Examiners' Report/
Principal Examiner Feedback

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Pearson Edexcel International GCSE
Mathematics A (4MA0)
Paper 3H

Pearson Edexcel Certificate
Mathematics A (KMA0)
Paper 3H

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Students who were well prepared for this paper were able to make a good attempt at all questions. However, it was clear that there were some students who would likely have been better off taking the Foundation tier paper.

Students should be reminded to retain full accuracy when working through multi-step calculations.

When questions require that students 'show clear algebraic working' or 'show each stage of working clearly' it is essential that these instructions are adhered to. Failure to do so can result in no marks being awarded even when a correct answer is given. In particular, when using the quadratic formula to solve a quadratic equation, substitution into the quadratic formula should be shown.

1 The vast majority of students gained full marks in this question. Those who worked with the unitary method in part (a) frequently rounded prematurely (from 800 ÷ 6) and therefore gave an inaccurate final answer. Part (b) proved slightly more demanding with the common error being to work with the scale factor $\frac{300}{450}$ rather than the correct $\frac{450}{300}$. Some candidates showed the correct answer in working (50 x 9 = 450) but then put 50 on the answer line.

2 It was disappointing to see so many students on a higher tier paper fail to find the correct duration between 9:30 and 11:15, many trying to subtract and concluding the difference was 1.85. Equally disappointing, from those who did find the correct duration, was the use of 1.45 rather than the correct 1.75 when calculating the speed. A significant number of students failed to consider the units of their answer, working out the speed in km/minutes rather than in km/h. This error was also indicative of students failing to consider the reasonableness of their answer; students would be well advised to look back at the context of the question and consider if their answer is a sensible one.

3 The requirement to show full working in this type of question is a standard feature on iGCSE papers. The majority of students do show all stages in their working but there are still some who miss out vital steps. The most common method was to multiply by the reciprocal of the second fraction but, increasingly popular, was to write the two given fractions as equivalent fractions with a common denominator and then divide the numerators. It is important to show any cancelling – not just write the cancelled answer. Candidates who tried to use decimals gained no credit.

4 Part(a) and (b) were generally well done; common incorrect answers were $25r$ and $15(r + 10)$ in (a) and y^{14} and $2y^9$ in (b). Part (c) showed a variety of responses apart from the correct one - common were $x^2 - x + 5x - 5 = x^2 - 4x - 5$ or $x^2 - 6x - 5$ as well as $x^2 - x + 5x + 4$. Many candidates scored at least 1 mark for part (d), with a mark commonly lost by failing to cancel the numerical terms correctly, if at all.

5 The common error in part (a) was to give the frequency (14) rather than the class interval. Whilst many correct solutions were seen in part (b) the common error was to find the sum of the frequencies and divide by the number of classes (40 ÷ 5) giving an

answer of 8 which close inspection of the frequencies in the table should have revealed was not the mean. This also holds true for those candidates who worked out 605 ÷ 5. Students who did show that they understood the correct processes involved in finding the mean from a grouped frequency table sometimes used the wrong mid interval values for the class 5 – 9 and 15 – 19 (7.5 and 17.5 rather than 7 and 17 respectively). Several candidates used the end value of the interval rather than the mid-point and a significant number multiplied each frequency by 4 instead of the mid-class value. The correct answer was very common in part (c) but a significant number of students found 14% of 40 rather than changing 14 out of 40 into a percentage.

6 Those students who understood how to construct a perpendicular bisector generally gained full marks. However, there were a small minority of candidates who, having drawn in construction arcs then forgot to complete the process and draw in the perpendicular bisector. Another response often seen was to construct, usually above the line *AB*, only one pair of intersecting arcs and then draw a line from this intersection down to *AB*. For full marks, both pairs of construction arcs must be present.

7 In part (a) the most common incorrect answer was the set $A \cap B$. In part (b) 4,5 or 7,8,9,10 were frequently seen as incomplete answers that were worthy of the award of one mark. Some candidates simply wrote 4 numbers or omitted this part completely indicating a lack of familiarity with set notation.

8. The majority of students gained a mark for expanding the bracket on the left hand side of the question correctly. From then onwards, there were frequently errors in either the algebraic manipulation or the subsequent arithmetic. When the solution to an equation is a fraction, students would be well advised to give the answer as a fraction. Those who attempted to give the answer as a decimal, without first giving the answer as a fraction, frequently went straight to −1.5 which was insufficiently accurate which meant the final accuracy mark could not be awarded.

9 Despite the presence of the formula for the volume of a cylinder being clearly identified on the formula sheet, some candidates selected the formula for the curved surface area of a cylinder. Others copied down the correct formula but then failed to substitute correctly with 5.4 rather than 5.4^2 being the most common error seen. In part (b) significant numbers of candidates misunderstood the question and, rather than give the upper bound in (i), gave the diameter. From those who did understand the requirement to find the upper bound, 5.44 was a common incorrect answer. There was a slightly higher success rate in part (ii).

10 The correct line was seen more often than not in part (a), frequently drawn from a table of values. Some students still plot all the points from their table and then omit to join these with a straight line. In part (b) the required lines were frequently confused with $x = 2$ and $y = 3$ drawn rather than $x = 3$ and $y = 2$. Some students attempted to just draw a region without first drawing the lines $x = 3$ and $y = 2$; it is good practice to first draw all lines given before attempting to identify the region. It is also imperative that students do make their chosen region clear.

11 A significant number of students simply applied Pythagoras's Theorem to find the length of the hypotenuse and gave that as their answer for the required angle. A small minority of these students did then go on and use their value for the hypotenuse with the Sine Rule or a different trigonometric function to find angle *ACB*. It was disappointing to see so many students identify that they needed to use tan in the given

triangle but then fail to identify the opposite and adjacent sides correctly. Frequently the value of tan was given as the size of the angle.

12 Many students were able to carry out the first step of expanding the brackets correctly but then unable to make any further progress. Those that could manipulate algebra correctly generally went on to gain full marks although a few lost accuracy by changing to decimals rather than sticking with a fraction for the final answer.

13 It was very common to see the range, rather than the interquartile range, given as an answer in part (a). Some students remembered that they had to use ¾ and ¼ to generate an answer but went on to find these fractions of 20 (the largest value in the list), or of 175 (the sum of the numbers in the list). A significant number of candidates failed to re-order the list of numbers. Many were able to give a correct response in part (b) but, equally, there were many students who missed the point completely. Many also stated that a higher interquartile range led to more consistency. It was evident that many students do not understand the meaning of interquartile range. Correct responses in part (c) generally referred to two of the (new) scores being above the median and two below. Some students did show that the median of the new scores was also 17. Others misinterpreted the scores given in part (c) and tried to fashion their response around these values added into the list in part (a) – a completely wrong approach.

14 In part (a) there was clear evidence of some students misreading this question and so giving the total amount of interest earned rather than the value of the investment after 4 years. It was disappointing to see a significant number of students using a 'build up' method to find 4.5% and 2.75% rather than using their calculator efficiently. Several candidates appeared to use a % key on their calculator and write down their results without showing the method. In these cases inaccuracy led to loss of method marks. Whilst many students did use multipliers and so an efficient method there were a significant number of students who worked out the interest gained each year as a separate calculation; the latter method frequently resulted in a loss of accuracy in the final answer. One common error was to find the interest for one year of 4.5% from investing £8000 , then find the compound interest for investing £8000 for 3 years at 2.75% and then add together either the two total amounts or the two lots of interest. Another common error was to use the wrong scale factors, for example, 1.45 or 1.0045 instead of the correct 1.045

In part (b) the candidature was split between those who recognised the problem as a reverse percentage and so divided by 1.02 and those who employed the incorrect method of decreasing the given amount by 2%. A few students did employ the correct method of solution but with the wrong multiplier, usually 1.2 Some multiplied by 1.02 rather than dividing.

15 From this point onwards in the paper there was a noticeable number of blank responses. Part (a) was generally correct. Students found part (b) far more demanding with only the brightest able to make inroads into the question. Those that did realise the importance of the values 5 and 13 sometimes gave just those as their answer rather than the range of the possible values. It was disappointing in part (c) to see far too many able students fail to use the scales on the axes correctly; too many times the gradient was given as $\frac{8}{10}$ from counting squares rather than $\frac{8}{1}$ from using the scales correctly. Many students did not realise that, in order to find an estimate for the gradient of the curve at a point, it is necessary to first draw a tangent. Part (d) was well done (although a significant number wrote the answer as $x \leq -1$). In part (e) many

were able to work out the value of g(−3) but were then unable to make further progress.

16 The most common error from those who were able to gain some marks in this question was to fail to consider both values of the square root of 9 and so just give $x < 3$ as the answer. A small number who did find +3 and -3 wrote the answer incorrectly as x<-3 and x<3. Many could not isolate the x^2 term correctly going from $5x^2 = 45$ to $x^2 = \frac{45}{25}$ or $5x = \sqrt{45}$

17 In part (a) the 48^o was frequently given for the answer to (i) along with the popular incorrect reasons of 'alternate angles', 'corresponding angles' and 'angles in the same segment are equal'. Many of those who did realise that the correct answer was 96^o were unable to give a sufficiently detailed reason; an answer such as 'it is double 48^o' was insufficient. A number of candidates used words like 'edge' rather than circumference and therefore lost the mark for the reason.

Few students spotted the link, using the alternate segment theorem, between angle *ATS* and angle *RQT*. Several students did get as far as showing that angle $SRT = 47^o$ following the use of opposite angles in a cyclic quadrilateral sum to 180^o but were then unable to make the link to angle *ATS* using the alternate segment theorem. Many students made the assumption that triangle *RQT* was isosceles or that angle *SRQ* or angle *STQ* was a right angle.

18 Whilst many students realised that they needed to find the gradient of each line in order to answer the question, errors in finding the gradient of both lines were seen very frequently. The gradient of the line through *A* and *B* was often seen as $\frac{3}{4}$ rather than the correct $\frac{4}{3}$; those that did divide the increase in *y* by the increase in *x* sometimes got the coordinate values confused or made arithmetical errors. A sketch of both graphs on the same axes was sometimes seen but this was often not sufficiently accurate to be able to be of any use in reaching the correct conclusion.

19 A very common error was to write $3r^2$ rather than $(3r)^2$ when substituting $3r$ for the radius in the formula for the volume of a cone and several ignored the information that radius of cone was 3 times radius of sphere or incorrectly substituted $3r$ as the radius of the sphere rather than the cone. Some candidates made no error with the algebra but gave *h* in terms of the radius or substituted $3r$ into the formula for the volume of the sphere.

20 The most common error seen in this question was to substitute the given values into the formula $\frac{1}{2}absinC$. Others tried to use Pythagoras's theorem to find the missing side of the triangle, incorrectly assuming that the triangle was right-angled. Some students did recognise that the most efficient first step was to calculate the value of angle *BAC* but, having done that successfully, often stopped at that point or used their value in $\frac{1}{2}absinC$ rather than the value for angle *ABC*.

21 Very few fully correct answers to this question were seen. The majority of candidates were able to pick up the first mark in this question for using $P(x') = 1 – P(x)$. Some of these candidates then scored a second mark by finding the total probability of being late on one day, but then incorrectly added this number to itself . Very few got further than working out the probability of being late once from $0.7 \times 0.1 + 0.3\times 0.05 = 0.085$. Many of these then followed up with 2×0.085 for a final answer. Some used the inefficient method of drawing out a full four-stage tree diagram and adding all 12 of the possible combinations whilst others employed the much more efficient method of subtracting the probability of being on time both days from 1.

22 It was disappointing that, having formed a correct equation, a significant number of students then expanded $(x – 14)^2$ incorrectly to give $x^2 – 196$. Those that managed this expansion correctly generally then went on to gain full marks. An error of a similar ilk was to go from $x+\sqrt{12^2-x^2}=14$ to $x^2+12^2-x^2=14^2$.

23 Having found two relevant vectors, some students left it at that rather than finishing with an appropriate conclusion. Some could find vector OP or vector PA and quite a few could find vector AB - then things often became very confused.

Summary

Based on their performance on this paper, students should:

- read each question carefully, preferably referring back to the question when the answer has been found to ensure that the answer given does answer the question set
- use fractions not decimals when working in algebra
- ensure that full accuracy is maintained throughout multi-step calculations, only rounding the final answer
- ensure that correct geometric reasons when required
- show the method used when using a calculator to find percentages.

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