Principal Examiner Feedback

November 2016

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Calculator) 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

November 2016
Publications Code 1MA0_2H_1611_ER

GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 2

Introduction

It was pleasing that the majority of students showed working out to support their answers and this was often well set out and easy to follow. One problem that was evident on this calculator paper was the use of premature approximation. Many students rounded values at intermediate steps in their calculations which resulted in a loss of accuracy in the final answer and a loss of marks.

Many students appeared to be struggling to access the questions on this paper. It seemed as though many had not covered all the topics in the specification and were therefore faced with unfamiliar questions that they could not attempt. The vast majority of students were unable to answer the higher level questions found towards the end of the paper.

Report on individual questions

Question 1

This question was answered very well, with most students knowing what was required, and the table was usually ordered correctly. The most common mistake was to omit a number, usually one of the repeats, eg 56 or 48. It is a pity that students did not check that they had 20 items in the leaf. Most students gave a key.

Question 2

In part (a), writing the ratio as 225 : 475 gained both marks even if the ratio was then simplified incorrectly. Many students worked out the two shares as £225 and £475 but did not write down the ratio 225 : 475. They either gave an incorrect ratio, eg 1 : 3, on the answer line or gave no ratio at all. These students scored one mark only. Some students worked out only one of the shares correctly but still scored one mark.

There were many fully correct responses of 175 and 455 in part (b). A common error was 630 ÷ 5 = 126 then 630 −126 = 504 with the answer 126 and 504. A number of students wrote 630 ÷ 18 = 35 but did not progress any further. Some wrote several other calculations as well, such as 630 ÷ 2 = 315 and 630 ÷ 5 = 126, so did not gain the method mark.

Question 3

The more successful students used an algebraic approach and formed an appropriate equation, eg $4x + 31 = 6x - 21$ or $4x + 31 + 6x - 21 + 90 = 360$, before going on to solve for x. Many students lost marks for incorrect algebra when attempting to isolate the terms in x and the number terms. Incorrect equations such as $4x + 31 + 6x - 21 = 360$ were common and a significant number of students only created an expression, usually $6x - 21 + 4x + 31$ followed by $10x + 10$. Some students realised that $4x + 31$ and $6x - 21$ were both equal to 135 and many who did so went on to score full marks. A trial and improvement approach was used successfully by some students.

Question 4

The vast majority of students gained full marks in part (a). The ones who didn't were mainly those who added the probabilities but didn't subtract the total from 1, giving 0.7 as the answer. One mark was awarded quite often for 0.3 written in the table with a different probability on the answer line. A few students struggled to add the four numbers together correctly but still attempted to subtract from 1 and were awarded one mark.

Part (b) was generally answered well. The most common way of responding was to add the two probabilities and then multiply by 60. The arithmetic to go with this method was usually done correctly. In some responses the answer was given as a fraction (21/60) and this lost the final mark. It was also common to see responses where students worked out estimates for landing on A and for landing on B but did not attempt to add them together.

Question 5

This question was well answered and the correct answer was often given with no intermediate working. The most common incorrect answer was −1.857..., from keying in $1.45^2 \div 3.89 - \sqrt{5.75}$. When students gained only one mark this was usually for evaluating 1.45^2 correctly.

Question 6

The 1.5m height of the wall confused a significant number of students who did not appreciate that this was a simple ratio question. Dividing 300 by 6.5 after adding the 5 and 1.5 was not uncommon. There were also attempts to scale up from 5 to 8 by doubling or halving; often the error here was in finding the bricks for 0.5m incorrectly. A surprisingly large number of students misinterpreted the question and gave the answer 480 - even after finding that 180 extra bricks were needed. The most successful method was to divide 300 by 5 and then multiply by 3 or by 8, though dividing by 7.5 and then multiplying by 4.5 or 12 was also common. Students appeared to need more experience of questions with extra information that may not be needed in their solution.

Question 7

This was generally completed correctly with many students scoring full marks. The majority of correct responses came from those completing a table of values. It was rare to see the whole line drawn from only two points, such as the x and y intercepts. When 2 marks were awarded it was often for plotting the points but not drawing in the line or for a line that was too short. It was also common to see one point plotted incorrectly, eg (−1, 6), but with a correct straight line segment through at least 3 of the correct points. Students scoring no marks either had no table of values or a table of values with no discernible pattern so it was unclear what they were trying to do.

Question 8

In this QWC question it was necessary to have a correct calculation, correct units, and a correct statement of comparison. Many of the students who gained 2 marks for changing 31 euros into pounds or £23.50 into euros failed to gain all 3 marks. For some this was because they failed to give the correct units with their conversion. For others it was because they gave a difference in cost rather than the comparison that was asked for in the question, eg 'the wallet is cheaper in France'. Some students used the exchange rate incorrectly, eg working out $23.50 \div 1.34$ instead of 23.50×1.34, whilst a minority just compared 31 with 23.50.

Question 9

To gain any marks students had to work out the length of the diagonal *DB*. Many students failed to recognise that this required the use of Pythagoras' theorem which was very disappointing. It was common to see attempts to answer the question using areas or by finding the weight of the perimeter, neither of which earned any marks. Those students who did use Pythagoras' theorem usually earned 1 or 2 marks. Some started by converting centimetres to metres but even if they did this incorrectly they were still able to earn method marks for correct use of Pythagoras, eg $6^2 + 20^2$. A small percentage of students then went on to complete the method correctly. To earn the final method mark it was necessary to add all five lengths, convert to metres and multiply by 0.9. Errors were often seen in one of these steps; division by 0.9 being a common error.

Question 10

There are several ways to approach answering this QWC question and students are expected to make it clear what they are doing. The most commonly seen approaches were to either calculate the cost per gram for both cartons or to calculate how many grams could be bought for £1. Many students earned two marks for using one of these approaches. Another approach was to find a common multiple of either the weights (or the prices) and use the factors to calculate the costs (or weights) to enable a comparison. Although this method was less common it was often successful. To earn the final mark for the conclusion it was necessary for students to make a clear statement of which carton was the better value. Circling or ticking the diagram or calculation was insufficient. Those who calculated the cost per gram usually chose correctly and were awarded the mark as long as their calculations were correct. However, those who calculated how many grams could be bought for £1 often misunderstood the units of their found values, assuming they were 78p and 80p, and chose the smaller carton.

Question 11

This question was poorly answered. Many gained 1 mark for finding the area of the circle but finding the area of the square proved to be beyond the majority of students. An incorrect method of 6 × 6 was frequently seen but less understandable on a Higher tier paper was the number of students who worked out 6+6+6+6 or 6×6×6×6 for the area. Some students worked out the area of the square by first finding the area of one of the triangles and some used Pythagoras's theorem to find the side length of the square. Those using Pythagoras sometimes rounded the side length before working out the area of the square and lost accuracy. It is disappointing when students fail to understand that $(\sqrt{72})^2$ gives 72, not 71.9 or a similarly rounded figure. Some students found an area for the square that was greater than the area of the circle and went on to subtract the area of the circle from the area of the square.

Question 12

In part (a), many students were able to use the index laws for multiplication and division to simplify the expression. Some students earned one mark for reaching n^{10}/n^6 but either gave this as the final answer or simplified it incorrectly and gave an answer such as $n^{1.6}$ or n^{60}. A common incorrect first step was n^{21}/n^6.

The first mark in part (b) was accessible to most students, with mistakes more common in the second expansion (e.g. $3x + 6$ or $2x^2 + 5x$). Many students correctly obtained the x term in the final answer but a large number did not combine x^2 and $2x^2$ correctly.

In part (c), the majority of the partially completed factorisations used $3ab$, $3a$ or $3b$ as the common factor, not necessarily completing the partial factorisation successfully. A smaller number used $9a$ or $9b$ as the common factor. Those who did choose the correct $9ab$ as a factor often left the bracket as $(2 + 3ab)$ and lost the second mark; students need to appreciate that in ab^2, only the b is squared.

Question 13

Many students completed the cumulative frequency table correctly although there were some who clearly had no idea how to work out the cumulative frequencies. Those who completed the table correctly generally plotted the points and joined them with a curve or with line segments. Some students did not join the points and some drew a line of best fit. There were some graphs drawn with the points plotted at the midpoints of the intervals and some graphs were condensed into the w = 100 to 150 region. Part (c) was poorly answered. A common mistake was to find 25% and 75% of the total frequency but then simply subtract 20 from 60 and give 40 as the final answer. Some students gave the lower quartile, not the interquartile range, as the answer. Many students scored one mark in part (d) by reading from the graph at *weight* = 150, although relatively few then went on to use their reading to work out the percentage.

Question 14

This question was not well answered. Students frequently worked out 360 ÷ 5 = 72, often followed by 180 – 72 = 108, but then marked the angles in incorrect positions on the diagram and gained no marks. Many errors were seen. These included: using 72° as an interior angle of a regular pentagon; using 108° as an angle in the trapezium or as an exterior angle of the pentagon; using incorrect totals of 720° or 900° for the sum of the angles in a pentagon. Even when they marked 108 in a correct position many students did not know how to use it to find angle *SRC*.

Question 15

Many students did not recognise that this was a trigonometry question and attempted to use angle rules for parallel lines or triangles to calculate the angles, scoring no marks. A few did manage to write down SOHCAHTOA in one form or other but were unable to use it. Some students tried to substitute 24 and 15 into the same formula, eg tan$x$=15/24. Many of those who did use trigonometry appropriately were successful at finding *BD*. Unfortunately some of those who found *BD* as 13.24 rounded it prematurely to 13 and consequently lost the accuracy in their final answer. Some used cos and found *AD* but thought it was *BD.* After finding *BD* the majority used Pythagoras' theorem to find the hypotenuse *CD* (usually successfully) but then many just left this as their answer, unsure how to proceed. Students finding *CD* did not get any more marks unless they then went on and used it correctly to find angle *BCD*. Relatively few students managed a fully correct solution with an answer in the given range.

Question 16

Overall, this question was answered very poorly with few students scoring more than one mark. However, it was pleasing to see some fully correct and well presented solutions. Those students that attempted an algebraic solution often scored one mark for writing a correct expression but many failed to write down two correct expressions. It was common to see Liam's answer written as $x - 10$ rather than $10 - x$. Some students were able to use their expressions to form an equation but many of the equations seen failed to take into account the information that Julie's answer was two thirds of Liam's answer. Those that did attempt to use this information sometimes had 2/3 on the wrong side of the equation. Many students resorted to a trial and improvement approach but these did not result in a correct answer and gained no marks.

Question 17

Most students seemed well prepared for the standard question in part (a) and many were able to write down a suitable question with an appropriate time frame. Some students incorrectly interpreted 'how often' as 'how many hours' and there were others who wrote a correct question but then put times (eg, 'hours' or 'days') with the response boxes. Sometimes the response boxes were not exhaustive, most commonly having no zero option. A significant number, though, missed out an option in the middle, eg '6-8' then 'more than 9'. Relatively few students gave overlapping response boxes.

In part (b) most students who used a correct method, eg 460 ÷ 1709 × 200, rounded their answer to either 53 or 54. A few students gave 53.8 as the answer and scored one mark only. Common incorrect methods seen included 460 ÷ 963 × 200 and 460 ÷ 787 × 200.

Question 18

When students scored 1 or 2 marks, it was usually for angle ABD = 62º and/or angle BAD = 90º. These angles were often marked on the diagram. Reasons, on the other hand, were rarely correctly stated, with many students attempting descriptions which usually did not include the required key words. Quite a few students thought that one or other of the triangles was isosceles.

Question 19

Many students achieved one mark in part (a) for correctly obtaining at least 3 correct terms after expansion. Some of those that got 4 terms correct were unable to simplify them correctly.

Part (b) proved difficult for the majority of students with many not realising that two brackets were needed. When two brackets were used it was common to see either (e – 12) or (e – 6) as one of the brackets. Some of those that did use 3 and 4 in the brackets did not get the signs correct.

Those using the formula in part (c) had difficulty coping with the fact that both b and c were negative and a large majority of the errors seen were caused by '− *b*'. Although the fraction lines were often not long enough subsequent calculations usually showed that a correct order of operations had been used. The majority of students using the formula did use 2*a* in the denominator and had '±'. Students should be encouraged not to round values prematurely, as this often leads to a lack of accuracy in the final answers. Many students, however, did not attempt to use the formula but tried unsuccessfully to work with the equation or used trial and improvement to find one solution. If trial and improvement is used then both solutions must be found before any marks can be awarded.

Question 20

A large number of students did not attempt this question and there were disappointingly few fully correct answers. The most common response, when it was attempted, was to use the values given in the question leading to 0.5 × 7.8 × 5.2 sin 63 = 18.06... There was sometimes an attempt to give a lower bound to this value such as 18.06 − 0.5 = 17.56... In cases where the upper bounds and lower bounds of the original values were shown students often failed to use all three correct values in their calculation, eg writing 0.5 × 7.8 × 5.15 sin 62.5 or 0.5 × 7.75 × 5.2 sin 62.5.

Question 21

Most students did not appreciate that this was a volume question and it was very poorly completed. Those students that scored all four marks either worked out how many litres of compost were needed for 12 baskets in comparison to the 200 litres available or found that only 11.9 baskets could be filled with the available compost. These solutions were generally well annotated and structured clearly. Some students gained one mark by correctly considering the volume needed to fill one basket but made no attempt to convert the units (few demonstrating that they knew the connection between litres and cm^3), hence the comparison of values was meaningless. Many tried to compare 33510 or 16755 with 200 and found no need to include the fact that they needed 12 baskets either. The majority of students scored no marks. Some only considered 50 × 4 = 200 and then attempted to divide by the diameter, 40, or by the number of baskets, 12. Others tried to involve the shape of the basket but there were many incorrect attempts seen, including: using the diameter instead of the radius; using an incorrect formula for the volume; finding the surface area of a sphere or hemisphere; calculating the area of a circle; calculating the circumference.

Question 22

The majority of students made no attempt at part (a). Those that did often only included a table of values and did not substitute any values into the equation.

Relatively few attempts were made at part (b). The most common incorrect response was when students reflected the curve in the x-axis, i.e. applying the $-\sin x$, but then did not translate the graph for the +1. When the correct response was seen it was normally exemplified by plotting turning points and x-axis crossing points with an attempt at the curve.

Question 23

If an attempt was made, students were often successful in finding the vector *AB* although there were some errors from failing to use the '–' sign appropriately. Some students mixed up the direction of a vector when writing vector statements and scored no more marks. Other common issues arose from misunderstanding the ratio 5:1 with students using either 4/5 or 1/5. Of the students who could get to a correct expression for *OT* some lost the final mark when they failed to factorise 5/6**a** + 10/6**b** to show that *OT* is parallel to **a** + 2**b**.

Question 24

Very few students attempted this question and many of those who did attempt it tried to prove the statement using numbers. Those using an algebraic approach could generally expand correctly but often forgot the bracket and so incorrectly simplified the numerator. Only a few students factorised the denominator or cross multiplied, with several incorrectly trying to cancel terms within the numerator and denominator. When cross multiplication is used, students should remember to state that the left hand side = the right hand side as the equation is no longer in the form originally given.

Summary

Based on their performance on this paper, students should:

- check that the leaf contains the correct number of items when drawing a stem and leaf diagram
- practise deriving and solving equations
- include the necessary units in a QWC question

  practise finding exterior angles and interior angles of polygons
- practise finding angles using the circle theorems and giving reasons
- not round intermediate values in multi-step problems, as this often leads to a lack of accuracy in the final answers.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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