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Examiners' Report/ Principal Examiner Feedback

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

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Introduction

This paper proved to be accessible to most students, allowing them to demonstrate their ability across the assessment criteria. They often failed to score marks on the similarity and differentiation questions and some struggled with set notation. Many students demonstrated excellent algebraic skills and also an ability to use their calculator competently.

Report on Individual Questions

Question 1

This only caused a problem to a small proportion of students. There was the occasional rounding error and attempt at estimating by rounding each number.

Question 2

Most students were able to factorise $18c - 27$ in part (a) although some only offered a partial factorisation, usually $3(6c - 9)$, although those unfamiliar with the topics attempted to subtract 27 from $18c$ getting $-9c$. In part (b), many gained one mark, finding 4 correct terms, but then lost the accuracy mark by simplifying incorrectly. Others found the terms required but made sign errors.

Question 3

The relatively small number of students who lost marks in part (a) often did so because they either thought the transformation was a reflection in the line $x = 1$or because they attempted to describe it as a translation followed by a rotation. Some referred to a mirror line rather than reflection. In part (b), students were usually able to enlarge shape **P** with scale factor 3 but marks were frequently lost for using a different centre of enlargement. Likewise in part (c), it was quite common for students to rotate **R** about the origin or another centre.

Question 4

A large proportion of students achieved full marks in part (a). Similarly, part (b)(i) was answered well although occasionally 40 was multiplied by 0.5 or 0.05 rather than 0.15. Part (b)(ii) was more challenging with some students finding an estimate for the total number of prizes won rather than the total value of the prizes won.

Question 5

Marks were rarely lost in part (a) although occasionally students used an incorrect formula. In part (b), there was a good awareness that Pythagoras' Theorem was required and only a small proportion used it incorrectly, usually by adding the squared numbers.

Question 6

Most students were able to use repeated division or a factor tree in part (a) to express 600 as a product of powers of its prime factors, which without working, gained no credit. Some, though, only expressed their answer as a product of prime factors which failed to answer the question as set. Others made numerical errors but were often able to gain method marks. In part (b), most students simplified $5^2 \times 5$ first before dividing 5^{12} by their 5^3. A small number tried to write $\frac{5^{12}}{5^2 \times 5}$ as an ordinary numbers which gained no credit.

Question 7

Almost all students were able to solve e – 2 < 0 in part (a). Part (b) was also answered well although some students didn't change the inequality sign when dividing by –3. A small number gave their answer in part (c) as an inequality although most who gave an integer did so correctly.

Question 8

Expressing 163 as a percentage of 683 did not pose a problem to most students in part (a), although a few did attempt to find the percentage increase from 163 to 683. In part (b), some students found 17.6% of 1028 rather than increasing 1028 by 17.6%. Working such as 1028 × (100 + 17.6)% was seen on a number of occasions but this alone did not gain credit. Likewise in part (c), (100 + 87.6)% × x = 1028 was seen, which was enough for a method mark. Many students didn't appreciate that the population in 2001 represented 187.6% and so were not likely to gain any marks.

Question 9

Part (a) was generally answered quite well although some students subtracted the coordinates, rather than adding them, before dividing by 2. In part (b), those who were aware how to calculate the gradient of the line *AB* sometimes made errors with the negative coordinates. For example, rather than evaluate $\frac{2--1}{0--4}$, some worked out $\frac{2-1}{0-4}$. Others gained no marks for $\frac{0--4}{2--1}$. To gain M1 in part (c), it was necessary to be able to write down a partially correct equation of the line. Some students did not immediately realise that the y-intercept was 2 and instead substituted values of x and y from either point A or B into $y = mx + c$ to derive it. Others used $y - y_1 = m(x - x_1)$ to find their equation.

Question 10

There were very few incorrect responses in part (a). In part (b), a number of methods were used, including the sine and cosine rules. Students using one of these methods were more likely to make errors than those who used standard trigonometry.

Question 11

Most students were able to correctly solve the simultaneous equations and did so by adding the two equations together. Some chose a less efficient method and were more likely to make an arithmetic error. Students who found the correct values of c and d failed to gain any marks if they showed incorrect or no working or used a trial and improvement approach.

Question 12

The first method mark was accessible to almost all students. However, it was more challenging to score the other two marks. Some didn't appreciate the need to either factorise or use the quadratic formula. Most students who did have this appreciation were then able to score at least two and often full three marks.

Question 13

Many students scored one mark part (a) for either 64 or h^2 but not both. Responses such as $4h^2$ and $64h$ were seen but $64h^2$ proved a step too far for many. In part (b), students were able to score if they at least showed an appreciation that $\sqrt{a} = a^{\frac{1}{2}}$ or $\sqrt[3]{a^2} = a^{\frac{2}{3}}$. This proved to be a challenging question for many students.

Question 14

This was a standard cumulative frequency question. Many were able to correctly draw the graph in part (a) although some lost a mark for using the midpoints of the groups. A small number plotted their points at (170, 9), (180, 35), (190, 68) which gained no credit because the points need to be plotted consistently within each group. In part (b), those who drew a correct graph usually scored both marks. This was not always the case for students whose graph was not fully correct.

Question 15

In part (a), some students took the vertical height of the cone to be the slant length and so were unable to gain any marks. Those who realised there was a need to use Pythagoras' theorem usually continued to score full marks. Part (b) proved to be inaccessible to a large proportion of students. Without realising the sides of small and large cones were in the same proportion it was unlikely that progress could be made. The few that did appreciate this usually then went on to score all three marks. Many students didn't grasp that part (c) related to differentiation. Those who did were usually able to score well because the terms were easily differentiated.

Question 16

Part (a) was accessible to almost all students and only a few failed to answer it correctly. Not everyone understood the meaning of the domain of a function and answers such as $x = 0$ and $x > 1$ were seen in part (b). Those who knew how to find the inverse of a function sometimes found the algebraic techniques required too challenging in part (c), particularly collecting like terms in order to factorise. Such students usually scored one mark for getting as far as, for example, $x(y - 1) = 2y$. Part (d) highlighted that many were unaware that the domain of a function is the same as the range of its inverse.

Question 17

This question highlighted that many students did not fully understand set notation. Although most were able to complete the Venn diagram in part (a), a variety of responses were seen in parts (b) – (d). Many confused union with intersection and some listed the members when they were being asked to find the number of elements in a set and vice versa.

Question 18

A good proportion of students were able to answer part (a) and (b) correctly, although in (a), a significant number wrote 0.7 and 0.3 without multiplying them together. Part (c) proved to be more challenging but was accessible to those aiming for a high grade. Some only scored one mark because they didn't consider all of the ways that the total of the numbers on the two tiles could equal two.

Question 19

Parts (a) and (b) weren't answered well by a large number of students. Some didn't appreciate the vector that **b** represented. Others didn't mark their line with an arrow to define the vectors $\overrightarrow{PQ}$ and $\overrightarrow{PR}$. Part (c) was answered well but (d) was more challenging. Many gained one mark for finding $\overrightarrow{MP}$ or $\overrightarrow{PN}$ but were not always able to continue correctly in order to derive $\overrightarrow{MN}$.

Summary

- Students should be made aware of the need to show method when solving a quadratic equation by either factorising or using the quadratic formula.
- Some students were unaware that the inequality sign should be reversed when dividing both sides by a negative number.
- Students often didn't show enough method for 'show that' questions. For such questions, the emphasis is on them to clearly demonstrate how they derive their answer.
- Many students didn't have a grasp of set theory terminology.
- For probability questions, students should take care to note whether selections are being made with or without replacement.

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