# Principal Examiner Feedback

Summer 2012

GCSE Mathematics (Linear) 1MA0
Foundation (Calculator)
Paper 2

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# GCSE Mathematics 1MA0
# Principal Examiner Feedback – Foundation Paper 2

## Introduction

This was the first calculator paper from the 1MA0 linear specification in which there were substantial questions which assessed problem solving and communication in mathematics.

It was pleasing to see that many candidates had been well prepared and were able to demonstrate strategies for solving problems. Candidates were particularly successful in dealing with problems that involved money. However, many candidates were handicapped by the lack of a calculator or were unable to use it profitably, for example when calculating the percentage of an amount.

## Report on individual questions

### Question 1

All parts were generally well answered. The most common errors were, on part (b) - 78000 and on part (c) - 3600.

### Question 2

Candidates found a variety of names for these two 3-D shapes apart from the correct ones. In part (i) there were a lot of rectangles mentioned and on part (b) many prisms, triangles and triangular pyramids. Incorrect spelling was accepted provided the meaning was clear.

### Question 3

Most candidates recognised that Monday was 24. Similarly, very many candidates were able to spot that Wednesday was 8 + 2 = 10. However there was a sizable minority who gave the answer to part (b) as 12, either because they could not find one quarter of 8 correctly or because they did not read the question carefully enough and wrote down the answer to Tuesday.

Answers to part (c) were generally correct although some drew 3 circles and a quadrant for Friday.

## Question 4

Candidates tackled this question in a variety of ways. The most sophisticated method seen was $10 \div 0.79$ followed by $12 \times 0.79$ and a subtraction from £10. Candidates had then to write their answer using correct money notation. A more common approach involved use of the calculator to multiply 79 or 0.79 until the answer became more than 1000 or 10 respectively. This was then followed up by a subtraction from 1000 or from 10. Candidates who had no calculator were usually reduced to adding 0.79s or 79s and were rarely successful.

A substantial number of students misunderstood the question and gave an answer of 12, the number of packets that could be bought for £10. Others were not precise about money notation and wrote 0.52p.

## Question 5

Most candidates knew that the angle in a square was $90^{o}$. They were less successful in marking an obtuse angle on the diagram where the acute angle was often indicated and even less so in identifying two lines that were perpendicular where very often parallel lines were marked or the letters were put on the diagram in ambiguous positions.

## Question 6

Part (a) was well answered as $3c$. The most common miswrite was $c^3$.

Part (b) was also dealt with well.

Part (c) proved more of a challenge, although some candidates who got parts (a) and (b) wrong managed to get it right. Common wrong answers included $7p - 5t$ ,$11p +5t$ , $11p - 5t$ and even $7p\ 5t$. A few candidates went on from the correct $7p +5t$ to write $12pt$ so losing a mark.

## Question 7

Most candidates drew the two lines of symmetry - sadly many of these also put in additional lines that looked like diagonals.

Part (b), the idea of rotational symmetry was not well known with a wide variety of wrong answers, including $360^{o}$ and 5.

## Question 8

Both parts were fairly well done but with the typical errors seen on F tier papers. The most common was confusion between perimeter and area so the answers appeared reversed in (a) and (b). The other error sometimes seen was where the squares on the extreme corner tips of the shape were counted giving an answer of 28 cm for the perimeter.

**Question 9**

All parts of this question were very well answered.

**Question 10**

Most candidates were able to find *x* because they knew that *x* + 60 + 140 had to come to 360. They were less successful in part (ii) where many simply showed there working or said that they took 60 and 140 away from 360. An acceptable reason was that the sum of the angles around a point is $360^{o}$, with markers looking for the 3 key elements of 'angles' 'point' and '360'. Another reason accepted was ' The sum of the angles in a full turn is $360^{o}$' emphasizing the dynamic nature of the concept of 'angle'. 'Angles in (or round) a circle' was a common unacceptable response.

**Question 11**

Very few candidates could not read the time; generally those that failed had confused the hour and minutes hand. Similarly there were many good answers to (b), although some spoiled their response by writing 16:10 pm.

Part (c), a time problem was quite well done. One common strategy was to add 15 min, 10 min and 1 hour to get 1 hour 25 min and then subtract from 8 15. Although sound, some candidates were let down by working out
8.15 - 1.25 = 6.9. A second strategy was to start with 8 15 and subtract 10 min, then 1 hour and then 15min. Some candidates probably spotted they could make the working easier if they subtracted the 15 min first. A large number of candidates had an idea of when to start (say 6 30) added on the 10, the 15 and the 60 (min). When they found they got to 7:55, they tried to adjust (sometimes successively) to a later time. However, there was a significant number using this approach who started at 6:45 added on the 1:25 to get 8:10 and left their answer and working as this. Possibly they were interpreting the question in a sense that 5 minutes early is on time.

**Question 12**

Part (a) was well answered. Part (b) proved a challenge as there was no direct way of reading from the graph to find the answer. The most common successful method was to read off at 6 km and multiply the number of miles found (about 3.75) by 10. Some candidates had a clear idea of the required method but scored only 1 mark because they could not multiply a decimal by 10 correctly. Answers of 30.8 (from 10 × 3.8) and 30.7 (from 10 × 3.7) were often seen often without any working at all. A less common strategy was to use the 8km = 5 miles conversion from the edge of the graph and put down a number with a value between 7 × 5 and 8 × 5. However, this conversion was used incorrectly a number of times, with the candidate working out 60 × 1.6, giving an answer of 96.

## Question 13

Most candidates could readily identify the mode for part (a). Although the correct answers were often seen for (b) and (c) many candidates were confused over precisely what they had to do. So in part (b) a common answer was to add the scores to get 34 and write that on the answer line. Many candidates also confused the mean with the range. Of course there were others who found the median for the answer to part (b).

## Question 14

Many candidates knew that they had to substitute in the expressions for the values of $x$ and $y$. Part (a) was commonly correct as the evaluation of the expression $3.5 \times 12 - 5$ was written in the order that the multiplication would naturally be carried out first. Some candidates were unaware that $3.5x$ implies multiplication and thus worked out $3.5 + 12 -5$.

Part (b) proved to be more of a challenge because of the difficulty some had with negative numbers.

## Question 15

Most candidates could draw pattern number 4 on the grid although not all shaded in the relevant squares. The remaining two parts of the question proved more of a challenge. In part (b) some candidates sketched out what they thought pattern number 10 should look like, whilst others started the sequence 4, 7, 10.... Many candidates counted the white space in the middle as a tile and so used the sequence 5, 9, 13,… to end with 41. Other methods of greater insight or sophistication were seen - for example, the use of $3n +1$ showed that some students had learned how to find and use the $n$th term of an arithmetic progression. A particularly insightful analysis seen occasionally was that the numbers of grey tiles in the top and bottom rows of the pattern were the same as the pattern number and that the number of grey tiles in the middle row was 1 more than the pattern number. A common incorrect answer was 32 which probably came from assuming that the number of grey tiles in pattern number 10 was double the number in pattern number 5.

Similar lines of reasoning were used to answer part (c).

## Question 16

This proved to be a well answered question as most candidates knew what a factor was and could find 4 factors of 60. Generally as well as finding 4 factors candidates were able to select 4 which had a sum greater than 20 but less than 35. Very occasionally the sum of the factors turned out to be 20. The other common mistake which still earned marks was to use 8 in the list of factors of 60. Quite often there was little evidence of working, such as a list of possible factors. Weaker candidates often wrote down a list of multiples of one of the factors (often the factor 6)

### Question 17

Part (a) was found to be a more challenging question because of the fact that 120 is not a multiple of 84, so a unitary method has to be used. Virtually all the successful candidates worked out the $12^{o}$ represented 1 medal, and then were able to spot 10 for the number of gold medals. Part (b) was answered correctly by a minority of candidates who were aware that the pie charts showed only the relative number of medals won within each of the two countries.

### Question 18

This standard probability question was generally well answered. Some candidates gave both a correct probability and a word, for example "$\frac{0}{18}$, impossible". This was allowed for the mark, but not just the word on its own. Some candidates gave answers as ratios or odds. These did not gain marks.

### Question 19

Parts (a) and (b) were generally well answered although many candidates confused the order of operation in (a) and gave an answer of 5, presumably from 12 - 7. The fact that the solution of the equation in part (c) was 2.25 meant that it was not easy to spot so candidates had to resort to some lengthy trial and improvement or had to use a proper process such as subtract 6 from 15 and then divide by 4 in some cases accompanying a flow chart.

### Question 20

This type of problem has become more common. There are a variety of strategies available and the candidate has to select one. The most common method by far was to attempt to find 42% of 250, then $\frac{2}{5}$ of 250 and subtract the two answers from 250. Many candidates had technical difficulties with finding 42% of 250 and were only allowed a mark for a build up method if each part were correct - for example 25 four times and two lots of 2.5. They also had difficulties with $\frac{2}{5}$ of 250, often working out 250 ÷ 5.

Some candidates occasionally worked with percentages so were able to convert $\frac{2}{5}$ but often left their answer as 18% rather than trying to find 18% of 250. A few candidates were able to find 42% of 250 (105), then took it off 250 (145) and found $\frac{2}{5}$ of 145

## Question 21

Many candidates were unaware of the idea of an algebraic graph and thus did not attempt the question. Of the remainder, some knew that the answer was a straight line, but often joined the points (-1, 3) and ( 3, -2), presumably focussing on the numbers given in the equation and in the range of values of $x$. Of course, many knew that they had to work out a set of values of $y$ and used sensible integer values of $x$. Of these that did this, some candidates made an error on the value of $y$ when $x = -1$. Surprisingly, there were many cases of correct values of $y$ being found but a really incorrect set of points being plotted - often in a vertical line. There were some cases of 5 points being plotted correctly but not joined up.

## Question 22

This question was found challenging as it was not making the common demand of sharing an amount in a given ratio. There were three successful strategies used. Firstly, some candidates turned it into a problem they were more used to and looked for a number which when shared in the ration 2:5 gave a difference of 45. As they had calculators this could be done fairly quickly. Secondly, some candidates started with the ratio 2:5 and built up through 4:10, 6:15 and so on until they reached 30:75. Thirdly, some candidates carried out the most efficient method of dividing 45 by 3 and then multiplying the resulting value by 2. Many candidates treated the question as a 'divide in the ratio' and scored no marks. Others gave an answer of 18 obtained from $45 \div 5 \times 2$.

## Question 23

This was a *quality of written communication* (QWC) question and as such a candidate was expected to display sufficient and clear working to enable them to reach a decision and state it unambiguously to answer the demand of the question. Generally, candidates answered the question well. The main strategy used was to notice that 5 × 2.5 kg = 12.5 kg. So by multiplying the supermarket price by 5, this gave a price that was directly comparable with the farm shop price. If the candidate went on to state that the farm shop was better value then all 4 marks were awarded. (Note it was insufficient for the communication mark to just refer to the 12.5 kg.)
Another method often employed was to find the cost of 1 kg from the farm shop and 1 kg from the supermarket then compare these and state 'farm shop'. Because a comparison was being made in this question candidates had to be careful about using consistent units or at least making clear what the units of cost were, £ or p. Some candidates who knew they had to compare common quantities worked out $12.5 \div 9$ and $2.5 \div 1.83$
They usually made the wrong choice of sale outlet by selecting the smaller number as being the best value. A few candidates chose a different weight to compare, with 25 being the most common.

**Question 24**

Both parts of this were standard transformation tasks. There was some confusion in the minds of many candidates as to which was the *x*-axis - many gained 1 mark by carrying out a reflection in the *y*-axis. Although most candidates drew a reflection there were a few rotations and even translations.
Whilst many candidates scored 2 marks on part (b) there were a lot who did not understand the idea of enlargement and simply extended a couple of sides, usually the bottom and left hand. A few candidates carried out an enlargement with scale factor 2

**Question 25**

This proved to be a well-answered question. On part (a) most candidates multiplied 200 by 25.82. However, after that they were less clear with answers of 5164, 5100, 51.64 and 52 often seen. Part (b) was well answered generally by dividing 400 by 25.82 although some candidates used their calculator to good effect and found 15.50 by trial and improvement.

**Question 26**

Part (a) was a standard one word answer question. Qualifications of 'negative' such as 'strong negative' were allowed. Descriptions of a relationship were not as the question asked specifically about correlation. Many candidates were able to get an allowable answer to (b) either by drawing a line of best fit or by estimating directly from the graph.

**Question 27**

This was a QWC question. As such, candidates were expected to show clear working and to reach and state a conclusion based on their calculations. The conclusion had to be the correct number of boxes for the area of grass they had calculated and to earn the mark the candidate had to display enough working to allow at least 1 method mark to be obtained. The most successful candidates were those that had a clear idea of what to do and set out there working in a systematic manner.

There were many pleasing attempts at the question although few achieved all five marks, mainly because they could not work out the area of the pond. In fact, many candidates thought that the area of the pond was 3.8, not realising that the 3.8m above the double arrowed line was the diameter. In addition many worked out $\pi \times 3.8$ for the area. A common error, when faced with an answer of, for example, 5.3 to their calculations, was to round down to 5.

**Question 28**

The last question on the paper and also a QWC one. In order to gain full marks, a candidate had to work out the total annual cost of water used, add £28.20 to it and then state a suitable conclusion relating back to the demand. Candidates were allowed to use an approximate number of days in a year - the most common approximations being 364 ( from 7 × 52) and 360 ( from 12 × 30). The approximation 336 ( from 7 × 4 × 12) was felt to be too far off 365 and so lost a mark.

Many candidates made a good attempt at this question. They clearly understood what processes were involved and the need to state a conclusion. However, many candidates lost at least one mark from not spotting that cost was given in pence per 1000 litres and so calculated costs in the several thousands of pounds.

Candidates were awarded a mark for an answer between £87 and £89 which allowed for sensible approximations. They were also awarded a mark if they were clear what units of cost they were using when comparing with the £107 and stating the appropriate conclusion based on their calculation.

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