilities should add to 1 and were able to subtract 0.58 to find 0.42 but then this was commonly divided by 2 rather than 3. Those who did manage to divide by 3 often got an answer of 0.14. Some failed to note the decimal point and divided 42 by 3, without noting that this was then a percentage.

(b) Generally, this part of the question was well answered. Many students gave the correct answer of 145 with working shown. A minority of students divided 250 by 0.58. As the wording of the question mentioned "estimate", some rounded 0.58 to 0.6 and then found 150 from 0.6 × 250, no credit was given for this. Students are encouraged to read the question carefully. Students should know the difference between when a number is required and when a probability is asked for, and not offer answers such as $\frac{145}{250}$

Question 5

This was an unfamiliar type of question but even so it was not answered as well as might have been expected. Many students recognised that the question required them to find the radius or diameter of only one of the circles as they were identical. Some students at this stage simply divided 20 by 3 to obtain an incorrect radius. Many students worked out the circumference of a whole circle, 62.8, and then divided by 2 to find the circumference of the semi-circle, 31.4, and then multiplied by 3 and then added 20 to find the correct answer of 114.

Some students misinterpreted the question by finding the circumference of the circle and then multiplying by 3 and then adding 20 or finding the circumference of the semi-circle and adding 20 and then multiplying by 3. Some students found the circumference of the semicircle, multiplied it by 3 and then failed to add on the 20 and so lost 2 out of the 3 marks.

Weaker students went down a wrong path by attempting to work out the area of circles or semicircles.

Question 6

This was a slightly different question from previous series as the idea of reverse percentages was applied twice to different values involving a fraction and a percentage. Students answered this question in two different ways – those who used the correct method of division by $\frac{5}{6}$ or 0.8, or those who used the incorrect method of multiplication by $\frac{5}{6}$ or 0.8. Careful reading of the question would help students realise that $\frac{1}{6}$ is a fraction of the original (normal) price and not $\frac{1}{6}$ of the given (sale) cost of ticket A. Likewise 20% is a percentage of the original price and not 20% of the given cost of ticket B. Many students made the familiar mistake of simply finding $\frac{1}{6}$ or 20% of the sale ticket prices and then subtracting or adding these values from/to the price of the given tickets.

Question 7

Many students answered this question well. The most efficient way to do this question (and one that does not require use of a calculator) is to pick out the lowest powers of the prime numbers which are in both A and B, and multiply the resulting terms together to get $5^3 \times 7^2 \times 11^4$. It was encouraging to see many students using this approach to answer the question.

Question 8

There were many successful answers in part (a). Students who gained one mark could separate the x term on one side and the numbers on the other side. These students could rearrange to obtain $5x \geq -6$ then divided by 5. Many fell at the final hurdle and gave an answer of $x \leq -\frac{6}{5}$ instead of $x \geq -\frac{6}{5}$

In part (b), most students scored some marks. The award of two marks was relatively frequent and shows that these students could correctly identify two of the lines bordering the region, $x \leq 7$ and $y \geq 2$. Students found it difficult to identify the third inequality $y \leq x$.

Question 9

Parts (a) was answered well, though occasionally 58 700 was seen.

Part (b) was answered well, though occasionally 8.4×10^{-7} was seen.

Part (c) was generally answered well and many students arrived at the answer of 57.8. There were a minority of students who wrote out each number as an ordinary number with some missing some zeros resulting in 5.78 or 578 which gained zero marks. Some students decided to divide 1.47×10^9 by 8.5×10^{10} rather than 8.5×10^{10} divided by 1.47×10^9

Question 10

Many students could find the length of the perpendicular line from *C* by finding $\frac{8}{\tan 40}$ to obtain 9.53. The more able students then worked out the length from *B* to the foot of the perpendicular by subtracting 9.53 from 22 and obtaining 12.5 thus gaining 3 marks.

Some students at this stage worked out the length of *AC* and then got into a tangle of how to find the value of angle *x*, by wrongly assuming angle *ACB* was a right angle.

In some cases students used a variety of unnecessary methods such as the sine rule, cosine rule and Pythagoras theorem to find the value of *x*.

Question 11

Many students found the final part of the question difficult. Most understood a common denominator was required and attempted to find one. This usually resulted in a denominator of 24*x*. Overall, few made complete progress with this question, often leaving their final answer as $\frac{14x+20}{24x}$. There was clear evidence of incorrect cancelling throughout. Some students were quite careless in writing out their solution by giving the final answer as $\frac{7x+10}{12}$ omitting the *x* in the denominator.

Question 12

This whole question was very well answered by the vast majority of students.

(a) Most students calculated the correct missing values. Substitution of the negative *x* values was the usual cause of error.

(b) The majority of students were able to plot the points they had created from the table. Most likely errors were those that included negative values. Some students did not join up their plotted points. A common source of lost marks was joining their points with a series of straight line segments.

(c) Many students could not identify the correct graph. A common incorrect answer was C.

Question 13

Part (a) was generally answered well. There was less success in (b) as many struggled to interpret what reading they had to take, and some managed to take a correct reading but then failed to subtract their cumulative frequency from 80 and then convert their answer into a percentage.

It is important that the method for reading off the graph is shown, if the working was inaccurate e.g. 8 coming from 80 – 72 as 72 is read off the *y*-axis incorrectly (misread the scale), M1 could only be awarded if evidence was provided that 72 had come from a reading from a time of 50 seconds; writing readings on the axes is another way to provide evidence on a question like this.

Question 14

Where students were able to recognise the application of the 'angle at the centre is twice the angle at the circumference', this question was answered well.

Some creative approaches were seen – for example, involving tangents at right angles to the radius. Other approaches also brought in 'angles in the same sector' and 'angle at the centre' theorems. Whilst it was possible to secure full marks with some of these more complex approaches, it would be worth students noting that the question was worth only 3 marks and should therefore employ relatively short, efficient methods.

Students who clearly had identified angle *AOC* as being equal to 52 (by seemingly visual inspection), arrived at an angle of 26 degrees for angle *ABC* and gained no marks.

Question 15

Marks on this question were well spread, but most students were able to start by removing the denominator and expanding the left-hand side correctly, but some students were then unable to gather the n terms correctly on one side of the expression. Some students made simple errors, such as losing signs or missing out brackets or expanding $x(3n – 4)$ incorrectly to $3nx – 4$. Those who did gather the n terms correctly usually found an acceptable expression for n with relatively few continuing with incorrect cancellation.

Question 16

Generally, this question was answered well with most gaining 2 marks; some gained 1 mark for 1 correct term, with $12x^2$ given as $4x^2$ and -8 as $-8x$ or absent being the most common errors. Many students correctly equated their $\frac{dy}{dx}$ to $\frac{1}{3}$ and went onto rearrange and solve to gain 4 marks for the two correct values of x. Some students equated $\frac{dy}{dx}$ to $\frac{1}{3}$ and rearranged but could not solve their equation, gaining 3 marks whereas others set $\frac{dy}{dx}$ equal to 0 and therefore could not gain this method mark.

It is important that a method is seen in order to award any marks.

Some students did not realise when they square root, it should lead them to two values of x as the question asked for two points on the curve.

Question 17

Many correct answers were seen from those students who appreciated that the area of each bar is proportional to frequencies in histograms. Most students made some attempt at answering the question and sometimes produced a mass of figures, but it was not always clear as to what the figures represented. It is important that the student ensures that their method of solution is made clear. Usually ,the most efficient method was to correctly calculate the frequency density values and put these on the vertical axis. Students who did this inevitably reached the correct answer, although there was still some misinterpretation of the range required in the question.

Several students used the vertical scale as a frequency scale thereby ignoring the column width, this often led to incorrect answers being seen, and hence students were unable to earn any credit.

Question 18

Many students were unable to make much progress in this question. Those that made a successful start generally scored 3 marks for using the cosine rule correctly to work out the length of *AC*. At this stage they did not work out the perimeter and simply divided the value of *AC* by 6. A number of students having correctly found the length of the journey and dividing it by 6 could not convert this into hours and minutes.

Many students worked out angle *ABC* incorrectly. A common error was to subtract 132 twice from 360 leading to a value of 96. Even with this incorrect value it was encouraging to see these students go on to use the cosine rule correctly to find *AC* then to find the whole perimeter. Once they found the perimeter, they divided it by 6 thus gaining 3 marks out of 5 marks for a value of 96 for angle *ABC*.

There were many incorrect methods such as assuming angle *ABC* was a right angle and going on to use Pythagoras.

Question 19

This question was poorly attempted. Those who worked out the value of *a* and *d* substituted into the S_n formula to obtain $\frac{n}{2}\left[2(3)+(n-1)4\right]=7260$ thus gained 2 marks at this stage. Some students could not expand and simplify $\frac{n}{2}\left[2(3)+(n-1)4\right]=7260$ to obtain a correct quadratic equation.

If a three-term quadratic could not be obtained, the student could not gain any possible follow through marks. Factorisation and the quadratic formula were both used well to solve the quadratic equation. The mark scheme was very generous here and, as a consequence, those students who made minor arithmetical errors, leading to their 3 part quadratic, were able to score up to four marks if all working was shown clearly.

Some students assumed the number of terms was *x* rather than *n*. They worked out *x* as 60 thus losing the final mark as they did not work out 239

Question 20

This question was poorly attempted. Some started by mistakenly calculated the P(15 cents) to be $\frac{72}{121}$ and then went on to either leave this as their answer, square this value or multiply it by 2

Some students tried tree diagrams to reach an answer.

Those who took the correct first step of calculating $\sqrt{\frac{49}{121}}$ for P(10 cents) and then working out $1-\frac{7}{11}\left(=\frac{4}{11}\right)$ for P(20 cents) then finding $\frac{7}{11}\times\frac{4}{11}$ inevitably went on to gain at least 2 marks.

Question 21

This question allowed the opportunity to gain some marks by using simple trigonometry or Pythagoras theorem or both, thus a student could gain 3 marks. Three dimensional Pythagoras and trigonometry is always a challenging subject for students, and so it proved again. However, it was good to see many make a good start and gain some credit. A decent number of students were able to complete a process to find *AF* using Pythagoras. The common error was to apply Pythagoras' theorem incorrectly, subtracting rather than adding the squares of the lengths.

Many students successfully worked out the length of *DE* or the length of *EF* or the length of *AF* or a combination of these lengths.

Some students lost marks as they did not find all 3 lengths and/or used the formula for the volume incorrectly.

Question 22

A rough sketch of a circle as a starting point would have helped and students should be encouraged to use diagrams to help their understanding/visualisation of a problem.

Many students scored 2 marks by working out the gradient of the radius to be $-\frac{5}{4}$ and then working out the perpendicular gradient to be $\frac{4}{5}$. From there only the most able students were able to proceed and gain further marks, usually by using $y = mx + c$ to find the y intercept and the required x intercept.

This tactic would have been more apparent if students had drawn a line, together with its perpendicular line to help the visualisation.

Some students worked out the length of the radius and then could not progress with the rest of the question thus gaining 1 mark. There was an acceptable method in the mark scheme that started from working out the length of the radius, but this was rarely seen.

Question 23

Questions at the latter stages of the paper are graded at level 9 and are designed to be challenging. This was another question that the students found challenging with many students failing to realise that they had to find the linear/volume scale factors. Many used a factor of 16 throughout, earning as a result, no marks. Many students tried to set up the initial equation but were hampered by the fact that they did not know how to proceed from working out the area scale factor.

The third mark was only obtained by the most able students as they had to find a **correct** equation based on powers of 2 (or 4 or 8 or 16) only. This proved very challenging for the vast majority of students.

Question 24

This question was poorly answered. Only the very best students were able to recognise the transformations in parts (a) and (b) and give the correct values for *a*, *b*, *p* and *q*.

Summary

Based on their performance in this paper, students should:

- be able use formulae given on formula sheet correctly. Also, to be aware of which formulae are given,
- be able to apply Pythagoras theorem and trigonometry in the context of a problem,
- be able to read graph scales accurately,
- be far more disciplined in their use of simplifying algebraic expressions,
- read the question carefully and review their answer(s) to ensure that the question set is the one that has been answered and their answer(s) represent a reasonable size,
- make sure that their working is to a sufficient degree of accuracy that does not affect the required accuracy of the final answer,
- make their writing legible and their reasoning easy to follow,
- students must, when asked, show their working or risk gaining no marks despite correct answers.

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