Examiners' Report/
Principal Examiner Feedback

January 2016

Pearson Edexcel International GCSE
Mathematics A (4MA0)
Paper 4H

Pearson Edexcel Certificate
Mathematics A (KMA0)
Paper 4H

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Introduction

The demand of this paper was in line with previous papers and it discriminated well between students, the early part of the paper being well answered and the end of the paper being more challenging. In particular, students struggled with simplifying a quadratic quotient, the intersecting chord theorem, using surds to give the total surface area of a cylinder and a demanding standard form question. Generally, we saw students showing adequate working but a few failed to do so and this often cost them valuable marks. It was noticeable that some students failed to use their calculators correctly for the calculator question and for substitution, often failing to use brackets to square values which included negative signs or surds.

Question 1

While many students were able to gain full marks on this question it was surprising to see quite a large number unable to use their calculators correctly. Without the use of the fraction button or correct use of brackets, candidates often got the order of operations incorrect by calculating $\sqrt{4.6} \div 8.1 - 3.7$. Some students calculated the numerator and denominator separately, the $\sqrt{4.6}$ often causing rounding problems. We awarded a mark for seeing the numerator or denominator calculated correctly or $\frac{\sqrt{115}}{22}$, as given by some calculators.

The rounding in part (b) was a problem to many students, where they rounded up the last figure or gave the value to 2 significant figures, apparently thinking that the leading zero was a significant figure. There were many instances of the response in part (b) bearing no relation to the answer to part (a).

Question 2

While we saw many correct answers, it was disappointing to see some students fall down on squaring a negative number; again incorrect use of the calculator often caused this problem. Many candidates gave the answer of −95 coming from using −25 for $(-5)^2$. We also saw a number of candidates calculating $(3e)^2$ rather than $3e^2$. If a student did not get the correct answer we awarded a mark for seeing $(-5)^2 + 4 \times -5$, with brackets essential or for seeing 75 for $3e^2$

Question 3

Many students were able to give the correct answers of 3 and 10. Those that didn't often gained a mark for showing that the total of the values on the cards was 32 or that the range being 9 meant that one of the numbers should be 10. If a candidate showed the method to give the total of the two remaining cards was 13 they gained the second method mark. If no method was seen, a candidate could gain a mark for giving two numbers with a total of 13 (most frequently we saw 4 and 9) or two numbers that gave a range of 9 for the eight cards. It was surprising that some students showed they thought that the range being 9 meant that one of the numbers should be 9.

Question 4

This question was answered well by the majority of students sitting this paper. The most common mistake for the student who gained no marks was to multiply both the numerator and denominator of $\frac{2}{5}$ by 30, giving an answer of $\frac{60}{150}$. If the student correctly calculated 12 but then re-wrote it as a probability on the answer line, they were awarded 1 mark only for a misunderstanding of the 'number of times the spinner lands on yellow'.

Question 5

The majority of students were able to find the correct value for the angle *x* but many did not pick up the mark for a correct reason. Some appeared to have not realised they needed to give the reasons and some gave incorrect or incomplete reasons; mentioning similarity in isolation was insufficient and a number of candidates just stated 'parallel lines'. For the award of the mark the student had to say angles in a triangle total 180° or corresponding angles (the underlined words/number were essential). Incorrect values for angle *x* included 55° where the student correctly calculated AEC as 110° and then thought that BDC was half of this; we also saw $x = 140$ when a student correctly calculated ABD as 140° and then thought that *x* was an alternate angle with this.

Question 6

A good number of students at this level gained full marks for finding the coordinates of the midpoint of *BC*. There were a fair number of candidates who had clearly done work with coordinates and appeared to be doing a calculation for the gradient. Some also subtracted one coordinate from another and then divided by two, rather than adding the values for x and y before dividing by two. We also saw a number doing $\frac{x+y}{2}$ for each set of coordinates to get (2.5, 7.5). There were also a good number of (7,15) and (5, 5), adding or subtracting coordinates but failing to divide by 2.

Question 7

Part (a) of this question was done well by the vast majority of students, the occasional student forgetting to subtract 12% of £30 from £30; these students gained 1 method mark.

Part (b), although more challenging, was also done well, however with less success than part (a). Some students gained 1 mark for putting 9 = 12% but then they did not know how to progress. Some candidates added or subtracted £9 to lose the final accuracy mark. Common mistakes for incorrect responses was to multiply or divide by 1.12 or 0.88; also a misunderstanding of the question that £9 was the reduced price of the coat.

Question 8

(a) The majority of students gained full marks for this part of the question. Those that did not, often gave 0.4 (the total of the given probabilities) as the answer.

(b) Many students were able to give the correct answer for this question, some using the method of 6×20 or $\frac{6}{0.05}$. Most students, however, found the number of cars of each colour, which caused problems for a few with the number of silver cars; the students could gain a method mark for 3 correct products out of 4 shown.

Question 9

(a) This question was mostly correct; if an error was made, it tended to be forgetting to multiply 2 by x.

(b) We saw a good number of correct inequalities but a number of students do not realise that the answer to an inequality must be a range of values, $x > 2.5$ in this case. If the answer of 2.5 alone was seen, following a correct answer then we awarded 1 mark. Candidates who worked with equations were also able to gain method marks for their correct working.

(c) It is essential that if asked to 'show clear algebraic working' then the student must do this in order to be able to access marks. We saw a good number of correct answers which followed correct algebraic working, so these gained full marks. The students who used a trial and improvement method, rather than algebra to find the answer were unable to gain any marks, even for a correct answer. Other mistakes included 'losing' the minus sign on the $5m$ when subtracting 3 from both sides, adding 3 to 32 rather than subtracting it or subtracting the 3 before multiplying by 4. Some students correctly showed $m = -5.8$ in the working space but 'lost' the minus sign on the answer line; care is needed with copying answers correctly to the answer line.

Question 10

We saw many correct answers for this question. Not reading the question carefully, and using the given length as the perimeter, was the most common error. Students commonly gained either no marks or full marks here.

Question 11

This question was frequently correct; students should, however, be reminded that without clear algebraic working no marks could be awarded. The negative sign on the value of y (-0.5) caused a few problems for students who substituted this value. As in Q9c, students need to take more care and not 'lose' the minus sign. Too many correctly found both values, but incorrectly wrote $y = 0.5$ on the answer line.

Question 12

A fair number of students gained full marks for this question, and many who could not give a fully correct answer were able to gain a method mark for the correct gradient of -2. Some students clearly did not understand what was required and some obviously got confused by parallel and perpendicular lines; many did not make any link between this question and the general formula $y = mx + c$ for a straight line.

Question 13

There are several ways of gaining the correct answer for this question and provided we saw evidence of a correct method with no contradictions, such as an interior angle marked as an exterior angle on the diagram we were able to credit these attempts. Students were asked to 'show your working clearly' and without scoring at least a method mark they were unable to gain any credit. Many students calculated the interior angle of the decagon correctly to get 144, but were then unable apply this answer to the problem and so gained no further marks. The candidates who spotted the regular pentagon lying within the decagon had the quickest route to a solution, and almost without exception, gained full marks.

Question 14

Generally this question was done reasonably well; the main mistake for those not gaining full marks for (a) and (b) was to believe the scale factor was 2, coming from incorrectly assuming the sides BC (5cm) and EC (10cm) corresponded rather than AC (4cm) and EC (10cm). There were also mistakes made when students attempted to add or subtract and also attempts using Pythagoras' theorem. Part (c) was less well done, most students forgetting that you needed to square a scale factor for area.

Question 15

The majority of students correctly plotted and joined the points for a cumulative frequency graph; we saw a few bar charts and a few 'cumulative frequency graphs' that were plotted at the midpoints of the height range for each range in the table (145, 150, 155,...), although less than previous series. Most students were able to find the median and if they didn't read correctly were able to gain a mark for 30 or 30.5 shown on the graph or stated in their answer space for (b). For part (c), those that did not gain full marks often read off the value for 174 cm but omitted to subtract their value from 60 to find the number of men taller than 174 cm. A significant number of candidates are still not indicating their workings on the graph where they read off values and are thus risking losing all the marks for parts b and c; students must be encouraged to do this to maximise their opportunities of gaining marks.

Question 16

Many students were able to correctly differentiate this equation with a few incorrectly leaving the constant term or giving the answer as $6x - 12x$; one mark was gained for differentiating one term correctly which was invariably $6x$. For part (b), around half of the students gave the correct answer. Those that were not correct often equated their dy/dx to zero or substituted 18 for x in their dy/dx or used the original equation with $y = 0$ or $y = 18$

Question 17

(a) It was uncommon to find this expression simplified correctly, many students gaining only one mark for 2 correct terms out of the 3 as well as many scoring zero. It was the value of the cubic root of 8 that was commonly forgotten. Common answers were $\frac{8e^2}{f^4}$, $\frac{2.6e^2}{f^4}$, $\frac{8e^3}{f^4}$ rather than $\frac{2e^2}{f^4}$.

(b) Many students factorised this expression only partially, usually $2(y^2 - 36)$, not realising the need to use the difference of two squares. Some candidates also gave the answer as (2y + 12) (y – 6), again only partially factorised. Students must be reminded that when they see 'factorise fully' there are at least 2 factors. Some students also divided by 2 rather than taking out a factor of 2.

(c) Some students started to incorrectly cancel out values from the numerator and denominator without factorising, often gaining a numerical answer. For those that realised the need to first factorise the numerator and denominator, it was most common to gain the method mark for the denominator. Some students clearly struggled with the coefficient of p^2 being 2 and many were unsuccessful in the factorising of the numerator. If a student successfully factorised the numerator and denominator they generally gained full marks, by then correctly cancelling (p – 3). However, some students gained the correct answer and then simplified further incorrectly and so lost the accuracy mark

Question 18

Questions of this type often appear on iGCSE papers and it was clear that many students were very familiar with the process required. A few made a mistake after showing a correct equation involving a constant, giving the constant as $\frac{7}{4}$ rather than $\frac{4}{7}$. For part (b), the majority of students were able to correctly find the value of *x* if they gave a correct equation in (a). We allowed follow through marks for using an incorrect value of the constant term, so this allowed the student using $\frac{7}{4}$ to gain full marks for the second part. Also for part (b) many candidates gained the answer 21 for root *x*, but then did not realise they had to square the 21 and square rooted instead to find *x* or gave the answer as 21 or $\sqrt{21}$.

Question 19

Quite a lot of students gave a correct answer, but we saw a fair few that contained fundamental errors. Even though students are given the trigonometric ratios on the formula sheet, some were unable to copy and use them correctly and instead of, for example, $PQ = 8.4 \div \cos(38)$, we frequently saw $PQ = 8.4 \times \cos(38)$. Some introduced more stages than necessary by using legitimate but roundabout routes in finding QR, such as finding *PQ* then *QS* then *SR* then finally *QR*; these less direct methods often led to slightly inaccurate answers.

Question 20

Some students were clearly familiar with this circle theorem, but they were in the minority. Some candidates had some knowledge of the intersecting chord theorem, but applied it incorrectly because the intersection was external to the circle. These candidates then worked commonly worked with $10AB = 7 \times 8$ or $10BP = 15 \times 7$; we also saw
$7 + 8 = 10 + x$. There were also a lot of blank responses, indicating the need for students to do more work on this topic.

Question 21

The majority of students correctly identified this question as one in which the cosine rule was needed. A few used the cosine rule incorrectly, and some, after a correct initial equation showed that they used the incorrect order of operations. A few forgot to square root their BC^2 giving the answer of 97.4...., for which they gained 2 method marks. Some students rounded in the middle of the calculation and lost the accuracy mark despite using a correct method.

Question 22

We saw a good amount of well set out responses to this question, but there was also a fair share of blank responses and responses that were without any understanding of what was required to solve the equation. Common mistakes were expanding brackets incorrectly, particularly −6(x −2) and gaining −6x −12 rather than −6x + 12, for which a student could gain a maximum of 2 method marks. This question required students to 'show clear algebraic working' and in particular we were looking for a correct method to solve the correct quadratic equation; most students gaining the correct answer were able to benefit from all marks because clear working had been shown. Nevertheless, it was disappointing to find clearly able students, awarded 3 marks for a correct quadratic equation, then unable to progress further, despite being faced with a relatively simple factorisation. Often students that used the quadratic formula to solve the equation lost the final marks because the (−b) in this case (− −1) was written as (−1)

Question 23

This question was quite challenging to many students but we saw a fair few completely correct responses following thorough working. We frequently saw students start working with decimals for the radius, when the form of the answer clearly required surd work. These students gained no marks unless their work showed recovery. A few students worked with the curved surface area alone or only used one circle rather than two. A few students used the formula for volume of a cylinder, misunderstanding that total surface area was required. The most common error resulted from brackets not being used in the calculation of the area of the circle. This was frequently written as $\pi 4\sqrt{3}^2$ rather than $\pi(4\sqrt{3})^2$, with the resulting error in calculation excluding access to more than the first 2 marks.

Question 24

There were many blank responses to this question. Some attempted the question but failed to understand that they must first find the radius of the sector and spurious working generally showed they were aware of having to use 50/360 in some way, although some tried to do 360 ÷ 50 instead. The more able candidates who understood how to solve the problem, showed clear working and generally gave a correct answer; 10.5 rather than 34.5 was given as an answer in some cases when the candidate forgot to add on 2 × 12 for the full perimeter. Once again, not reading the question carefully meant that a significant number of students attempted to work with 20π as the area of the whole circle.

Question 25

The many blank responses seen with few gaining full marks is a clear indication this topic and the associated algebra is very poorly grasped. One method mark was often gained for 32 or 3.2 seen; the first method mark could also be gained for 10^{10k}. Some students who were able to confidently tackle the question forgot to give the answer in standard form and left it as 32×10^{10k}, gaining 2 of the 3 marks available, a few who did attempt to put the answer in standard form gave the answer as 3.2×10^{11k}. Some candidates felt that their calculators could provide the answer, but were confounded by the presence of *k*.

Summary

Based on their performance of this paper, students are offered the following advice.

They should:

- Annotate diagrams carefully – method marks may often be gained for correctly labelling angles or for working on graphs such as cumulative frequency graphs.
- Show all the stages in working, realising that if the question states this then they may gain no marks unless they do so.
- Show clear algebraic working when required to do so.
- Read questions very carefully, not making assumptions before doing so.
- Check that they have transferred answers shown in the working correctly to the answer line, especially the inclusion of any minus signs.
- Use calculators effectively making use of the fraction button or brackets to ensure values are calculated accurately.
- Learn the intersecting chord theorem.

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