Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

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Mathematics A (4MA1) Paper 2H

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International GCSE Mathematics
4MA1 2H Principal Examiners Report

This was an unusual examination series and we had a very varied group of responses with some of an excellent standard but others leaving out vast quantities of the questions on the examination paper.

On the whole, working was shown, but it is still the case that many students would do well to show us all the stages in their work, especially when a calculator is used.

Problem solving questions often cause students problems and the best advice for them is to try to do what you can even if you cannot finish the question as valuable method marks can often be gained.

Question 1

(1a) Most students were able to get the correct answer of g^{10} for this question. A few who did not know the laws of indices multiplied the powers and gave g^{24}
(1b) Mot students knew the rule for division of values with the same base and correctly subtracted the powers. A few inevitably divided the powers.
(1c) A fair response - many errors involving misuse of powers - 6 instead of 9 and c instead of c^2. Lots of d^6 as well. It was striking how inconsistent individual errors in answers were.
(1d) Many correct answers. Some gave the correct answer in the working but not on the answer line, where they just wrote -1.25. A surprising large number could not even get the −1.25

Question 2

Part (a) proved to be problematic to only a very small proportion of candidates, although some wrote 40 as their answer. Similarly, in part (b), most candidates scored full marks. However, errors included using cumulative frequencies and adding midpoints as well as summing the frequencies and dividing by 5 (the number of groups). Furthermore, some tried to multiply the frequencies by the class width of 10 or found frequency densities.

Question 3

A large proportion of students were able to get to the correct answer but found it difficult to give fully correct reasons – usually not enough of them. Often missing was 'angle sum of triangle'. The default method was to start with the opposite angles of a parallelogram are equal property, then vertically opposite angles then isosceles triangle.

Question 4

This proved to be a challenging question for many candidates with the mast majority scoring 0 or 4 marks. Those who did not score often divided 76 by 10 or 7, rather than 4 to find the value of one part (£19). Numerical methods were common, although a significant number successfully used an algebraic approach such as $7x = 3(x + 76)$.

Question 5

Both parts were generally answered correctly. The nature of the numbers in the question caused some to misread or drop a digit, especially in part (a). Not all students were able to use $\times 0.85^3$ as an efficient method. A common error was to assume the multiplier was 1.15. As usual there were some 'simple interest type' answers in (b).

Question 6
Most candidates were able to score full marks, helped by the same scales on the *x* and *y* axes. Some used L rather than *y*, owing to the fact the question refers to line **L**. Others confused the gradient with the *y*-intercept, wrote down $3x - 2$ as their answer or incorrectly found the gradient to be 1/3.

Question 7
Generally well answered although quite a few used Pythagoras and then sin or cos or of course the Sine Rule.

Question 8
This was accessible to most candidates, although some did not gain any marks because the formulae for either the area of a triangle or Pythagoras' Theorem were applied incorrectly. Examples included $0.5 \times 8 \times 8.5$, $\sqrt{4^2 + 8.5^2}$ and $\sqrt{8.5^2 - 8^2}$. Those who used Pythagoras' Theorem were most likely to score full marks although many also offered correct solutions by using trigonometry to find an interior angle of the triangle followed by $0.5ab\sin C$.

Question 9
Many fully correct answers but equally as many found just the curved surface area so losing 2 of the 5 marks.
There were a large number of students who misread the volume as 72 so losing any accuracy marks.

Question 10
Only a small proportion of candidates were unable to correctly complete the cumulative frequency table in part (a). Similarly, most were able to gain marks for drawing the cumulative frequency graph in part (b), although the most common errors were made when plotting (20, 26) and/or (50, 114) because of a misread of the scale on the vertical axis. Part (c) proved more challenging, although candidates would benefit from drawing horizontal lines from 30 and 90 on the vertical axis across to the curve and then down to the horizon axis. Part (d) scored better than (c), although some only gained the first mark having not subtracted from 120 to get their answer. It would also be advisable to draw lines in this part.

Question 11
(11a) Generally well done. The power was dealt with better than the number - where 8 and 16/3 were often seen. A few students left their answer in terms of powers - such as $8^{\frac{2}{3}}$ for example.

(11b) Students found this deceptively simple question difficult to deal with. Some students have been taught that with a fraction and a negative power to invert the fraction. In this case the fraction is $\left(\frac{2}{y}\right)^4$ but students could not progress to the required form, often writing $16y^4$

Another common approach was to write $\frac{y^{-4}}{2^{-4}}$ but most students could not then make any further progress.
(11c) Mixed fortunes here. Lots of students did not multiply throughout by 12. Quite a few had a sign error when expanding the second bracket so losing 2 of the marks.

Question 12
This question proved to be inaccessible to a significant number of candidates, who either did not know how to make a start at all or incorrectly applied one of the basic rules of indices. Those who appreciated the need to write each term as a power of 3 or less frequently 9, sometimes scored only 1 mark, mainly for writing 3^{6x} or 3^4 as part of an equation. They were then often unable to write a correct equation without powers such as $4 + 6x = 5$. Candidates who reached the correct answer by trial and error gained no marks because algebraic working was required.

Question 13
The vast majority knew the correct method for answering this. However, there looked to be too many casual attempts with little attempt at rigour. The most common failing was to write $10x$ as just 6.81 i.e. not demonstrating any knowledge of recurring decimals. In addition some students overlooked the instruction to use algebra and wrote down, for example

$10 \times 0.\dot{6}\dot{8}1$ = ….. and $1000 \times 0.\dot{6}\dot{8}1$ = …. and came out with the answer without any intervening working.

Question 14
The fact that a Venn diagram was not provided seemed to make this question less accessible to many. In part (a), some candidates listed the elements of A while others misinterpreted the inequality symbols and gave an answer of 7. Likewise, in parts (b) and (c), confusion with the inequalities cost marks with a significant number not including 23 as part of their answer in (b) and others listing 19, 20, 21 and 22 in (c). Some just listed the elements of the Union of sets A and B in (b). In part (d), a lack of awareness of the subset notation meant that many did not gain the mark although those who had picked up marks from the earlier parts to this question usually also answered this correctly.

Question 15
Many struggled after the first step. Those who got to the second step generally achieved full marks. There were some sign errors in the algebraic manipulation, such as $xy - 2x = 5 - 3y$

Question 16
There were several correct and incorrect approaches. Making x the subject in the linear equation and then using substitution was the method most likely to gain marks. However, even with this approach it was not uncommon to see substitution errors and also mistakes when expanding brackets. Those who managed to get as far as a correct 3-term quadratic equation often then went on to score at least four of the five marks. Making y the subject in the linear equation was a more challenging route and many fell short with their algebraic manipulation and so often picked up a maximum of 2 marks. Some candidates tried to use the elimination method by multiplying both sides of the

linear equation by $3y$, but it was common for early errors to be made resulting in no marks being awarded.

Question 17

A large number of students only expanded $(3x + 2)(2x - 4)$ and then solved this set to zero. The problem for many was that they tried to substitute the solution (x) of their equation into $3x + 27$ and reach some conclusion about A.

Of those who set up the correct inequality, the vast majority got the upper bound of 3.5 but failed to notice that the rectangle does not exist when $x < 0$.

Question 18

Many candidates seemed to cope better with this question than the others later in the paper. However, some were not able to correctly use the angle between the CH and the plane ABCD. It was quite common for candidates to start by using Pythagoras' Theorem to find the length of side BH rather than using trigonometry to find AC. Those who did manage to find AC usually then went on to correctly find BC and the volume of the cuboid.

Question 19

Quite a few students were able to find correct vector expressions but then did not conclude with the correct conclusion. Students need to realise that a formal proof with a conclusion is required for questions such as this.

Question 20

Being the penultimate question, this unsurprisingly was only accessible to a small proportion of candidates. The need for an algebraic approach was one step too far for most. Making a meaningful start was the key to scoring marks and in fact those who managed to write a correct expression for the probability of taking 2 blue counters often went on to score full marks. The most common correct approach was to consider the number of blue counters in terms of the number of red counters in the bag. Some candidates acquired the correct answer without algebraic working, scoring no marks.

Question 21

This proved to be very difficult for most because of the negative signs. Some had an idea how to complete the square but the $-x^2$ threw many of the ones who attempted it. There were few correct answers and those who attempted part (b) generally only scored 2 marks, because they did not provide a unique inverse. Some who scored 1 or 2 marks in (a), showed poor algebra in (b) - again the problem was with negative signs where taking square roots of a negative expression and then being creative with sign changes was quite common.

Summary

Based on their performance in this paper, students should:

• learn and be able to recall formulae such as Pythagoras' theorem and know when to square add and when to square and subtract.

• read the question carefully and review their answer to ensure that the question set is the one that has been answered e.g. the total surface area of a cylinder is found rather than just the curved surface area.

• Ensure full algebraic working is shown when it is requested otherwise the likely score will be zero e.g. on simultaneous equations.

• learn angle reasons using correct terminology so that fully correct reasons can be given when requested.

• note that a perpendicular height is needed to find the area of a triangle when using

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

• show clear working when answering problem solving questions in order to maximise their potential for gaining marks even when a small arithmetic error is made or if the question is not fully completed.

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