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Principal Examiner Feedback

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Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Non-Calculator) Paper 1H

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GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 1

Introduction

Many candidates had been coached well for the examination and were able to carry out standard techniques with accuracy. Answers to QWC (Quality of Written Communication) questions generally showed enough working to allow the award of communication marks.
The standard of arithmetic was very poor. This was manifest in the lack of basic techniques especially with the 4 rules. Specific examples are given in the reports on the individual questions given below. In many cases, the level of presentation and of organisation of working left a lot to be desired and made it difficult for the marker (and the candidate) to work out the logic of the response.

Reports on Individual Questions

Question 1

Part (a) was found to be straightforward by the majority of the entry. Of the rest, there were some who first found a common denominator and then tried to multiply numerators together and denominators together, which, if correct, would gain the one mark available. More often the 'common' denominator was left as that and the numerators multiplied together. There were many cases of $2 \times 1 = 3$

In part (b) candidates were expected to find a suitable common denominator (invariably 15 for those who knew what to do). There were a surprising number of candidates who subtracted numerators and denominators to get, for example, $\frac{2}{2}$ or who found the correct common denominator but did not change the numerators. A small number of candidates added instead of subtracted - they lost the accuracy mark.

Question 2

This was well answered. Very few candidates were unable to show they understood what they had to do. There was a substantial number who lost a mark because they omitted a value (usually in the twenty row). Presumably they had not counted the entries in the table and compared with the twenty numbers in the list at the top. Most candidates gave a sensible key, often without units, but some lost a mark because they wrote 'children' as the units, which is clearly wrong.

Question 3

There were many correct answers to this question. Candidates who designed and completed a two-way table were generally successful in gaining all 4 marks. Others were less so as they often lacked the organising principle already built in to the table. They generally started off confidently by finding the number of males (29) or the number of females who play squash (2). Subsequent calculations were then often confused as candidates could not keep track of what it was they were actually working out. In particular, they wrote down their calculations without making it clear (e.g. 2GSq would have done) what they were actually finding. There were too many cases of 50 – 21 = 19 seen.

Question 4

From a functional maths point of view, very many candidates showed they cannot tackle such a task as this one successfully. Generally, finding one third of £24 was no problem, although a minority of candidates thought that finding 30% would do or gave the wrong value for 24 ÷ 3. Similarly, many candidates were successful in finding 60% of £12 or £24, usually by dividing by 10 and multiplying by 6. However, although the mathematical techniques were carried out competently, there was an enormous lack of attention on what to do with the two figures already calculated. A very common error at this stage was to work out the sum of the discounts. Less common, but still frequent, was to added the adult discounted price to the discount for the children. This lost half the marks for the question. The common parlance of 'off of ' does not help students in this! A significant number worked out the cost for 1 adult and 1 child and many left the otherwise correct answer as £25.6.

Question 5

Candidates were often fully successful in answering this question. The vast majority remembered to put in a time frame and suitable sets of response boxes were very often seen. A common error was for one pair of response boxes to have a figure in common - for example 2-4 followed by 4 - 6 with all other boxes being correct. This lost a mark. Other candidates did not include a zero. A few candidates did not read the question carefully enough and wrote the question 'How many books do you read each week?'. The use of inequality signs was thankfully rare.

Question 6

In part (a) too many candidates could not carry out this simple expansion correctly. There were many responses of the form $2m^2 + 6$ or worse.

Part (b) also proved to be a challenge for many candidates. A few candidates could carry out a correct partial factorisation. A common error was $3xy(xy - 2)$, presumably displaying a misunderstanding of the interpretation of x^2y^2 as against xy^2. There were, of course, many candidates who gained both marks.

Question 7

Most candidates realised that they were expected to display suitable working out and declare their answer in a clear form. The vast majority of candidates proceeded by working out the area of the L shaped field. This was generally done successfully by dividing the shape into 2 parts, calculating those areas and summing them. Area by subtraction was very rare. Thankfully there were few perimeters found on this paper. However, a common error was to ignore the overlap between the 16 by 6 and the 10 by 7 rectangles so getting an area of 166 m^2. Once the area had been found, most candidates demonstrated in some form that they had to find how many times 36 goes into 124. This was sometimes done by division, but often by counting up in 36s until 108 was reached. Some candidates displayed their lack of arithmetical skills by failing to do this accurately - for example 36, 62, 98. Candidates who tried to draw out areas of $36m^2$ on the diagram were rarely successful.

Question 8

Very many candidates were able to get full marks on this question. Many others were able to score at least 1 mark - either by a suitable straight line at the right distance from the given shaded region or from the arc of a circle drawn correctly. Some candidates lost a mark because they did not draw a complete arc that met the rectangle.

Question 9

Candidates were often successful in both parts, although with greater success on part (a) than on part (b). A few candidates rotated the figure in part (a) through 180^o about the wrong centre (for example, a bottom corner of the trapezium). A small minority just plotted the 4 vertices giving no indication about whether they understood that rotations preserve shape. Part (b) proved more of a challenge for weaker candidates. The two main errors were - the correct size and orientation, but not with *O* as the centre, and the correct centre but the wrong scale factor (usually 2, less often 4). Many candidates interpreted ‘centre of enlargement’ to mean that the bottom vertex of the enlarged triangle had to be anchored at the origin. Candidates who drew a shape 3 times the size but in the wrong orientation did not score any marks.

Question 10

Most candidates knew that they had to find the price of equal quantities of milk. This was often unit prices, but also the price of 2 pints or 6 pints or 12 pints. However, this was one of the questions in which many candidates displayed a woeful lack of numerical ability. One common and sensible way to tackle the problem was to work out unit prices for the 4 pint and the 6 pint containers. This involved working out 1.18 (or 118) ÷ 4 and 1.74 (or 174) ÷ 6. There were too many cases where the divisions were completely incorrect and many cases where candidates could not deal correctly with the case 1.18 ÷ 4. Commonly, the answer was given as 29.2 from the remainder of 2, rather than the correct 29.5. Another error was to divide 1.74 by 2 then by 2 then by 2 presumably in (mistaken) analogy to dividing by 4. There was also evidence of candidates being unable to multiply decimals - for example 1.18 × 6 or 1.74 × 4 were often done by repeated addition.

Question 11

Candidates attempts generally fell into three groups.

(a) Those who worked out 360 ÷ 5 or 540 ÷ 5 and were able to identify that they were finding the exterior angle or interior angle respectively. They generally went on to score all 3 marks.

(b) Those who worked out 360 ÷ 5 or 540 ÷ 5 but were confused over which angle they had worked out - they generally scored 0 marks as the mark scheme was such that if it was clear they had confused interior and exterior, then they got 0 marks.

(c) Those who had little idea - too commonly thinking that the interior angles were 60^{o} for example. They invariably scored 0 marks.

Once again, some candidates lost marks because of numerical weaknesses. In this question this was often an error of the form 360 ÷ 5 = 62, for example.
It was pleasing to see some candidates giving reasons at each stage of their calculation.

Question 12

In part (a) most candidates were able to substitute the given value correctly into the formula. After that, there were many problems as a result of weakness with basic numerical techniques - firstly some candidates tried to expand the brackets but quite often did this wrongly by multiplying the 5 by the 77 only and leaving 32. Others worked out 77 - 32 and got the wrong answer whilst others did get the right answer but could not multiply accurately by 5. In addition, for those that got the correct numerator of 225 many could not even begin to divide by 9. Those that did get to the correct answer of 25 almost invariably made the correct conclusion. It was rare to see candidates who got to $\frac{5\times 45}{9}$ carry out the division first, so simplifying the calculation.

In part (b), the most common error from those candidates who understood what they had to do, was mismanagement of the 32 term with answers of the form $F=\frac{9C+32}{5}$ often seen.

Candidates should write out every single step when rearranging a formula. The mark scheme is designed to reward those who show a sequence of logical, algebraically correct processes.
There were a few flow chart attempts - these had to be correct the *F* to *C* way and then display that the order of operations had to be reversed as well as each operation being replaced by its inverse. Full marks were only given when the flowchart was correct and translated back into a correct algebraic formula.

Question 13

The key word in this question which very many candidates overlooked was 'estimate'. Unless there was an approximation done somewhere in the process to get to the answer full marks could not be achieved. Many candidates tried to calculate will the full figures – their working tended to be confused and their presentation so disorganised that it was not possible for markers to follow it. Candidate attempts tended to fall into two groups:

(a) Calculate the number of seconds in one day (86400) and then divide by 2014 (or 2000)

(b) Divide 2014 by 60 to find how many minutes there are between prizes (about 33) and then either work out how many prizes roughly this meant per hour or divide the number of minutes in a day by 33 (or 30)

The first method was bedevilled by awful arithmetic - a common error being $60 \times 60 = 1200$ to start off with. Very few candidates started with the calculation $60 \times 60 \times 20$ and went on to divide the answer by 2000 which is possibly the most direct way. It was disappointing to see candidates who clearly had a good grasp of what they were doing carry out such calculations as
$86000 \div 2000 = 43000$ (or 430 or 4300)
The second method generally worked well especially for those who realised that 33 minutes can be approximated by half an hour so a good approximation to the number of prizes is to double 24.

Question 14

Few candidates knew the correct conversion despite this being stated as required knowledge in the specification. Of those that knew the 5 miles = 8 km conversion, most could then carry out the rest of the calculation correctly to get full marks. A few impressive candidates knew that 50 mph was the same speed as 80 kph and were able to complete the question very succinctly. A few candidates did not use a sufficiently accurate conversion but still gained some of the marks. These candidates generally used 1 mile = 1.5 km. If they used this conversion correctly then they were awarded 2 marks for the question. Most candidates had no idea of the equivalence and either ignored the fact there were different units to get an answer of a little over 9 hours or made a conversion by multiplying by 10 or 100.

Once again, there was evidence of poor numerical skills with the division by 50 causing problems. There was, for example, little sign of cancelling the 0s or of doubling the 480 and the 50 when working out $480 \div 50$ and very often an answer was attempted by using some sort of build up method.

Question 15

The values of y corresponding to positive values of x were generally worked out correctly. There was less success with the negative values, especially the value of y at $= -1$. In part (b) values were generally plotted accurately and the points joined with a smooth curve, although the occasional set of straight line segments was also seen. Part (c) proved beyond most candidates. Correct solutions were split between those who connected up the whole question and drew the straight line with equation $y = x + 3$. They were then able to pick out the required values of x for the two marks. Other candidates restarted, rearranged the equation and solved it, usually by factorisation. If the two values of x were given then the marks were awarded. Some candidates spotted that $x = 4$ satisfies the original equation, but without any of the two approaches shown they did not score any marks.

Question 16

In part (a) candidates were expected to read off the values of the upper and lower quartiles from the box plot and then to subtract. The standard of subtraction was very poor with 5.6 – 4.85 often been worked out as 0.85. Even worse, it was sometimes worked out as 1.25. Of course, many candidates did not get that far and commonly worked out the range. Reading off the scale was also a challenge for many students.

Part (b) was a problem for those candidates who did not have a grasp of the meaning of the quartiles and that the upper quartile essentially divides off the upper 25% of the population. Some candidates had some idea but worked it out as the upper 75%.

In part (c), candidates only scored a mark if they referred to a meaningful statistic from both the distributions and made a comparison. For many candidates this comparison naturally involved the median. A second comparison had to come from a measure of dispersion in keeping with practice from previous examinations. Candidates could compare the range or the interquartile range. For full marks one of the comparisons had to be in context (rather than as an interpretation) so a reference to distance ran, for example, was expected. Many candidates were unable to abstract meaningful statistics from the box plots and resorted to vague answers such as ‘ they ran further in the first half than in the second half’ which, of course, scored 0 marks. Answers which just referred to maximum and/or minimum values were not awarded any marks.

Question 17

Parts (a) and (b) were essentially knowledge based For part (b) a few candidates left their answer as $\frac{1}{10^2}$. This was not awarded the mark.

For part (c), candidates were expected to adopt one of two strategies. The first was to reduce each of the given numbers to an ordinary number and them compare sizes. If a candidate did the conversion correctly for at least 1 number, they were awarded the method mark. The second strategy, much more rarely seen, was to write each number in standard form. If a conversion was done correctly for at least one number then the method mark was awarded.

Many candidates, however, did not show what they had done and went straight to writing down the 4 given numbers.

Question 18

This was a standard simultaneous equation question which was, for some candidates a single step to eliminate one of the variables. Most candidates who had an idea of what to do multiplied the first equation by 3 and added. Those that subtracted were not awarded any marks. Others multiplied the second equation by 4 and subtracted. Those that added were not awarded any marks. In fact, elimination rather than substitution was the overwhelmingly commonly seen approach. Often, the elimination was carried out incorrectly with the difference between $12x$ and $-x$ being found as $11x$, for example.

Once again, arithmetical weakness meant that candidates were losing marks. Typical errors included:

- Getting to $13x = 91$ and failing to go any further
- Working out the difference between 64 and 25 and getting 41

It was a pleasure to see some candidates properly checking their solution.

Question 19

Candidates were expected to show how they could find the gradient of the given line by using a variant of rise ÷ run. Many candidates were unable to do this and had no idea of what a gradient is. Some candidates were able to give the correct gradient for the given line L_1, but then gave a different coefficient of x for L_2 . Candidates were much more confident in assigning the value of -5 to c in $y = mx + c$.

Question 20

This question was seen by candidates often successfully as one about similarity in context. Candidates were expected to find a suitable scale factor, for example, 1.5, or to do some work on equating ratios of corresponding sides. They had to write their equation in a form which enabled them to rearrange to find the unknown side if they did use ratios before they were awarded marks.

A few candidates realised that they could turn the sheet through a right angle with respect to the photo. This was accommodated in the mark scheme.

There were many attempts to equate areas in some form. These scored no marks unless there was a reference to the square of the scale factor, for example.

Question 21

There were a variety of methods to complete this problem with its complex configuration. The most common successful approach was to calculate the reflex angle *BOD* and the angle at the circumference *BCD*, then use the angle sum of a quadrilateral together with angle *OBC* = 15°. Other approaches were rare. They included using the alternate segment theorem (although often wrongly applied), or using angle *BOC* = 150° and angle *BOD* = 140° followed by using angles round the point *O* and a suitable isosceles triangle.

In many cases candidates wrote down figures but did not relate them to the angles found. In this case the marks could often not be awarded unless the 55° was given as the answer. Many candidates sensibly put values of angles on the diagram and these were accepted as evidence of correct processes.

Question 22

In part (a) candidates who had an inkling of what to do, generally scored at least 1 mark. The most common errors were shown with the coefficient with values 3, 9 and even 81 commonly seen as well as $3x^6 27y^{12}$ and other variants.

Part (b) proved to be a challenge despite the question being solely one of standard techniques – factorise both numerator and denominator and then cancel any common factors. In very many cases candidates did not do this and so scored 0 marks. For those candidates that spotted the obvious difference of two squares many sensibly used what they had found to help them find the factors of the denominator. Sometimes the common factor was misidentified as (x– 3) instead of (x + 3) and so gave the wrong factorisation as (2x +1)(x – 3) A few candidates spoilt their good work by trying to cancel their answer of $\frac{x-3}{2x-1}$

Question 23

This was selection without replacement and many candidates did not appreciate this. Common responses were to put repeats of the first set of branches on the second set of branches. Some candidates used denominators of 8 on the second branches and a few had the correct fractions but on the wrong branches – typically on the bottom second pair.

For part (b), candidates were expected to use the probabilities they found in (a). Candidates were awarded a mark for identifying at least one correct case and multiplying appropriate probabilities. Commonly one of the three cases was left out. This was sometimes the Yellow/Yellow case where candidates may have misinterpreted 'at least' and sometimes one of the Red/Yellow cases. Again, there was some evidence of poor arithmetic, but less strong in that most candidates who knew what to do could also multiply fractions correctly.

A minority of candidates solved the problem by using the complementary event. These were generally successful.

In both cases some candidates wrote what would be correct answers for compound events at the end the second branches of their tree diagram. These were not acknowledged for part (b) unless they were clearly indicated by the candidate that they were to be used in part (b).

Question 24

Candidates who had some idea of how to find the vectors $\overrightarrow{MN}$ and $\overrightarrow{AB}$ in terms of **m** and **n**, generally scored at least two of the three marks. The third mark was to give a reason based on the forms for $\overrightarrow{MN}$ and $\overrightarrow{AB}$ of why the two lines are parallel. Generally candidates earned the final mark by stating that 2**n** – 2**m** was a multiple of **n** – **m.** In general, notation was poor, with arrows above vectors rarely shown and with underling of **m** and **n** usually absent.
Some candidates did not read the information carefully enough and found that $\overrightarrow{MN}$ and $\overrightarrow{AB}$ were half the values given in the answer. These candidates could score a maximum of two marks.

Question 25

Part (a) was done correctly by those candidates who understood the standard process of rationalisation. Answers in any correct form, such as $4\sqrt{3}$ or $\sqrt{48}$ were accepted for full marks. If candidates went on to attempt to simply their answer and gave a subsequent incorrect answer then they were not awarded the final A mark.
Some candidates think that they can rationalise the denominator of the fraction by squaring the top and squaring the bottom presumably under a misapprehension that they are dealing with equivalent fractions.

Part (b) required candidates to expand the square – in many cases this proved too much, with many cases of the equivalent of $a^2 + b^2$. The use of $a^2 + 2ab + b^2$ was rarely used even by successful candidates. Some could expand the brackets correctly, but could not see how to simplify their square roots so unsimplified answers such as $10 + 2\sqrt{16}$ were seen. Many went on to 'simplify' wrongly, giving answers such as $10 + \sqrt{32}$

Question 26

The first two parts of the question were basically about how well candidates knew their trigonometric curves. The response was very poor with very few being able to give the correct coordinates. Surprisingly for this target level, there were candidates who gave the correct values, but reversed - for example (0, 180) instead of the correct (180, 0)
The next part of the question was meant to assess how well candidates understood transformations when applied to the cosine curve. Again, correct answers were few and far between as most candidates did not seem to appreciate the basic structure of y = cos x as evidenced by the first part of the question with the sine curve.so were unable to relate the transformed curve to the original one.

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