Principal Examiner Feedback

Summer 2015

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

The demand of the paper was in line with previous papers. Students did appear to have been well prepared for the examination. However there were a few questions, at the higher tariffs, that many students were unable to attempt. Particular questions which were poorly answered include question 15(b) comparing gradients between points, question 18 finding a region satisfying a number of inequalities, question 19(a) linking algebraic techniques with probability theory, question 22(b) surds, question 23 a complex volume problem and question 24(b) transformation of a function.

Arithmetic errors were once again a common feature of this non-calculator paper; this had a particular affect on the success in questions 4, 9, 10 and 14. Overall, there was also noticeable inaccuracy in the reading of scales and an inability to name angles correctly.

Centres do now seem to understand the demands of questions assessing Quality of Written Communication and students were, in the main, giving clear explanations when required. However it must be noted that clear sequential working was not always seen and because of this examiners were often unable to follow solutions easily.

Report on individual questions

Question 1

In part (a), stem and leaf diagrams were usually accurate, however many students failed to provide a key. Keys drawn were usually correct. It was noticeable this year that fewer unordered diagrams were produced.
Although in part (b) the majority of students were able to identify 3 heights greater than 184 cm, a significant number were unable to give this as a percentage of 20. Many left their answer as 3/20 and some tried to divide 20 by 3. Sometimes, answers of 85% were seen suggesting students had not read the question properly.

Question 2

The most common error made in part (a) was to work out (4 × 3)2. Some gave 24 (4 × 3 × 2) as their answer and some incorrectly evaluated 4 × 9. Very many students were able to solve the given equation correctly in part (b); 10/4 was a common, acceptable, form of the answer. Some students tried to simplify 10/4 further leading to erroneous figures like 2.2 A number of students that had gained the correct equation 4x=10, then divided 4 by 10 to get 0.4 Poor algebraic manipulation, often lead to incorrectly simplified equations, 6x = 18, 4x = 18 and 6x = 10 were common. Many students attempted trial and improvement methods, but these often failed with the absence of an integer solution.

Question 3

A suitable question for a questionnaire has two basic elements; an appropriate question that is pertinent to the survey and some (at least three) exhaustive, non-overlapping response boxes. Often students asked for the length of time spent at the BMX track instead of frequency of use. Response boxes were usually acceptable. The use of inequalities was rarer than usual, as was the use of a tally charts. Quite often a "zero" option was omitted and students need to be aware that the "more than 4" box in the responses, 0 to 1 times, 2 to 3 times and more than 4, is not exhaustive since "4" is not catered for. This was often seen.

Students should be encouraged to try to answer the question themselves to check that their responses are exhaustive and non-overlapping.

Question 4

Many students scored at least 3 marks in this question and often solutions were fully correct. Although the chosen method for long multiplication was usually appropriate and valid, many arithmetic errors were seen, as was the case when finding 120% of £52.50. Build up methods for finding percentages were popular but often failed to earn any credit through incomplete explanation, eg. 10% of 52.50 = 52 or = 5.22 were common errors. Students should be advised that the method should be clear, for example they should show that when finding 10% they intend to divide by 10. Some students correctly found 20% of £52.50 but then subtracted instead of adding. Some students assumed £52.50 was the actual price as they did not understand the concept of VAT. Most students subsequently drew a suitable conclusion from their calculations.

Question 5

This question was answered well by the majority of students. The preferred method being to find the volume 2 × 10 × 15 (= 300) and compare this with 5 × 5 × x.

5 × 5 = 10 was a common error and division of 300 by 25 was often inaccurate. A significant number of students left their answer embedded within a calculation, eg. 5x5x12=300.

Some found and tried to compare surface areas or perimeters; these gained no credit.

Question 6

All but a very few students failed to gain the mark in part (a) for correctly describing the required relationship. 'Negative correlation' was a common answer which gained the credit, however 'negative' alone did not. Some spoiled their explanation with contradictory statements. Part (b) was also answered well but a significant number of students were unable to correctly read the scale on the Price axis, answers such as 6050 were not uncommon, although the sight of an appropriate line of best fit did score one mark.

Question 7

Whilst the majority of students correctly rotated the given shape in part (a), a correct clockwise rotation of 90o was the most common error. This however did gain partial credit. Some students drew a 180o rotation and some rotated the given shape about centres other than the origin. Part (b) was less well done, many failing to correctly identify the equation of the line of reflection. Many students described the transformation as a reflection about the origin. This just gained one mark for correctly stating the type of transformation and the reference to the origin was ignored. Too many students used the word 'flipped' rather than reflection, or tried to describe a mirror line by a description rather than y = x. A significant number of students offered a combination of transformations, ignoring the request in the question for a single transformation. This scored no marks at all.

Question 8

In part (a), 2g was usually seen, for the award of one mark, but although the most common answer was the correct one, ±7h was often seen. The factorisation in part (b) was usually correctly carried out although it was not uncommon for students to treat this as a 'difference of two squares' problem. In part (c), most students scored at least one mark for correctly applying a rule of indices somewhere in their solution. $\frac{p^7}{p^2}$ was often seen but many times incorrectly divided or simply left as the answer. The most common mistake, gaining no marks, was an answer of $\frac{p^{12}}{p^2} = p^6$.

Question 9

This question was answered well. Most students scored at least one mark for listing multiples of 15 and 40 although many arithmetic errors were made in this process, particularly with multiples of 15. Some wrote 15 and 40 as a product of their prime factors but often were then unable to go any further. Answers of 3 and 7 or 2 and 7 were often seen by counting up incorrectly, sometimes failing to count the first multiple. Students must be encouraged to check their work. Some students got the order the wrong way round with answers of 8 and 3.

Question 10

Only the most able students gained full marks in this question owing to the multi-step nature of the problem. The majority of students scored one mark for a correct area after splitting the given shape, usually for 3.4 × 3 or 2.2 × 3 but were often unable to correctly complete the calculation of the overall floor area. Some students treated the floor as a trapezium or two trapezia (by splitting vertically down the centre) and failed to score any marks at all for the area. Many students could not find the area of a triangle correctly. After finding a floor area, many students ignored the fact that one pack of tiles could cover 2 m2 and used their area when working out cost. Those who did divide their area by 2 to find the number of packs often went on to use a non-integer value for the packs losing them a further method mark. It was not uncommon for students to then ignore the 25% discount and compare Mary's £100 with an undiscounted price. Again many 'build up' methods for calculating percentage failed as a result of both arithmetic error and failure to explain their method. Many students did not appear to have any structure to their working, with calculations scattered all over the page. Students who worked logically and structured their calculations generally scored better.

Question 11

The most common mistake in part (a), was to confuse multiples with factors and an answer of 3/10 (using factors of 4) was often seen. Some simply wrote 4/10 as their answer. A number of students still give probabilities in unacceptable forms; an answer of 2 : 10 for example only gained partial credit. In part (b), complete understanding of the problem was rare. Most students scored one mark for correctly working out the total income (30p × 100) however many ignored the fact that those winning the £1 prize also paid 30p resulting in an incorrect income of £24 (30p × 80).
A significant number of students mixed the monetary units and calculations such as 3000(p) – (£)20 were not uncommon.

Question 12

The majority of students were able to show that 40o was the required angle, although few were able to give fully correct reasons to support their working. Corresponding and alternate angles were often confused and reasons were often incomplete. It was common for the reasons to be ambiguous and not linked to the relevant working. Centres should make sure that their students understand what is required in this respect; mark schemes illustrate this very clearly. Angle labelling was also confused and misleading, often contradicting working. The use of 'F' and 'Z' angles was common. Centres should be aware that this is unacceptable at this level.

Question 13

Many students did not recognise the need to use Pythagoras's Theorem to find the unknown longer side of the octagon. This was often taken as 8 cm or 14 cm (8 + 6). In a number of cases, arithmetic errors were made in the squaring of 8 and/or 6 when Pythagoras was employed, leaving students to estimate a square root. Centres should remind students that they would not be expected to calculate the square root of a non-square number on a non-calculator paper which may prompt them to check their methods.

Students who realised that use of Pythagoras's Theorem was required usually scored full marks but for those that didn't, the outcome was usually zero. Area was often mistaken for perimeter. It was, however, encouraging to see that some students recognised the 6,8,10 Pythagorean triple.

Question 14

This question was poorly answered by all but the most able students. Many considered the journey as a whole rather than working with the separate stages. Correct application of the distance, speed and time formulae was rare. 10 ÷ 40 = 0.25 was often then interpreted as 25 minutes for the journey from Fulbeck to Ganby. In working out the required average speed, many students were confused with the units and often quite happily divided 18 miles by time in minutes to give their final answer. Many of the more able students, having correctly determined that the journey from Ganby to Horton took 20 minutes, divided 18 by 0.3 thinking that 0.3 is the same as one third. A few students thought the question involved conversion between miles and kilometres.

Question 15

In part (a), many students scored at least one mark for one correct coordinate of the midpoint. Those clearly showing the mean of each coordinate usually gained full marks whilst students who tried to use diagrams often found the correct x-coordinate only. Other common errors included an answer of (6, 13) or subtracting the relevant co-ordinates instead of adding them before dividing by 2. In part (b), very few students were able to gain any credit. Many tried unsuccessfully to use sequences, often assuming proportionality from one of the points and many tried to use gradients or derive equations of straight lines with moderate success. A significant number of students used multiples of the midpoints thinking this would produce points on the line. Often, one mark only was awarded usually for students correctly finding the gradient of AB but unable to go any further. Reciprocals of gradients were often found.

Question 16

The cumulative frequency table in part (a) was usually completed correctly although, again, arithmetic errors were sometimes seen. Plotting of points and reading of scales in part (b) were usually carried out well although the usual translated forms were seen. Some students correctly plotted their points but then drew a line of best fit instead of a cumulative frequency graph. It was good to see most students plotting at the correct end points of the intervals. In part (c), the most common error was to read off their graph from time = 50 instead of at a cumulative frequency of 50. Part (d) caused more problems; many simply giving the reading from time = 63 without subtracting it from 100. Many misread the scales and used either time = 61.5 or read the cumulative frequency scale incorrectly. This resulted in the loss of both marks for this part of the question.

Question 17

Very few students offered a convincing, fully correct solution to this question. Many demonstrated confusion between interior and exterior angles; 72o was often seen as an interior angle in the diagram. Even those giving the interior angle as 108o, often then failed to complete the solution correctly; many times angle BCD was shown as 108o and angle ACF as 90o followed by working just showing 108 – 90 or 90 – 72. Even though this gave the correct numerical answer, it was clear that it was the result of an incorrect method.
Some students, even though they found an interior angle, thought that angle ABC was 90 or assumed that triangle ABC was equilateral. It was also fairly common to see AC as a bisector of angle BCA.

Question 18

Very few students gained more than one mark in this question and this was usually for the graph of $x + y = 7$ correctly shown in the diagram. The graph of $y = 2x$ was rarely correct with $y = 0.5x$ sometimes seen instead. The line $x = 3$ was commonly seen confused with $y = 3$. Some were able to pick up a second mark for correct shading between $x + y = 7$ and $y = 3$ It was more common to see an array of vertical and horizontal lines drawn on the grid. When the three lines were correctly drawn, a fully correct solution was usually seen. A common error was to try and incorporate the inequality into the drawing of the lines so, for example, the line $x + y = 6$ was drawn in response to $x + y < 7$.

Question 19

In part (a), only a small minority of students were able to recognise and make the link between probability and the algebraic demands of this question. Some did write 6/n, but then could go no further, some tried unsuccessfully to work back from the given quadratic equation. Many students in this part tried to solve the quadratic equation and then either repeated their working or just give their answer in part (b). A variety of methods were used to solve the quadratic equation; factorisation and use of the formula often had sign errors. Many with correct solutions, failed to recognise that a negative answer was impossible. It was pleasing that there were many attempts at part (b) by students who had not been able to attempt part (a).

Question 20

Only a few students realised the need to eliminate the fraction. The vast majority were either unable to start a solution or simply dealt with one element, eg. subtracted 5 from both sides of the equation. $p \times 4 - a$ (without brackets) was often seen. Students correctly removing the fraction often went on to complete the solution and gain full marks. Many, however, did not gain full marks as they often divided by p or by 3 rather than factorise or failed to rearrange the equation to collect the terms in a together, resulting in many answers with 'a' on both sides.

Question 21

Most students were able to score one mark for showing an understanding of the recurring decimal notation. Many were then able to find two appropriate decimals to subtract in order to write x as a fraction. Some students, having seen the solutions to this type of questions before, guessed at answers such as 45/99 and failed to gain any credit. A number of students attempted to work 'backwards' and divide 1 by 22. This method was not acceptable as an algebraic approach was required by the question.

Question 22

Part (a) was answered well by those students with an understanding of indices, however very few were able to gain any credit in part (b) with 3 being a common incorrect answer. In part (c), multiplication of two brackets was quite well attempted although sign errors were common. Only a few were able to accurately complete the calculation with mistakes such as $-\sqrt{36} - \sqrt{36} = -\sqrt{72}$ and $\sqrt{12} \times \sqrt{3} = 12\sqrt{3}$ or $3\sqrt{12}$ being common.

Question 23

This was probably the most challenging question on the paper. Very few were able to see it fully through to a conclusion. Many students were able to score one mark for correct use of one of the given volume formulae but then unable to go any further. Some students ignored any volume calculations altogether and treated the problem as a simple rate of change/ratio problem. A number of the better attempts read the height in the cylinder as 6 metres after 5 hours instead of 6 metres above the vertex of the cone. Many students spent a lot of time attempting to find answers using numerical values for π.

Question 24

Understanding of transformations of functions is generally very poor, with the vast majority of students not even attempting this question. In part (a), parts (i) and (ii) were more usually seen correct than part (iii). In part (b), it was rare to see the transformation described as a translation and even more rare to see this then described by either a correct vector or by 4 units in the correct direction. Occasionally, one or the other was seen correct, but rarely both together.

Summary

Based on their performance on this paper, students should:

- check calculations on non-calculator papers to avoid arithmetic errors. This is particularly important on this paper in relation to percentage calculations.
- set out working in a clear and organised way. Don't leave the examiner having to make the decision as to which working is relevant.
- avoid trial and improvement methods in solving algebraic equations; they usually lead to incorrect or no answers.
- take care in reading scales from graphs and charts.
- use 3-letter angle notation correctly. In geometric reasoning questions, it is important to clearly relate reasons to working. Avoid simply listing a number of reasons.
- make an attempt at every question.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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