Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2024

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

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

November 2024
Publications Code 4MA1_1H_2411_ER

IGCSE Mathematics 4MA1 1H Principal Examiners Report

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

Students were less successful with volumes and conversion (Q5), solving inequalities (Q8b), finding areas of sectors (Q16) and using vectors (Q24).

On the whole, working was shown and mostly easy to follow. Those students who produce untidy, unstructured written work to the extent that their writing is almost illegible risk losing marks. There were some instances where students failed to read the question properly; an example being question 22. Here some students either did not realise they had to use the formula for the hemisphere, but instead used the formula for a sphere.

Bisecting an angle, arithmetic series, inverse proportion, upper and lower bounds dealing with accuracy and manipulation of algebra in later questions, proved to be challenging for many. Reverse percentage in a context, (Q7) also caused difficulty for less able students.

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

Comments on individual questions

Question 1

(a) This part was answered well. Only a minority of students wrote down 18. It was encouraging to see the majority write down $10 < p \leq 15$. Correct notation was not required to identify the modal group

(b) Many students answered this question well. The majority of the students showed clear working However, a common error by some students was to use the lower limits or the upper limits to work out $\sum fx$ so gained 2 out of the 4 marks available. This method is incorrect, and the students need to understand that they must use the mid points. Other common errors were

to write $\frac{1170}{\text{their freq}}$ (students should note that the value of the sum of the frequencies was given in the question) or writing $\frac{1170}{5}$. A common error was to multiply the frequencies by the class width (5).

Question 2

The majority of responses were able to draw the correct angle bisector with appropriate use of a compass, leaving construction arcs visible. The most common problem was not realising that arcs should be drawn from points equidistant from the base point *B*. A number of arcs were drawn with centres *A* and *C* which were not equidistant from *B*.

The most common response that scored no marks involved drawing some arcs centre *B* but with no clear purpose. Some students appeared not to use a compass, and attempted to draw freehand arcs.

Some students clearly lacked understanding of this topic and simply drew lines on the diagram such as a straight line from *B* to *C*.

Question 3

(a) As expected, this was answered well by the majority of students. It was rare to see an incorrect response such as p^8

(b) Many students gained 2 marks for this part of the question. Some students expanded the first bracket incorrectly by writing down $6n^2 + 6n$ rather than $8n^2 + 6n$. Students were credited for expanding the expression and having at least 3 correct terms (from 4), thus gaining the first mark.

(c) Many students gained all 3 marks for this part of the question, demonstrating an excellent understanding of, and ability to manipulate, algebra. Students often cleared the fraction and expanded the bracket in one step; this was to the detriment of some students who made mistakes in their expansion and were not clear in their intent to multiply both sides by 3. Mistakes also crept in when some students attempted to isolate their *x* terms, adding instead of subtracting or vice versa.

Students who used the alternative method given in the mark scheme and separated the left side of the equation into two fractions, were generally unable to do so correctly. Too many students did not appreciate the importance of dividing both terms by 3 on the left.

Some students were able to gain credit via the special case for a correct rearrangement following a partially correct expansion of brackets. This was provided they started with a 4 term linear equation.

Question 4

All parts of the question were answered well by the students. It was encouraging to see students could interpret set B, set $A \cap B$ and set A' correctly.

Question 5

Many students could easily gain the first 2 marks of this question by substituting into the formula for the volume of a cylinder and finding 277 088. Some students converted the 70 cm and 18 cm into 0.7 m and 0.18 cm respectively.

Many students didn't know that $1cm^3 = 1ml$ therefore $1000cm^3 = 1$ litre is a more useful fact than $1m^3 = 1000$ litres. Some students did not realise that $1m^3 = 1000$ litres. Some students divided the volume by 100 or 10 000 to arrive at the incorrect answer.

Question 6

Students who had a good understanding of the concepts of highest common factor and lowest common multiple found this question to be straightforward. However, this was often not the case, with many students confusing the two terms or being unable to apply the concepts to numbers given in index form.

The most efficient way to do this question (and one that does not require use of a calculator) is to pick out the prime numbers which are in both A and B , use the lowest powers of these primes appearing and multiply the resulting terms together to get $2^2 \times 5^2 \times 7$, however, some students gave an answer of 700 with the correct figures. Students who did not show any working and wrote down an answer of 700 gained only 1 mark, as the question did ask for an answer as a product of prime factors.

Less careful students often made the answer $2 \times 5 \times 7$ from selecting the primes that were common to A and B. Also, some students wrote $2^2 \times 5^2 \times 7 \times 11$ as their answer.

Question 7

Many students could easily work out 16% of 475 to find 76 as the discount for shop A. Many students performed very well for shop B as they recognised the reverse percentage and applied a sound method correctly. Most chose to divide the sale price by 0.85 or $\frac{85}{100}$ in a single step method, rather than equate 408 to 85% and then find 1% and 100% in stages. A small minority of students attempted to solve through trial and improvement with limited success. Some students gained 1 mark for finding 0.85 but then multiplied this by 408. The most common error was to increase the sale price by 15% or find 15% of 408 and reduce it by this value, showing a lack of understanding that the 15% was calculated from the original price. Some students misinterpreted the question and used 1.15 as their 'multiplier' rather than 0.85. It should be noted that (1 – 15%) did not received a mark for 0.85 or 85% until further correct progress had been made, such as (1– 0.15).

Some students worked out the correct values of 76 and 72 and then did not answer the question that shop A gave more money off their normal price.

Question 8

(a) The main incorrect answer was to write the signs the wrong way round in the brackets e.g. $(x – 8)(x + 3)$ or $(x – 8)(x – 3)$ or $(x + 8)(x + 3)$; one mark was awarded for cases such as these. Many students who found this part difficult and then could not answer the second part of this question. In part (ii) some candidates tried to factorise again or try to use the quadratic formula. Candidates should ensure they have the correct factors by multiplying back as a useful check for this type of question. Students failed to recognise that the word **hence** meant that they must use their previous answer to solve the equation. Some students did not understand that in part (i) they were being asked for factors not solutions.

(b) This 3 mark inequalities question saw mixed results. Some students struggled to deal with the negative coefficient for the y-term; it was common to see answers of y with 3.75 and the incorrect inequality sign or with an equals sign or just 3.75 on the answer line. It was also

common to see students rearrange incorrectly and end up with $10y$ and 5. That said, a significant number did manage to rearrange correctly to gain a correct answer for 3 marks.

Question 9

(a) This part was answered well.

(b) This part of the question was challenging to some students as they could not use a calculator to work out the final answer. Many students obtained full marks. Some students left their final answer as 52×10^{145} thus gaining 1 mark. Some common incorrect answers were 5.2^{146} or 5.2×10^{-146} or more commonly 5.2×10^{144}

Question 10

The intention of this question was to apply Pythagoras theorem on triangle *DEF* and then use similar triangles to find the value of *x*. This question was answered well with the overwhelming majority of students using Pythagoras theorem and similar triangles to work out the length of *x*. Of those who lost marks, some added 51^2 to 24^2 which scored zero marks for the first two method marks. However, if the students had clearly identified this incorrect value as *DE* then they could gain the third and fourth method marks to work out the value of *x*.

Some students used trigonometry to find the value of *x* which was an acceptable method by working out angle *DFE* and proceeded to work out *x* using trigonometry.

Question 11

The table was almost always completed correctly, and most students drew a smooth curve through their correctly plotted points although occasionally (0.5, 5) was plotted inaccurately.

There were a number who used a ruler to draw straight lines between points, particularly between the points (0.5, 5), (1, 4) and (2, 5).

Question 12

There were many successful methods which gained full marks by working out the lengths *BD* or *BC* or *AD* or *AC*. Many students started well by writing down $\tan 47 = \frac{(BD)}{4250}$ or $\tan 24 = \frac{4250}{(BC)}$, however, on most occasions these expressions were rearranged well but some students lost marks with expressions such as $BD = \frac{4250}{\tan 24}$ or $BC = \tan 24 \times 4250$. Once students worked out *BC* or *BD* they gained the first 2 marks. The third mark involved subtracting the length of *DC* from *BC* which was done well by many students.

Question 13

(a) The majority of students were able to correctly complete the probabilities on the tree diagram. A substantial minority gave integer values to the branches rather than decimals. Some students lost marks by not labelling the second set of branches on the tree diagram correctly.

(b) This part was usually done well, sometimes taking advantage of the follow through from the tree diagram for full marks. Just a few students added probabilities, producing a probability value greater than one.

Question 14

Most students showed an understanding of inverse proportion, and most were able to at least get a correct value for *k* if not all three marks. The majority of those that didn't get marks mistook the problem for a direct proportion one and tried to multiply *k* by d^2 rather than divide or failed to spot that the *d* was squared.

Students do need to be reminded to use an 'equals' sign for a formula rather than a 'proportional' sign; this was a common reason for students losing marks.

Question 15

Many students gained full marks for a fully correct expansion and simplification. A small number of students gained no marks as they multiplied two factors and then a different two factors and then tried to simplify from there. An example being $3x \times (2x - 1)$ added to $3x \times (5x + 4)$. Of those that did gain the correct answer, some then attempted to factorise. If done

correctly, 3 marks were still awarded as per the mark scheme. If done incorrectly e.g. dividing by 3, only 2 marks were awarded.

Question 16

It was pleasing to see many students give fully correct solutions to this question. Many students applied the formula for the area of the triangle correctly by using one variable such as *x* or *r* for the radius of the sector of the circle. Some students rearranged their expression incorrectly, for example, to find $r^2 = \frac{120 \times \frac{1}{2}}{\sin 50}$. Some students worked out the correct value of the radius to be 17.7 and then used an incorrect method to find the area of the sector of the circle.

Some students worked out the area of the sector correctly, 136.7 or 137 and then proceeded to subtract the value of 120 from it to gain only 3 marks out of 4

Question 17

(a) Many students wrote down the correct answer of $5\sqrt{27}$ or $n = 5$. Students who simply wrote down 5 were not credited anything unless they had $5\sqrt{27}$ in the working space.

(b) Many students knew the correct process; to rationalise the denominator, and sensibly showed how to do this.

Errors seen from students in this question included using an incorrect multiplier to rationalise the denominator, typically using $\sqrt{2}-1$ or simply entering the given fraction as a calculation into their calculator and copying the screen display - this approach scored no marks as working was requested.

Students must show all the stages of working to gain full marks. Students that take short cuts in their working risk losing marks.

Question 18

Most students attempted this question although some failed to demonstrate any understanding of histograms, sometimes just totalling bar heights. Those who associated areas with frequency generally made progress, though mistakes were common, especially reading scales from the vertical axis.

Two marks were frequently awarded for 99, the number of students who spent between 20 minutes and 60 minutes to complete the puzzle, but many failed to realise that they also needed the total number of students in order to form a proportion.

Some students counted the number of "small squares" or "big squares". The mark scheme enabled students to gain method marks for this different approach if they involved some sort of area.

Question 19

There were a fair number of blank responses on this high grade question. However, it was pleasing to see many students gain full marks on this arithmetic series question. Of those that did not, some were often able to pick up a method mark for finding the equation for the sum of the first 30 terms. Less successful was the attempt for finding an equation for the sum of the 10th and 20th terms. The aim was to set up two linear equations in a and d but some students could not go any further with the equations, from this point.

This was a question where clear layout was essential. Those students that took care to present their work in a logical way were often successful whereas where working was muddled students often lost their way and also lost marks they might otherwise have gained.

Question 20

Students who appreciated that this question required calculus usually gained at least 1 mark by differentiating at least one of the terms from $y = 2x^4 - 64x$ correctly. Many students correctly equated their $\frac{dy}{dx}$ to 0 to gain the first 2 marks. At this stage many students found it difficult to rearrange the equation to find x. Some students did not realise that when cube rooting 8 the value should be 2 not ±2 thus losing the third method mark.

Students who worked out the value of x to be 2 then went onto find $y = -96$, however, some students left their answer as $(2, -96)$ which is incorrect as the question asked for the equation of the tangent. Some students worked out $y = -96$, however, they then worked out some spurious equation that was incorrect and lost the final mark as subsequent incorrect working is not ignored.

Question 21

Most students were able to show at least one correct error bound for *x* or *y* or *w*; many showed both upper and lower bounds. $28.44\dot{9}$ or $17.4\dot{9}$ were sometimes used rather than 28.5 or 17.5 respectively but teachers should emphasise the use of 28.5 or 17.5 since terminating decimals such as 28.499 or 17.499 were not accepted. Some errors were made by using a mixture of upper and lower bounds in the given formula. Some students substituted the given values of 28.4, 17 and 90 into the given formula and then found bounds for their answer. This gained no marks.

Many who were successful on this question wrote the unrounded answer 12.750….. and didn't round to 3 significant figures, as the question asked. This was not penalised, but students should be advised to give answers to the degree of accuracy, as stated in the question.

Question 22

The formula for the volume of a sphere is given on the formula sheet. Many students wrote down $\frac{4}{3}\times\pi\times12^3$ or $\frac{4}{3}\times\pi\times9^3$ or each expression divided by 2 to find the volume of a hemisphere to gain the first mark. However, students are encouraged to read the question carefully as some students subtracted the value of $\frac{4}{3}\times\pi\times9^3$ from the value of $\frac{4}{3}\times\pi\times12^3$ but did not divide their answer by 2 thus losing the final 2 marks. Numerous candidates gained the first mark but did not complete the question successfully. Some students used $\frac{4}{3}\times\pi\times r^2$ rather than r^3 or subtracted 9 from 12 and used 3 in their volume formula.

There was a reasonably large quantity of blank responses suggesting that students either found this question too difficult to attempt or that they had run out of time to answer.

Question 23

This was a challenging question for many students as the majority of responses were blank. The students who tried to answer the question had a variety of methods at their disposal. Many students used the calculus method to find the value of *k*. Many students differentiated to find

$2x - 8$ and then stated $x = 4$ and were awarded 2 marks. After working out $x = 4$ they then had no idea how to proceed to make further progress in order to find the value of k.

The mark scheme had other alternative methods that were used to answer this question successfully. Some students used creative methods to come up with actual values for p and q without an algebraic approach and as the question clearly stated 'Show clear algebraic working' a minimum of 2 method marks were needed to be gained before correct answers were accepted.

It was pleasing to occasionally see a perfectly correct response.

Question 24

Most students were able to score well on the first 2 parts of this question, although some ignored the instruction to give answers in simplest form. Parts (i) and (ii) were intended to give a starting point for part (iii) and many students accepted the hint and made reasonable progress. Most students who attempted the question followed the method shown in the mark scheme (finding 2 separate paths for the vector *OR*) but a few used an alternative approach. In all cases, many errors were seen, especially with signs and missing brackets.

The question asked for vectors to be written in terms of **a** and **b**. It was not unusual to see a complete mixture of inaccurate notation, with vectors put equal to scalars and vectors divided by vectors.

It is essential that students show clear working and use correct notation for vectors.

Question 25

This was poorly attempted by the students. Many didn't realise that they needed to complete the square as the most common way to reach the correct answer. Thus, only the most able mathematicians were able to secure full marks. Those who knew how to find the inverse of a function sometimes found the algebraic techniques required too challenging, particularly by using the method of completing the square. Some students gave an answer of $6 \pm \sqrt{\frac{x+65}{2}}$ not realising that only the positive answer was required as $x \geq 6$.

Unfortunate errors included $2x^2 – 24x + 7 = 2(x – 6)^2 – 36 + 7$. Some misinterpreted $x \geq 6$ as a cue to solve a quadratic inequality.

Summary

Based on their performance in this paper, students should:

- be able use formula given on formula sheet correctly
- learn to write a number as a product of its primes in index form
- learn how to apply trigonometry and Pythagoras theorem to problems
- learn the formula for the area of a sector of a circle
- use brackets when formulating expressions or equations
- read the question carefully and review their answer to ensure that the question set is the one that has been answered
- make sure that their working is to a sufficient degree of accuracy that does not affect the required accuracy of the 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

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