Pearson

Examiner's Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE

In Mathematics A (4MA0) Paper 4HR

edexcel

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 2018
Publications Code 4MA0_4HR_1806_ER

General

Students across the full grade range for the paper found ample scope to demonstrate their knowledge, skills and understanding. The accuracy of numerical calculations was usually good but care is still needed to avoid premature rounding when values are needed in subsequent working, as in the three dimensional trigonometry question, for instance. Accuracy in algebraic manipulation was less secure, especially when negative signs and brackets were involved.

Some students are very good at showing clear, step by step working. They benefit by a greater success rate and by securing more method marks when the final answer is incorrect. By contrast, there are those who show little or no working, relying heavily on calculators to provide a correct answer. They sacrifice the opportunity to score method marks when their calculations are wrong. In some cases questions specify that working must be shown, an indication that a correct answer without adequate working may score no marks.

Question 1

Many students found this a challenging start to the paper. A number of them did find the correct 3 numbers and others gained two marks for selecting 3 numbers, such as 4, 20, 31, that satisfied two of the properties. It was the range that seemed to cause most confusion. A common answer was 4, 20, and 27. Clearly, some students have difficulty in differentiating between the three different averages. Some well-reasoned answers were seen but trial and improvement was more common and effective use of algebra was rare.

Question 2

Most students identified the angle x as 67° but fewer were able to give alternate angles as the correct answer, sometimes opting for corresponding angles instead. Abbreviations and terms such as Z angles and alternative angles were not accepted. Opposite angles of a parallelogram was a common response, but this alone was not a complete reason to link x to the 67° angle shown at D. Sometimes a brief statement about which angles were equal was given but this was not enough to score the mark. Part (b) was done well, normally by considering opposite angles of the parallelogram or the angle sum of triangle BFC. Common mistakes were to take angle ABF as 67° or angle BCF as 60°.

Question 3

This familiar question was answered well, with very few numerical mistakes, other than giving the product of 0 and 2 as 2. The traditional error of giving the mean for the final answer was not seen too often. Unsuccessful responses usually added the integers from 0 to 5 or added the frequencies, with just a few trying to work with cumulative frequencies. Part (b) caused a little more difficulty. Some found the mean instead of the median, and others gave the frequency 3 instead of the corresponding number of trees.

Question 4

This was a concise question on a popular topic. Most students knew what was required and used an appropriate method to achieve the correct answer, usually finding 6% of £8.50 and then adding this to £8.50. Occasionally, 51p was subtracted from £8.50. Students are advised to show 6% as a fraction or a decimal in their working in order to gain a method mark if their calculation is incorrect. A common mistake was to divide 8.50 by 6.

Question 5

The idea of an enlargement was generally understood and there were many correct answers. The enlarged shape was sometimes distorted, especially by a misplaced bottom vertex, and it was frequently in the wrong place, often with *A* at the centre of the new figure. Those who drew lines of enlargement usually avoided both of these mistakes. Descriptions of the rotation were usually good though it was not unusual to miss out part of the detail or use the word turn instead of rotation. It was necessary to specify clockwise when the angle was given as 90^{o}. A combination of transformations, usually a rotation and a translation, scored no marks.

Question 6

The initial calculation of $2240 \div 805$ was done very well, but there were problems converting this to hours and minutes. It was sometimes interpreted as 2 hours 78 minutes. Those who did multiply by 60 occasionally left the answer as 167 minutes, often using the answer line to give 2.78 as the number of hours and 167 as the number of minutes. There were also some rounding errors that gave the number of minutes as 46 or 48.

Question 7

The simultaneous equations were presented in a way that suggested the elimination
of y by substitution. Solutions that adopted this approach were usually concise and accurate. Many students chose to rearrange the first equation and then try to eliminate a variable using the more familiar method of adding or subtracting the equations. Sign errors were common during this manipulation. Substitution to find the value of the second variable was done well.

Question 8

The combination of trigonometry and bearings challenged many students. Those with an understanding of both topics usually produced clear and correct working to score full marks. Others seemed less sure which angle to find and frequently failed to indicate their intention in the working. Some did not recognise the need for trigonometry. Seeing two side lengths, they felt that Pythagoras' theorem was required. The final step to obtain a bearing caused some difficulty. Angle CAB or angle ABC was frequently given as the answer, and others gave the bearing of A from B.

Question 9

The first three parts of the question were answered well. The most common errors in part (a) were to leave the number as 3; to give the number as 9; and to add indices to give $3a^5b^7$. Most mistakes in part (b) occurred with simplification after a correct expansion. As with part (c), handling negative terms incorrectly was the cause of many of the wrong answers. There was a wider range of marks for the inequality. This was just a routine question for some students. Others struggled with the double inequality. The majority of those who chose to divide by 2 as their first step did not divide the full expression $2p + 3$. Those who subtracted 3 as their first step were more successful. A common error was to combine the two inequalities, adding 5 to $2p + 3$ to give $2p + 8 < 13$.

Question 10

Most students knew exactly what to do in part (a) to answer this concise question on a popular topic. Marks were rarely sacrificed by not showing working, which generally took the form of a factor tree or repeated division in a table. Some attempts showed pairs of factors of 280 instead of the prime factors. Part (b) was also answered well, although there was some confusion between the highest common factor and the lowest common multiple. In some cases a common factor was given but not the highest common factor. Prime factors of 630 were usually shown.

Question 11

The correct positions for the first and third quartiles in this list of 15 discrete values were the 4^{th} and 12^{th} values. It was common to see 3.75 and 11.25 used instead. This gave the same values for Q_1 and Q_3 and it was condoned as a method on this occasion. Other incorrect positions for the quartiles were not accepted, so $10.5 - 3.5$ scored no marks, despite giving a correct value for the inter-quartile range. One of the more frequent mistakes was to subtract the positions of the quartiles, $12 - 4$ or $11.25 - 3.75$. Occasionally, the range was given as the answer.

Question 12

Plenty of students showed confidence in handling the fractions in this equation. They showed clear steps of working, either adding the fractions or multiplying both sides by 12 as a first stage, and usually obtained the correct answer. Others were less meticulous with their working, often omitting brackets or losing the denominators of the fractions. A few managed to recover from their poor notation but it was the cause of many mistakes. It was not unusual to see the fractions still with a common denominator of 12 after multiplying the right of the equation by 12. This tended to lead to a further multiplication by 12 later in the working. Some students got as far as $\frac{5x+1}{12}=2$ only to give $5x=25$ as the next step of working.

Question 13

The number in part (a) was nearly always written correctly in standard form. There was then an expectation that part (b) would ask for an answer written as a normal number so, ignoring the question, the answer was frequently given as

$2\,340\,000\,000$. The main mistake in part (c) was to divide the population of Morocco by the population of China. The two values were also subtracted on occasions and there were also some errors with the position of the decimal point in the answer.

Question 14

There were no complications to this probability question. The tree diagram was usually completed correctly. There were just a few incorrect fractions on the right branches, usually in an attempt at sampling from a single bag without replacement. Part (b) was also answered well, with occasional instances of adding the probabilities or including an extra product.

Question 15

Very few mistakes were made in completing the table of values. Points were then plotted with a good level of accuracy, helped by the simple scale on the y axis. Many good curves were seen but there are still those who join some or all points with straight lines, and this is not accepted. Students should aim for a continuous curve that passes through all of the points, making it clear without being too thick. The point $(-3, -18)$ was sometimes plotted at $(-3, 18)$, possibly in the expectation that the curve should be a parabola. Part (c) was more difficult and many did not understand what was required. Attempts to rearrange the equation were often successful in identifying the correct straight line, and this was usually drawn accurately. The line $y=-3x-2$ was not uncommon, Most of those who reached this stage understood which readings to take from the graph and they were usually accurate in doing this. Sometimes one of the values was missed.

Question 16

There was a good spread of marks for this question, discriminating well between students with different levels of algebraic understanding. At the lower end, there was no meaningful attempt. Then there were those who made fundamental mistakes at the beginning, such as trying to simplify to $p=\frac{\sqrt{w}+4}{\sqrt{w}-2}$, $p=\frac{w-2}{w-1}$ or $p=\left(\frac{w+4}{w-2}\right)^2$. A correct first step was managed by many but not all of these were able to clear the fraction. Brackets were often omitted. This tended to cause mistakes in subsequent working. Clear and accurate use of mathematical notation was closely correlated with success in isolating terms in w, a step that suffered from sign errors. The final stage of factorisation and division was accomplished by a reasonable number of students with strong algebraic skills.

Question 17

There were two quick marks available for a good proportion of students who were familiar with the intersecting chords theorem. Others went back to first principles and formed an equation using similar triangles. This was often done correctly but it was not unusual to see one of the fractions upside down. There were also attempts to use the sums of sides as part of either of these methods, but they were all incorrect. A common misconception from those unfamiliar with the intersecting chords theorem was to assume that the two chords both had the same length, which produced 3.5 as an answer.

Question 18

Students below the target grade commonly treat histograms as bar charts and they make no progress. Then there are those who have some understanding of frequency density but make mistakes like dividing the interval width by the frequency. This leaves a reasonable number of students who know how to work out frequency density, and they scored well on both parts of this question. A useful step was marking the correct frequency density scale. The final bar in part (b) was sometimes the wrong width. Many students gave answers without any working.

Question 19

This sort of question causes some confusion to students who believe that part (a) is asking them to solve the quadratic equation. They then wonder what to do in part (b) and may end up deriving the equation. This sort of misinterpretation is not condoned. Many students did understand what was required and they gave convincing derivations of the equation. They needed to show the product

$(x+3)(2x+1)$ and the expansion of these brackets. They also needed to show

2×3 or 6 and link this clearly with the product of brackets and the area, 45. Part (b) instructed candidates to show working clearly. In questions that involve quadratic equations, this is usually an indication that no marks will be awarded unless correct substitution in to the quadratic formula is shown, since factorisation was not an option for this equation. Most students understood this instruction and the equation was solved reliably, but a few gave only values for the roots, possibly in surd form that can be obtained directly by using a calculator function. The accuracy mark was sometimes lost because the negative root was not excluded, and this was not an acceptable value in the context of the question.

Question 20

Most of the attempts to answer this question started by writing $x = 0.2\dot{7}\dot{8}$ and similar equations for $10x$, $100x$ and $1000x$. It should be emphasised that the numbers must be shown as recurring decimals at this stage. The first mark required two appropriate equations to be selected. This was often done successfully but some tried to make progress with an inappropriate pair, such as x and $1000x$. After choosing suitable equations, most solutions gave convincing working to reach the required fraction, though some omitted the fraction that followed their subtraction, $\frac{276}{990}$ for instance, simply stating the given answer.

Question 21

There were some very good answers which showed clear steps of working that were correct in every detail. There were also plenty of attempts that understood the need to use a common denominator but could not process the algebra correctly. A reluctance to use brackets was the usual source of errors, frequently concluding with -25 as the numerator in the answer. It was not necessary to expand brackets in the denominator of the answer, but if this was done, it had to be done correctly.

Question 22

This was probably the most challenging question on the paper so it was pleasing to see a reasonable number of correct and elegant solutions. Mistakes were many and varied, often leaving students struggling with lengthy pieces of complicated working. A common problem was to multiply indices instead of adding them. Some multiplied numbers as well to give expressions like 25^{n^4-5n} and 25^9. The numerical powers of 5 tended to get muddled by those who felt the need to seek a common denominator for the two original fractions. A more fundamental misconception was simply to equate the powers $\left(\frac{n^2}{6} \times \frac{n^2-5n}{3} = 3\right)$ without any attempt to combine them to give a single power of 5 on each side of the equation. Students who managed to surmount the initial hurdle of simplification normally obtained the correct quadratic equation, which they usually solved reliably. Since n was specified to be a positive number, the final mark was withheld unless the negative root of the equation was rejected.

Question 23

No complicated trigonometry was required to answer this question. The emphasis was on interpreting a three dimensional problem and applying the basic skills of Pythagoras and trigonometry clearly. A reasonable number of students achieved this, often drawing their own two dimensional diagrams to support their method. They usually calculated an accurate final value, avoiding the pitfall of using rounded answers in successive steps of working. Other attempts often found a correct length for AB before becoming confused. A significant problem was the failure to label working or to give any indication which length or angle was being calculated. Another common mistake was to assume that the angle OBP was also 72 degrees.

Question 24

The structure of questions follows a standard pattern. They start by providing the information needed to answer the question and they finish by saying what has to be done. Students need to pay careful attention to this. The key word here was *perimeter*. Despite this, a substantial number of students looked at the shaded area and then attempted to find this *area*. Apart from this, the main mistakes were using the radius as the chord length and using 108 instead of 72 in the cosine rule or when finding the arc length.

Question 25

Most attempts scored the first mark for writing down at least one correct error bound. The exceptions were usually those that worked out the volumes using the original dimensions, sometimes trying to apply an arbitrary error bound at the end. Many solutions also scored a second mark for finding the upper bound of the volume of the cube, although 11.54 was sometimes used in this calculation. A common mistake was to find the upper bound for the volume of the sphere as well, but there were also plenty of fully correct responses.

Summary

Based on their performance in this paper, students should:

- read the question carefully to make sure that they are attempting to find the answer that is required
- be careful not to assume information that is not given in the question
- aim to present working that communicates their method clearly, taking particular care to label working and to include brackets where they are necessary
- learn the differences between statistical terms such as mean, median and mode; range and interquartile range; bar chart and histogram
- learn formal terms for giving geometrical reasons