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Principal Examiner Feedback

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

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GCSE Mathematics 1MA0
Principal Examiner Feedback - Higher Paper 1

Introduction

A significant number of students were unable to access all the marks on the paper- as shown by the number of questions not attempted towards the end of the paper. However, far fewer able students took this paper than previous series, perhaps due to the new rules on re-sits.

Answers to QWC (Quality of Written Communication) questions generally showed enough working to allow the award of communication marks.

The standard of basic arithmetic was generally low. Students often lost marks for errors in single digit multiplications and/or additions- see detailed comments below. Some students did not have the necessary equipment for the construction in question 10.

Report on individual questions

Question 1

Many students were able to score at least 1 mark in this question, usually in part (i), but few were able to score all 3 marks. A significant number of students attempted to evaluate the calculations by long multiplication/division rather than by relocating the positions of the decimal points in the given information. Students should be advised to estimate the values of calculations as a guide to determining the positions of decimal points in given information.

Question 2

This question was not done well. A significant number of students were unable to express 32 out of 80 as a percentage. A common incorrect answer here was $\frac{32}{100}\times 80$. Many of those students who were able to write down the correct calculation for the percentage, ie $\frac{32}{80}\times 100$, were then unable to work this out correctly. A surprising number of students attempted to change $\frac{32}{80}$ to a percentage by adding 20 to both the numerator and the denominator. Some students attempted to work out 32% of 80, usually by employing a multiplication grid or a method of decomposition. Most students adopting a method of decomposition were unsuccessful in their attempts.

Question 3

This question was answered quite well with many students able to produce a correct ordered stem and leaf diagram with an appropriate key. A significant number of students did not know how to deal with the stem. A common incorrect answer for the stem was 8, 9, 1, ie omitting both 10 and 11. Other common errors include not using all 18 of the given heights and, perhaps more significantly, omitting to write down a key.

Question 4

This question was not done well. Few students could write down a correct formula for T in terms of x and y. A significant number of those students having reached the correct formula, $T = 6x + 8y$, then went on to "simplify" this, eg $T = 14xy$. A very common incorrect answer here was $T = x + y$.

Question 5

Many students were able to score at least 1 mark in each part of this question. In part (a), many students were able to rearrange the inequality to the form $6y > 3$ but a surprising number of these were then unable to solve this for y. A common incorrect answer here was $y > 2$

In part (b), many students were able to write down the correct inequality for one side of the solution, eg $x > -3$ or $x \leq 4$, but relatively few were able to do this for both sides of the solution. Common incorrect answers included, eg $-3 > x \geq 4$, $-3 > x \geq 4$, $-3 < x \geq 4$ and $-2, -1, 0, 1, 2, 3, 4$. Some students gave their answer in the form $-3 < n \leq 4$, ie using an n (or some other letter) instead of x, which was accepted. Students should be advised to use the letter of the variable provided in the question rather than make up their own variable.

Question 6

Most students attempted to answer this question by calculating 27 × £5.54, usually by a method of partitioning or by using a grid. A significant number of students were unable to use their chosen methods without error, often making simple errors in multiplications or in the subsequent addition of the various elements of the calculation. Students should be advised to take particular care when dealing with place values, eg in the correct partitioning of 5.54 to 5, 0.5 and 0.04 rather than the incorrect 5, 0.5 and 0.4. Errors in addition were often due to incorrect numbers, or no numbers, carried between columns, or to the incorrect alignment of columns. Some students omitted to include a correct monetary unit with their final answers. The vast majority of students were able to make a correct decision based on the totals they had calculated.

Question 7

Many students were able to score a mark for calculating the area of a relevant rectangle, but relatively few could score all 4 marks. A common incomplete answer here was to work out $8 \times 15 = 120$, generally successfully, subtract this from 138 to get 18, and then divide this by 3 to get 6, but then giving the final answer as 6. Few students attempted a purely algebraic approach. A common incorrect answer involved equating 138 to the perimeter of the shape rather than the area. A significant number of those students attempting to find x by trial and improvement were unsuccessful, often forgetting to check that the total area should equal 138.

Question 8

Few students were able to score full marks on this question, but many scored at least 1 mark. Often students did not identify the angles they were using, either in the diagram or in the working. Some students used ambiguous notation to identify angles, eg angle *BFG* identified as angle *F* in their working. A significant number of students identified angle *BFG* as being equal to angle *BGF*, ie an incorrect application of base angles of an isosceles triangle. When writing down the reasons for their answers, these were often incorrect or incomplete, eg the reason for angle *ABG* equalling angle *BFG* was given as "corresponding angles" and the reason for angle *GFB* equalling angle *FBG* was given as "isosceles triangle". Frequently students did not give all the reasons for their working. A common incorrect answer was to correctly work out angle *BFE* as 115°, but then to write $x = 115^\circ$. Students should be advised to identify the angles they are using in the diagram, or unambiguously in their working, and not to give abbreviated reasons for their working.

Question 9

Part (a) was done well. Most students could identify at least one thing wrong with the question, typically "overlapping intervals" followed by "no units of distance". Common incorrect answers here were "no time frame" and eg "no 4 to 8".

In part (b), most students could write down a suitable question for the questionnaire and gave at least three non-overlapping exhaustive response boxes. Common incorrect answers involved giving inconsistent time frames, eg boxes labelled "daily", "weekly" and "monthly", and incorrect questions, eg "How long does it take you to go to the supermarket each day?". Non-exhaustive response boxes were often due to the omission of a zero option, eg "0 times a week".

Question 10

This question was not done well. Few students could construct the perpendicular from the given point to the line. When drawing the arcs at point *C* centre *A* and centre *B*, students should be advised to draw arcs below the line as well as at point *C*. It was evident that a significant number of students did not use compasses to draw their construction arcs. A common incorrect answer was to draw the perpendicular bisector of the line *AB*.

Question 11

This question was done quite well. Many students were able to work out the monthly payments for the caravan. A significant number of students were unable to calculate 20% of 7000. A common incorrect answer here was "10% = 70, (so) 20% = 140". Students should be advised to show all the stages in calculations of percentages, eg by stating 10% of 7000 = $\frac{10}{100} \times 7000$ etc, rather than simply stating the results of calculations they may do incorrectly their heads. Most of those students who were able to reach the total payment £5400 were then able to divide this by 6 correctly for the final answer, but relatively simple errors in arithmetic were not uncommon, eg 8400 – 3000 evaluated as 4700.

Question 12

Part (a) was done quite well. Many students were able to factorise the given expression correctly. Common incorrect answers here were $8e^2$, $8e^3$, and $3e(e + 5)$. A significant number of students gave their answer in the form $1e(e + 5)$, which was accepted.

In part (b), many students were able to expand the brackets correctly, but relatively few could then go on to solve the equation correctly. Frequently students did not show all the stages in their working by writing down a correct process on both sides of an equation, eg $7k - 21 \underline{+ 21} = 3k - 5 \underline{+ 21}$. A common error here was to expand $7(k - 3)$ as $7k - 3$

In part (c), many students were able to score at least 1 mark for starting to expand the brackets. Often these expansions contained sign or algebraic errors, eg $2x \times x$ worked out as $3x$ and $+3 \times -8$ worked out as -5. A significant number of students having obtained a correct 4 term expression went on to simplify this incorrectly, eg $2x^2 - 16x + 3x - 24$ incorrectly simplified to $2x^2 - 19x - 24$

In part (d), many students were able to write down a correct first stage in solving the algebraic equation, usually by multiplying both side if the equation by 4. A significant number of these were then unable to solve the resulting linear equation, often making a sign error in the calculation, eg $7 - 3f = 8$ incorrectly simplified to $3f = 1$; or by writing the final answer in an incorrect form, eg $\frac{1}{-3}$ or -0.3

Question 13

Part (a) was done quite well. Many students were able to write 180 as a product of prime factors- the use of factor trees being by far the most popular approach. Here, as elsewhere, basic arithmetic was an issue for some students, eg 180 written as 2×60 or as 8×20. A common incorrect answer was to write the prime factors as a list of prime factors rather than as a product of prime factors.

Part (b) was not done so well, though many students were able to get 1 mark for writing two numbers with one of the two required properties, ie as having an HCF of 6 or as having a LCM a multiple of 15. Popular incorrect answers, scoring 1 mark, were 30, 60 and 3, 5.

Question 14

Dealing with the fractions in this question proved to be an issue for many students. A common approach to answering this question was to work out 600 ÷ 4 =150 followed by 4500 ÷ 750 = 6, but then not being able to go any further. Many of those students attempting to work out 4500 ÷ 750 did this by repeated subtraction, often arriving at an incorrect answer of 5 (rather than 6). Some students attempting to work out 150 ÷ 6 did this by ((150 ÷ 2) ÷ 2) ÷ 2, ie by incorrectly dividing by 2 three times.

Question 15

In part (a), most students were able to score 1 mark for drawing a box plot for at least 2 points correct from the lower quartile, the median and the upper quartile. By far the most common error here was to draw the greatest value at 230 (rather than 290). Some students had difficulty interpreting the scale, taking one small square to represent 10 minutes (rather than two small squares).

Part (b) was not done so well. Many students did not explicitly compare the medians or a suitable measure of spread. A common incorrect answer here was eg “Boys spend more time doing homework”. Students should be advised to name the measures they are comparing. Other incorrect answers include the comparison of the greatest values and/or the least values of the distributions, and not giving at least one of the comparisons in context, eg by referring to time in some way.

Question 16

Part (a) was done quite well. Many students were able to draw a correct cumulative frequency diagram for the information given in the table. Common errors were due to misinterpreting the vertical scale, particularly at (40, 138) and (60, 186), plotting points at mid-interval values, and careless drawing of the graph, such that the curve did not pass through all the points. Students should be advised to take more care when drawing cumulative frequency graphs and ensure that these pass through all the plotted points.

In part (b), many students were able to use either their cumulative frequency graphs, or the information given in the table, to comment on the accuracy of the given statement. Most students used the given percentage (10%) to calculate a frequency to compare, ie 20, rather than use a frequency from the table/cumulative frequency graph to calculate a percentage to compare, eg 5%. When reading values from a cumulative frequency graph, students should be advised to show their working by drawing clear lines between the axes of the graph and the graph.

Question 17

Many students were able to score at least 1 mark for calculating the exterior/ interior angle of the octagon or for finding the angle *KFG* (110°) in the hexagon. A common error here was to treat the hexagon as a regular hexagon, or to incorrectly state the sum of the interior angles of the hexagon as 360°. A significant number of students had difficulty in working out 360 ÷ 8 or 1080 ÷ 8.

Question 18

Few students were able to score more than 2 marks in this question. In part (a), most of those students who appreciated that trapezium *ABCD* is an enlargement of trapezium *AEFG*, and stated the scale factor, eg $\frac{18}{12}$, were then able to work out the length of the side *AB* correctly. By far the most common incorrect approach, however, was to work out the difference in the lengths of the sides *BC* and *EF* (to get 6) and add this to the length of *AE* (to get 11). In part (b), relatively few students knew that they were required to use the area scale factor for the enlargement. A common incorrect approach was to increase the area of trapezium *AEFG* by the linear scale factor (to get 54) and then either give this as the final answer, or subtract 36 from this to get an incorrect final of 18. A significant number of those students who appreciated that they needed to use the area scale factor for the calculation were unable to do this correctly, eg by not being able to calculate 1.5 × 1.5 correctly, or by giving the final answer as the total area of the trapezium *ABCD* rather than as the shaded area. A very common incorrect approach was to use the area of a trapezium formula in an attempt to find the areas.

Question 19

In part (a), many students were able to score at least 1 mark for working out 2 or more values in the table. Common errors were to work out 4 ÷ 0.5 as 2 and/or 4 ÷ 8 as 2.

In part (b), most students, having scored at least 1 mark in part (a), were then able to score a mark for correctly plotting 5 or 6 points from their table. A common error here was to join the points with straight line segments rather than with a smooth curve.

Question 20

Few students were able to score full marks on this question. Though many were able to find the radius of the hemisphere and use this to find either the curved surface area of the cylinder or the area of the circular base. Common errors here were to find the volume of the cylinder rather than the curved surface area of the cylinder and/or to omit to include the area of the circular base in the calculation of the total surface area. A significant number of students started their answers correctly by writing a suitable equation for the given information, eg $2\pi r^2 = 32\pi$, but were then unable to solve it correctly for r, often cancelling π on only one side of the equation.

Question 21

Few students scored full marks in this question but many scored 1 mark. Most of these students were able to expand the brackets to obtain 4 terms, but many made errors in dealing with the surds or with the signs. Common errors here were $3\times\sqrt{2}=\sqrt{6}$ and $2\times\sqrt{2}=\sqrt{4}$.

Question 22

Part (a) was done quite well. Many students were able to correctly simplify the given expression. A common incorrect answer here was 0.

In part (b), few students could score the marks for both taking the square root and taking the reciprocal of the expression. A common incorrect answer involved taking the square root of only part of the expression, eg $\frac{8x^6}{5y^2}$, which was not always followed by an attempt to find the reciprocal. Another common error was to incorrectly take the square root by halving both the powers and the coefficients, eg $\frac{32x^3}{12.5y}$, again not always followed by an attempt to find the reciprocal. In part (c), few students were able to score full marks but many scored 2 marks, usually for $\frac{5(x+3)}{(x-3)(x+3)}$. Common errors in simplifying the algebraic fractions were often due to errors in signs and/or to poor or absent bracketing, eg $\frac{5x+15-4x-12}{(x-3)(x+3)}$, or in continuing to "simplifying" a correct expression incorrectly, eg $\frac{x+27}{x^2-9}$ incorrectly cancelled to $\frac{3}{x}$.

Question 23

Few students were able to score full marks in this question but many scored 1 or 2 marks for writing down and adding at least two correct probabilities. Whereas a significant number of students recognised the need to combine the cards to obtain different totals for odd T, relatively few could relate these combinations to the actual process of selecting the cards at random. Most students considered specific odd and/or even totals for T, as shown by methods 1 and 2 in the mark scheme, rather than by considering odd and even numbers with odd/ even totals, as shown by methods 3 and 4 in the mark scheme.

Question 24

Many students were able to find the gradient of the line $2y = 3x - 4$ or the gradient of the line passing through the points A and B, but relatively few were able to find both of these correctly. Correct reasons were often based on examples rather than by a direct appeal to the formula $m_1 \times m_2 = -1$, eg "the gradient of the line perpendicular to $2y = 3x - 4$ has to be $-\frac{2}{3}$ not $-\frac{4}{3}$". Students should be advised to show their methods clearly, eg by quoting a suitable general formula for calculating gradients, before attempting to use it.

Question 25

Many students were able to score 1 mark on this question, usually in part (i) and/or part (iii). A common error in part (i) was (6, −4). A common error in part (ii) was (6, −8). A common error in part (iii) was (−3, 4)

Summary

Students should be advised to

- estimate the values of calculations as a guide to determining the positions of decimal points
- use the letter of the variable provided in the question rather than make up their own variable
- identify the angles they are using in diagrams, or unambiguously in their working, and not to give abbreviated reasons for their working
- name the statistical measures they are comparing
- take more care when drawing cumulative frequency graphs and ensure that these pass through all the plotted points
- show their working in cumulative frequency graphs by drawing clear lines between the axes of the graph and the graph

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