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Principal Examiner Feedback

November 2014

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Foundation (Calculator) Paper 2F

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GCSE Mathematics 1MA0
Principal Examiner Feedback-Foundation Paper 2

Introduction

In order to gain the highest marks, students needed to give consistently accurate answers throughout the first, easier parts of the paper as well as on the more challenging material towards the end. There were a number of instances where a failure to note key words or use crucial pieces of information led to a loss of marks where the mathematics required was relatively straightforward.

Although this was a calculator paper, a number of students did not always use efficient methods for some questions and instead reverted to perhaps more familiar non-calculator methods for calculations such as finding percentages. The majority had at least partial success with a question testing calculator skills so it would appear that students did have a calculator with them to use.

Organisation of working proved a challenge for many students and more structure to solutions could have ensured more marks were gained, particularly on questions testing Quality of Written Communication, involving geometrical reasoning or final conclusions requiring supporting evidence.

Report on individual questions

Question 1

Perhaps in their eagerness to get started on the examination, an unfortunate number of students mixed up the demands for area and then perimeter in parts (a) and (b) of this first question. Some found the $8cm^2$ enclosing rectangle area in part (a) and there was much evidence of miscounting centimetre sections of perimeter in part (b). Students who marked the diagrams in some way often had the most success as did those who underlined or highlighted the words area and perimeter as they tackled the questions.

The vast majority of students had no difficulty drawing a correct reflected shape in part (c) with just a few showing a translation instead.

Question 2

Students were very successful indeed when interpreting the dual bar chart to read off a value for Skegness in part (a).

Part (b) proved very slightly more challenging where students had to use the key to identify which of the bars with height 6 represented Blackpool. Incorrect answers of Tuesday or Saturday were seen when Skegness rather than Blackpool had 6 hours of sunshine.

The majority of students tackled part (c) by finding the weekly totals for both towns and then the difference. Whilst a few made arithmetic errors, evidence of this working led to a method mark being awarded. Where students found daily differences instead, they often included only the days when Skegness did have more hours of sunshine than Blackpool and failed to take account of the days when it did not leading to a final figure of 8 hours rather than 6.

Question 3

Parts (a) and (b) were done very well by nearly all students with just occasional place value errors leading to 0.07 or 7 instead of 0.7 and 4.5% rather than 45%. There were occasional instances of 7.10 which would appear to indicate a misunderstanding of the relationship between fractions and decimal notation.

A high proportion of students were able to gain the first mark in (c) for writing 30% as $\frac{30}{100}$ or another equivalent fraction, often $\frac{15}{50}$. They then either stopped a simplification process or made subsequent errors. Full marks were awarded for the student's final answer so a few lost the second mark by an incorrect simplification after $\frac{3}{10}$ had been reached, often giving $\frac{1}{5}$

A few students chose to write their answer as a decimal and others thought that 30% is equivalent to $\frac{1}{3}$

Part (d) proved the most challenging part of this question for weaker students. Rounding errors were apparent with 2.73 and 2.80 the most common incorrect answers. There were also various answers offered with errors involving the re-positioning of the decimal point such as 27.38 or 273.8

Question 4

A number of students did not interpret the word perpendicular correctly in part (a) and instead drew parallel, or occasionally diagonal, lines.

It was pleasing to see that the majority of students were equipped with a pair of compasses which they used competently to draw a circle of the correct radius in part (b). There were only a few instances of misinterpretation of the word radius to draw a small circle with diameter 4 cm instead.

Part (c) was also well done with many correct responses seen; students would be well advised to use the grid lines and particularly position vertices on grid intercepts to ensure accurate diagrams.

Part (d) was the most challenging question part with many struggling to complete a correct quadrilateral once 2 right angles had been drawn. Many presented a pentagon with 2 right-angles or had a curved instead of straight fourth edge.

Question 5

Students were very successful selecting the correct information from the table to give correct answers for both parts (a) and (b).

In part (c) most students were able to show at least one of the correct probabilities on the scales. Although the probability of a winter flowering bulb was exactly zero, some students lost the mark as they did not indicate a cross at exactly 0 but some way along the scale suggesting that the probability was not absolutely impossible. Students should be encouraged to follow the instructions exactly; here indications on the scale other than crosses were condoned providing there was no ambiguity.

Question 6

Although most students appreciated that the first two lessons were cheaper, many missed that the information in the box showing that they cost £12.75 **each** and instead used £12.75 as the price of both.

For part (a), the omission of the final zero in an answer of £85.5 was often seen and condoned but students need to be aware that they should always use correct money notation.

For part (b) most students gained marks for their correct method to subtract the cost of 2 £12.75 lessons or the 5 lesson total calculated in part (a) and then divide the remainder by 20.
Use of just the single £12.75 cost for 2 initial lessons was condoned for the award of method marks here. Once the figure of 14 additional lessons had been reached, some students forgot to add on the initial 2 lessons and so gave 14 rather than 16 as their final answer. Although students were permitted calculators, a number showed lengthy working to add enough £20 lessons individually to the initial starter lesson figure rather than use a more efficient division calculation. This strategy sometimes led to errors counting up the number of £20 lessons and incorrect final answers.

Question 7

The vast majority of students gave the correct answer in part (a) with just a few losing the mark as they showed the lowest temperature of 6° instead of the place name Newcastle.

Similarly, success rates were high in part (b) with just a few students using 2 rather than −2 as the initial temperature and so giving an answer of 7 and others with a final answer of 2 perhaps miscounting along a number line.

In part (c) many correct answers were accompanied by a correctly labelled number line with −5 and 3 clearly indicated which itself attracted a method mark. This number line strategy proved more successful than attempts to find the midpoint by arithmetic means which often included errors with signs. A final check of an answer to make sure that it did indeed lie between −5 and 3 may have prompted some students to revisit their working and try to find a correct answer.

Question 8

All parts of this question were accurately answered by most students with just a few instances of the reversal of x and y coordinates, most commonly in part (b). Students appeared to find the concept of a mid-point very familiar although a few found (3, 3), the mid-point of *AC*. The vast majority had no difficulty finding the missing vertex of a square.

Question 9

There were many fully correct responses in part (a) with students selecting the correct information from the question, adding the correct 5 lengths and dealing with a units conversion correctly. Errors did occur when students used only some of the given information: they typically used just one of each of the 32 cm and 45 cm lengths or ignored these numbers completely and carried out a division of 2m into 5 equal pieces. Where the correct numerical answer had been obtained, students only rarely lost a mark for omitting the appropriate cm or m units. Students appeared generally confident with conversion between metres and centimetres with a few choosing to work completely in millimetres.

Although part (b) had a functional maths context, this did not necessarily help some interpret the answers to division calculations correctly for the situation given. Many did not appreciate the need to consider each shelf separately and round **down** to the nearest integer. This led to many answers of 46 from rounding 320 ÷ 14 = 22.8… up to 23 on each shelf or working with both shelves together to give 640 ÷ 14 = 45.7… which was usually rounded up. For this functional question, the students needed to select just the relevant information about the shelf width from the diagram. Unfortunately, many included the height of the shelves in their calculations. An additional shelf width of 450 mm was often used and some students carried out an "area" calculation before dividing by 14 mm to give the somewhat unrealistic answer of 10285 DVDs.

Question 10

Students were generally able to find the mode correctly in part (a) although a few gave the highest frequency of 4 instead. There were occasional responses giving the mean or median values.

Part (b) was well answered by students with many scoring full marks. Where marks were lost it was as a result of merely giving the total of 18 rather than the mean, division by 9 instead of 10 and occasionally working out the median instead of the mean. Students need to be aware that a data value of 0, whilst not contributing to the total goals, still needed to be included in a total frequency of 10 rather than 9 games. The correct final answer of 1.8 was sometimes rounded to 2, presumably through a need to present a whole number of goals as the mean. This subsequent working was ignored for the award of full marks in part (a) but the student had to use the correct 1.8 in their comparison to secure full marks in part (b).

Most students tackled part (b) by carrying out a mean calculation for all 12 games and they generally reached the correct mean of 2 goals and gave a correct conclusion and explanation for this starred question testing Quality of Written Communication. Calculation errors included division by 10 or 11 rather than 12. Some missed a few crucial words in the question and answered as if the question had simply asked if the mean would be **greater**.

Question 11

Very few students scored no marks and many scored all 3. Most seemed to understand that a column in the timetable represented a single journey although a few gave a departure time from one column and an arrival from another. Errors were made where students disassociated arrival and departure times for Peterborough. Even where errors had been made with the train journeys, most students gained the final mark for correctly showing arrival at the meeting exactly 30 minutes for arrival in York, although some gave 10 00, the meeting start time, instead.

Question 12

Part (a) was very well answered with the majority of incorrect answers showing 12 from a calculation of 17 – 5 rather than 17 + 5
Students had slightly less success in part (b) where again the incorrect operation to solve the equation was selected giving 2 from 6 ÷ 3 rather than carrying out the correct 6 × 3
Few part marks were awarded in part (c) as both formal solution and inverse operation methods generally reached the correct fraction answer $\frac{17}{5}$ or 3.4 and scored both marks. Some students attempted trial and improvement methods but as this question had not indicated that this method was to be used, they were unable to gain method marks for working which did not reach the correct final answer.

Question 13

This triangle construction was done well by many students who presented accurate work within the ± 2mm and ± 2° tolerances allowed. Those who faltered generally had the correct 5.5 cm for *BC* but did not have the correct angle *ABC* drawn. Although instances of the common protractor scale reading error to give 55° were evident, it was apparent that other students perhaps did not have a protractor they could use.

Question 14

In part (a) most students were able to replicate the pattern. Incorrect responses generally showed the first pattern repeated 5 times, resulting in the additional dot being repeated an extra 4 times. Part (b) was also very successfully answered with most students gaining the mark.

In part (c) the most common incorrect responses did involve some use of the term to term difference of + 4 but frequently this was seen as $n + 4$.
The students who had presented the correct *n*th term expression in part (c) generally went on to use it correctly to answer part (d). Other correct answers often came from a clear continuation of the sequence or a diagram showing pattern number 12. Many students used multiples of values in the table incorrectly, typically deducing that pattern 10 would have 42 dots as pattern 5 had 21.

Question 15

The angle required was often worked out correctly by many students but they then lost at least one of the final two marks through omissions or errors in their geometrical reasoning. Often reasons given missed out crucial words such as **angles,** stating, for example, "A triangle is 180 degrees". References to "angles in a circle" were often seen instead of the correct "angles around a point".

A misconception about the angles on a straight line was evident with students using all the angles connected along the line *ABC*. Thus x was calculated as 110° from 180 – 32 – 38

Question 16

Many students used their calculators accurately to reach the correct 89.3855 and the majority picked up at least one mark for evaluating part of the calculation correctly, typically finding the square root of 14.44. The squaring aspect caused difficulties and some answers showed that it had been ignored or the result of (7.3 – 2.45) multiplied by 2 instead.

Question 17

Most students were able to correctly evaluate all of the missing values in the two way table in part (a). Checking their final answers by adding across or down the table in a different way could have enabled those who did make an error to correct their work.

Part (b) was completed less well, although most students were able to read the correct numerator value of 13 boys chosing karting. Many did not appreciate that it was one of the **boys** that was to be chosen at random and instead gave a denomiator of 100, the total number of all students. With a calculator to hand, some students went on to give acceptable equivalent decimal or percentage answers but their were a few instances of incorrect ratio notation and 13:47 seen.

Question 18

Those students who realised that one side of each rectangle had only 6cm on the perimeter of the shape usually went on to gain full marks, athough sometimes when listing each side separately they missed out or added an extra 6, reaching 74 or 84. Many students gained an initial mark for the 112 cm total perimeter of 4 rectangles but generally did not make further progress to deduct the hidden 4 cm sides. There was some confusion of perimeter and area evident with multiples of 40, usually 160, seen.

Question 19

Many students showed correct working to find a correct fraction, either $\frac{1}{4}$ or $\frac{3}{5}$, of the orignal 240 counters. However, a common mistake was to then subtract their first solution for yellow or green counters from 240 and then apply the other fraction of the remaining 180 or 96 counters. Some students added the fractions initially but often failed to do so correctly. Those students that chose to work in percentages frequently did not find 60% nor 25% of 240 but instead added to get 85 and just deducted this figure from 240 to arrive at a solution of 155. There was some evidence that students did not readily use their calculator for this question but instead relied on non-calculator methods to deal with fractions.

Question 20

Part (a) was answered successfully by the vast majority of students who appeared to identify the multiplier 3 and apply it with ease.

Part (b) proved more challenging although those that identfied the correct multiplier 2.5 generally applied it to reach the correct answer. Many other students used a build-up method to reach 750 m*l* of milk. Some showed 300 = 10 pancakes, 600 = 20 pancakes and 150 = 5 pancakes but then combined all to give a final answer of 35 rather than 25.

Question 21

Many correct responses were seen for part (a) although some students did not gain the mark as they wrote just “positive” or “positive relationship” without reference to **correlation**.

Many others gave acceptable descriptions of a dynamic relationship between length and width. A few tried to quantify a correct relationship but others did not score as they gave general descriptions of the length being greater than the width for one or all of the pine cones.

The majority of students gained full marks for an answer within the acceptable range. Many of those who failed to gain full marks often gained one mark for an appropriate line of best fit or a correct marking on the graph. A few lost the marks through misreading the scales.

Question 22

Many students appreciated that a conversion factor needed to be applied but often did so incorrectly using division rather than multiplication or vice versa. Often a correct conversion calculation was accompanied by another, incorrect, calculation (typically 5 × 1.16) and so marks were lost due to the choice of methods being shown. The first method mark was most commonly awarded for conversion of £2.50 to 2.9 euros but then the meaningless difference between 2.9 and 2.5 was often subsequently calculated. Unfortunately, some students who reached a correct final answer failed to secure the final mark as the units for the final value were omitted. Most students followed the question text and used the word euros rather than symbol €, so there were no sigificant issues with indistinct currency symbols.

Question 23

Many students could not factorise the expression in part (a). Some attempted a simplification leading to $9x$ or factorised just the first term correctly giving $3(x + 6)$.

In part (b) few students were completely successful with expanding and simplifying but many were able to pick up a single mark by expanding one part, generally the first bracket. Common misconceptions involved multiplying the first terms in each bracket, mixing up the signs and failing to deal with the -10 and -6 resulting in final answers of $7y - 4$, $7y + 4$ or $7y + 16$

Question 24

A minority of students could reach a correct final conclusion supported by figures from correct working. Some used very efficient methods involving totals but others did calculations involving individual year groups. In this instance, the target was not met for every year group so this less efficient method could still reach a valid conclusion. There was some confusion with students using just the figures for Year 11 perhaps thinking the table showed figures for the whole week and the bottom line was for Friday. Many students were able to pick up a single mark for the initial step of finding the total attendance for the week but subsequent working could get very confused involving, for example, calculations of numbers absent as a percentage of numbers present. Many students resorted to non-calculator build up methods to find 94% of a quantity.

Question 25

Drawing and labelling a set of axes correctly was the main initial fault here, costing very many students the first mark. Axes needed to be correctly labelled x and y and linear scales including the origin. A number of L-shaped axes were seen, labelling as if in one quadrant from an "origin" of $y = -7$ and $x = -2$. The most successful students showed a clear table of values with x and y clearly labelled ready to plot points easily. A number of students lost a final mark because they did not join their correctly plotted points together.

Question 26

Fully correct solutions to this problem were rarely seen but those students who appreciated the need to calculate the circumference and remembered the appropriate formula often went on to gain all the marks. The most common correct route was a calculation showing that the tables would only seat 84. Area or $\pi \times$ radius for circumference were sometimes seen. Many weaker students simply took 140 cm as the circumference for each table and often divided by 60 to conclude that each table would only take 2(.5) people; or they multiplied 140 by 12 and divided by 60.

Summary

Based on their performance on this paper, students should:

- be aware that they need to aim to score highly on initial questions in order to gain the highest grades and so take care not to drop careless marks through missing crucial key words and information.

- ensure that they bring correct equipment to construct accurate mathematical diagrams such as ruler, compasses and protractor and are proficient in using it correctly.

- become more confident using a calculator to perform calculations involving percentages and fractions and avoid resorting to non-calculator methods on a calculator paper.

- use a common sense approach to checking final answers to by re-reading the question demand and checking that the final answer is reasonable in any functional context given.

- set out solutions to geometrical problems clearly, using correct geometrical language for each step of their reasoning. In order to ensure that no steps are missed it is good practice to write down a calculation or deduction and then immediately show the angle reasoning used.

- show clear structure in their working for multi-stage calculations and make sure that a clear final sentence with evidence using calculated values is given in questions where a final statement or conclusion is required.

Grade Boundaries

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