Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2022

Pearson Edexcel International GCSE
Mathematics A (4MA1)
Paper 2H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2022
Publications Code 4MA1_2H_2206_ER

Summer 2022 Examiner's Report
International GCSE Mathematics
4MA1 paper 2H

Those who were well prepared for this paper made a good attempt at all questions and it was good to see several students attempting the more challenging questions near the end of the paper and being able to gain credit for their work.

The paper differentiated well, and overall working was shown which was easy to follow.

The questions that usually cause the most problems to students are the ones which feature problem solving, and students generally need more practice on these. It must be noted that even if a student cannot follow the problem through to the end, it is usual to be able to pick up some method marks for working that is useful.

We saw evidence of premature rounding in questions and would remind centres that this can lead to a lack of the award of the accuracy mark. Correct use of the calculator along with checking the values they put in and the values as they write them down is essential and students must be encouraged to deploy these checks. Relying too heavily on a calculator for the solution of quadratic equations for example, can cost students marks when clear algebraic working has been requested. It would be wise for students to use their calculators as a check but not to try and gain the correct answers and then work backwards.

Report on individual questions

Question 1

The question was generally well solved with the majority of students gaining full marks often without working. If not, many benefitted from M1, for realising that d was the mode and from that using the range to obtain a, gaining M1M1.

One common mistake was assuming the numbers were 5, 7, 8, 9 as 8 being the median implied it had to be there.

Some students confused the median for the mean.

It was not uncommon to see c as 8.5 or 7.5 even though a, b, c and d were all integers.

Question 2

This question was tackled successfully by most students. The most common mistake was to confuse the horizontal and vertical lines (ie drawing $x = 1$ and $y = 2$ rather than $y = 1$ and $x = 2$). Lines were rarely labelled, but provided they were not ambiguous were credited. Of those that drew the three lines correctly, most were able to correctly identify the region described by the three inequalities. In part (b) a follow through was available for a region enclosed by one vertical line, one horizontal line and a line with a negative gradient. Most drew continuous lines, although dashed lines were condoned.

Question 3

The majority of students gained full marks but there were a substantial proportion who could not convert between hours and minutes with 5.24 commonly seen. A few rounded too early resulting in an answer out of range of the A1. Many students converted the time into 324 minutes and then divided the distance travelled by 324 which gave an answer of approximately 12. It would be good if students were encouraged to think about the reasonableness of their answer in a question like this. In addition, some students need practice with mixed numbers on a calculator. The expression $\frac{3980}{5\frac{24}{60}}$ was sometimes seen but it was clear that the student could not use their calculator to do the division correctly.

Question 4

This was a 'show that' question with a calculation involving mixed fractions with the answer given. The majority of students were able to score at least one mark on this question. A few students dealt with the whole numbers separately, but most converted the mixed numbers to improper fractions. Those that worked with the subtraction of the improper fractions until they obtained the correct outcome were more successful in obtaining full marks than those who converted the result expressed as a mixed fraction to an improper fraction at the start. In those cases, a significant number of students did not clearly show that both sides gave $\frac{52}{21}$, and failed to complete the demonstration of the given result fully. Those who converted the improper fraction to the given mixed number were generally given full credit.

Question 5

This question proved to differentiate students in the early part of the paper. Nearly all responses gained at least one mark for finding the area of a rectangle. A small number of students failed to score any marks as they worked with perimeter instead of area. In cases where the formula for finding the area of a trapezium was applied correctly, most were able to follow the correct process to find CD. A few made errors in the calculation of the base of the trapezium and its height, sometimes trying to form a large trapezium. Having obtained a correct expression for the area of the trapezium, many errors were made in solving the equation as it involved both a fraction and a bracket#.

Question 6

Trigonometry is a familiar topic to students taking this paper, and the majority scored full marks. Where mistakes were made, they tended to be using the wrong ratio, or calculating the length of the wrong side. Some students who used the sine rule (as it is given on the formula sheet) were not able to rearrange the expression to make x the subject. Answers were required to only 1 decimal place, but greater accuracy was not penalised.

Question 7

Many clearly computed correct answers. It was disappointing to see many students multiply by 60 twice, this would mean that you would go a greater distance in 1 second than you would in one hour. Or had a general understanding of using 3600 and 1000 but used them the wrong way round. There were several students that thought that there were 100 metres in a kilometre.

A few students multiplied by $\frac{5}{18}$ but often got this the wrong way round and multiplying by $\frac{18}{5}$ gained no marks.

Question 8

This was done well but quite a few students found the fractions of the total number of cards instead of finding the fraction of birthday cards and anniversary cards. It was rare that students left their answer as 92/300. The most common error from students who could handle the ratio and the fractions was to leave the answer as 92 so only gaining 3 marks. A more basic error was to work in multiples of 15 from adding the numbers together in the ratios. This generally scored no marks.

Question 9

Most students managed this question well but there were a surprising number who tried to use 1.03% in their calculation and so got no marks. There were some basic calculation errors that should not be happening in a calculator paper. Students need to be reminded to check what they input into their calculator. It was pleasing to see many students using the compound interest formula, but a large proportion did a year to year calculation - some rounding their answers too early. The most common wrong approach was to use a simple interest calculation, scoring just 1 mark.

Question 10
Nearly all students attempted this question with the majority choosing elimination as their method. Nearly all recognised the need to have equal x or y coefficients in the two equations, however some then chose the wrong operation to eliminate a variable, and so were not credited. Those that found the value of one variable generally went on to use substitution successfully to find the value of the second variable. A number of students used substitution from the start, mainly with success although errors were sometimes made rearranging one equation to make one variable the subject. Students recognised the need for working so although this could be solved using the calculator there were very few attempts without working. Many elegant and concise solutions were seen.

Question 11
This question was done very well in both parts. There were a considerable number of students who got part (i) but not part (ii). Students need to be aware of the implications of the word 'Hence' in this type of question. It meant they had to use their answer to part (i). Solutions using the quadratic formula when the answer to part (i) was wrong or missing were not accepted

In part (ii) students often disregarded one solution by the time they got to the answer line, although they were not penalised for this.

When errors were made in factorisation many gained B1 in part (ii) due to the ft.

Question 12
A small number of students did not understand this question and were unable to make progress but those that did tended to gain full marks. A common error however was in thinking that the answer was 5.7 ie thinking that W represented the weight of each of the 3 parcels. Structured algebraic approaches were uncommon as the numbers were easily dealt with.

Question 13
This question was generally well answered with the vast majority of students being able to complete the table and draw the graph successfully. As always there were a few who drew histograms - these score no marks. The median was usually read off correctly. Many students were able to score full marks on the final part. The main areas where marks in this part were lost were, firstly, giving an answer that was not a whole number, secondly, failing to join the point (20,7) to the origin with the consequence that they could not take a reading at 18 and thirdly, failing to find 60% of the difference in the cumulative frequencies.

Question 14a

There were many good responses to this question. Many students now get at least 2 of the 3 questions by working in a systematic way, expanding a pair of brackets and then multiplying the resulting answer by the third bracket. Approaches were split between starting with the first pair and starting with the second pair. In either case it was disappointing to see omission of brackets at the start of the second stage, although most students could carry out the expansion correctly, or with at most 1 error.

Some students were under the impression that they could change all the signs of the terms to get a final answer, so occasionally fully correct answers in the working then lost a mark because of this misconception.

Question 14b

Most successful students had a first step of adding 7 to both sides. This then gave them a rearranging question which was much more like those they had had most practice on. These students generally went on to score all 4 marks.

One common error was to multiply the left-hand side by $(4 + c)$ but fail to deal with the -7 on the right-hand side. If carried through without any further errors this scored 2 marks. Another wrong approach which was marked similarly was to subtract 7 (wrongly) from both sides.

Question 15

(a) Most students understood that the fractions needed to be written over a common denominator and knew the process required to do this. They then needed to form the equation in a way that would allow solution by multiplying both sides by the denominator and removing brackets. A common error was to not recognise that minus $-6x$ is simplified to $+6x$ and worked with $2x + 1$ instead of $14x + 1$. Provided no more than one error was made then all method marks could be scored.

(b) Many students were unable to gain full marks for this part. A number of students did not recognize the approach to working with a quadratic. Factorisation was the most successful method used, although many made use of the quadratic formula given on the formula sheet. A few students used completing the square. Many obtained the correct critical values, although identifying the correct region proved challenging for a significant number in order to solve the inequality. A number of students who defined the regions used less than, rather than less than or equal to.

Question 16

Most students managed to score the full 3 marks for a fully correct Venn diagram. Quite a few who did not, failed to score the mark for 13 in G only, this then had a knock-on effect as they couldn't score any marks in (b)(i). Others just placed all the numbers from the question in the associated area without taking account of other numbers in that set. Quite a lot of students managed to score the marks for (b) either from a correct diagram or follow through marks. Some listed the numbers in the required areas rather than summing them.

Part (c) could be answered either from the diagram or the original data, bur many missed the conditional part of the question and had denominators of 100.

Question 17

Students who recognised that they could use an approach based on $M = kh^3$ generally did well. A surprising number, however got as far as $M = 32h^3$ but could not make further progress or, when substituting for M left the answer as 15.625 or worked out the square root of this number. Many students treated this as a direct proportion question with M proportional to h. Their answers were given 0 marks.

Very few used the alternative method which did not involve finding k.

Question 18

Most of the students attempted to answer this question and were able to score the first mark by writing any one correct upper or one lower bound of the variables a, b and f.

They were asked to find the upper bound of a quotient or an algebraic fraction. Some lacked the understanding that for a quotient to be bigger the denominator must be smaller. A similar, frequent error was that students used (2 x UBa - UBb) for numerator instead of (2 × UBa - LBb).

A very small number having obtained the correct value of 7.79 then tried to find an upper bound for this.

Question 19

A challenging question for many. Many students were able to correctly substitute x into the equation for a but were then unable to successfully remove the fraction from the denominator. $3\left(\frac{7}{4y-3}\right)$ mistakenly became $\left(\frac{21}{12y-9}\right)$ for many students.

Not all students cancelled down correct answers fully, with $\frac{56y-42}{42-28y}$ seen often.

Solutions that were correct tended to be well set out and structured clearly. A few also successfully used $x = \frac{14+7a}{3a}$ instead. A significant number of blank responses were seen, as well as methods that contained multiple errors in dealing with a three-layered fraction.

Question 20

This question exposed weaknesses in setting up an equation in a single variable and in the subsequent manipulation to solve this equation. The most successful students were careful to clearly define what the symbol they were using stood for - radius or length of the side of the square being the most common. Often brackets were missing or were misused - such expressions as $\frac{x^2}{4}$ were seen when $\left(\frac{x}{4}\right)^2$ was meant.

Students in many cases did not regard π as a number so got into extreme difficulty when dealing with such equations as $16x^2 - 4\pi x^2 = 40$ which, of course, can be written approximately as $3.434x^2 = 40$.

Some students lost marks despite setting up and solving the equation accurately, because they did not use their answer to find the perimeter of the square.

Question 21

The question seemed challenging for the majority who answered it. Vector AB and OP were very popular to achieve 1 mark and were often the only mark scored.

Many did not use scalars as part of a process to find a pair of expressions that could be used to identify the required ratio which was crucial to obtain further marks.

Of those who did use scalars, many scored 1 mark for finding OQ AQ, BQ or QP but did not proceed any further.

In many instances where the second M1 was gained, students would have two correct expressions for parallel vectors but they had not used ratios to form an equation in one variable that will lead to a solution and therefore gained only 2 marks.

Some responses were able to use OQP is a straight line by using vector OQ and QP where one is a multiple of the other to form an equation in one variable that could lead to a solution.

Question 22

This proved to be very challenging. Most students, who attempted it, scored 2 marks on the "algebraic" method and also 2 marks on the alternative method as they didn't have a particular strategy. This however was only worth 2 marks. There were a few good algebraic approaches, but very few students had a clear strategy. There were one or two students who used an alternative strategy based on similar triangles.

Question 23

We saw a pleasing number of students gaining full marks for this grade 9 question. Incorrect answers were common and were almost always (90, 0) and (180, –1) the coordinates of the corresponding graph for $y = \cos x$.

Question 24

As this was the final question in the paper it was not unusual to see no response, or responses that assumed that a pair of numbers, one with a power could be combined eg $6 \times 9^{(2n+8)}$ as $54^{2n+8)}$.

For those who identified that working with powers of 3 was needed more could cope with 9^{2n+8} rather than $(\sqrt{27})^{4n+6}$ If students simplified or factorised both 18 and 6 the first method mark was awarded if one of the expressions was expressed as a power of 3. Completing the process by expressing both numerator and denominator simply as powers of 3 scored the second mark. Most who did then simplified to 3^{2n-6}

Summary

- Students should think about the reasonableness of their answer e.g. a plane travelling from New York City to Los Angeles at 12 km per hour is not reasonable
- Students should not prematurely round as this can cause them to lose accuracy marks
- Ensure full working is shown for 'show that' questions
- If you know a quick way of doing something, please ensure you have it fully correct e.g. multiplying by $\frac{5}{18}$ to change a speed in km/h to a speed in m/s is great but if you multiply by $\frac{18}{5}$ you run the risk of gaining no marks
- Check what you input into your calculator as we saw many mistakes with numbers that suggested an unchecked approach
- Remember the difference between direct and inverse proportion
- Follow instructions such as simplifying your answer

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom