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# Principal Examiner Feedback

Summer 2012

GCSE Mathematics (Linear) 1MA0
Foundation (Non-Calculator)
Paper 1

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

### Introduction

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

The vast majority of candidates had time to attempt all questions however a significant number of candidates failed to give full and correct reasons to justify their working.

There were a few questions where a comparison had to be made but often candidates did not compare like with like and frequently did not make a conclusion. A high proportion of candidate responses comprised the answer alone, with no working. Where working was shown, it was often difficult to follow as there was little or no explanation of what was being calculated.

Where candidates are required to draw diagrams with a pre-printed grid, they should be advised to make sure that pencil lines are very clearly visible over the grid.

### Report on individual questions

### Question 1

This proved to be a good starter question with nearly 90% of candidates scoring all 3 marks. The most common error in part (a) was 300.8 and in part (b) the few who got this incorrect tended to write 62 or 6.4. Plotting at 38 was the most common error in part (c).

### Question 2

Majority of candidates were able to measure the line correctly. All recognised the need to put their answer in cm rather than mm.

A lack of a protractor did not stop nearly all candidates writing an answer in part (b). However it was evident that many candidates did not have a protractor as many wrote 45° as the size of the angle in (b). A significant number used their protractor incorrectly with 145° being a common incorrect response. Only 63% of candidates gave an answer between 33° and 37°.

It was pleasing to note that many candidates could draw a circle using a pair of compasses. Two thirds of candidates successfully produced circles that fitted within the overlay, even when the circles were drawn freehand. Quite a few drew a circle with a diameter 5 cm instead of a radius 5cm. Quite a few attempted to use a protractor to draw the circle. Many only drew a radius.

### Question 3

Part (a) and part (b) were well done. There was a good understanding of what was required for tally and frequency and most scored the mark in part (b) for 7 or ft from their table. ‘Banana’ proved a popular incorrect response to part (b).

In part (c) the vast majority of candidates drew a bar chart. A considerable number of these lost a mark for not labelling the vertical axis. A few also lost a mark as they started the numbering from 2 instead of zero or numbered the gaps on the vertical axis. Candidates need to be made aware that bars of unequal width are not acceptable. Other diagrams such as pie charts and pictograms were also acceptable although it was extremely rare to see an accurate pie chart drawn.

Overall, quarter of candidates scored all 6 marks with half scoring 5 marks generally losing the mark for not labelling the vertical axis in (c) correctly or not labelling it at all. A further 16% scored 4 marks.

### Question 4

Majority of candidates were able to start by showing an attempt to add £1.18 and 94p and scored 1 mark. The most common reason for losing the second method mark was a failure to take into account the 30p change. There were also a significant number of arithmetic errors – candidates seemed to have great difficulty in subtracting as well as dividing. Candidates did not set their working out in an orderly manner and many calculations were shown, some of which were relevant and some of which were not. Only half the candidates were able to score more than 1 mark with 36% scoring all 3 available marks.

### Question 5

It was pleasing to note that nearly all candidates scored all 3 marks. Part (a) proved to have very few incorrect responses. Errors were mainly in reversing the coordinates eg. (3,2) instead of (2,3).

In part (b) the majority of the responses were correct. Some candidates also neglected to mark the cross with a C as requested in the question.

### Question 6

Majority of candidates correctly answered part (a). The most common incorrect responses were 0, 1 and – 4. Some incorrect answers arose from the candidates using the top line of the table only.

The most common answer to part (b) was the correct answer of 6, although the correct answer of – 6 was not uncommon. Common incorrect answers included 5, –2 and 2.

Candidates found it harder to work out the minimum temperature on Sunday with only two third of candidates arriving at the correct answer, usually without the need for working.

## Question 7

Those who approached this question systematically were more successful in obtaining the complete set of combinations without repeats. Those who did not use a system appeared to randomly write down combinations until they thought their list was complete – this often resulted in missing or repeated combinations. Several simply wrote e.g. P – B, S, L which was not sufficient to score the marks as the combinations needed to be listed as individual pairs. Only a few candidates chose two mains or two starters as a pair. Overall, 87% of candidates scored both marks with a further 8% scoring 1 mark.

## Question 8

Virtually all candidates could identify that most of the students walked to school. Part (b) was well attempted by many candidates. Two thirds of candidates correctly found that 6 students cycled to school. Those who did not arrive at this correct answer seldom scored the method mark as they did not attempt to write the 90° which they had identified as a fraction of 360°. Those who arrived at the correct answer showing working either divided correctly by 4 or divided by 2 and 2 again. A few continued to divide by 2 again obtaining an incorrect answer of 3.

## Question 9

Part (a) was successfully done by 64% of the candidates. There were only a small number of blank responses seen. Too many candidates lost marks through careless drawing of the vertex. Many candidates found it hard to draw a triangle if they started with a base that was odd in length. The most common incorrect response was a right angled triangle that was not isosceles.

In part (b) nearly all of candidates were able to score at least one mark for drawing a rectangle of any size and two thirds of candidates scored both marks for a rectangle with area 12 $cm^2$. A significant number of 2 × 4 rectangles were seen with annotations, showing confusion between area and perimeter. A very small minority drew a triangle instead.

## Question 10

Nearly all of candidates were successful in part (a). However, in part (b), only 53% of candidates were able to mark the probability scale correctly (within 1 cm). Many put **B** at either $\frac{1}{2}$ or 1.

## Question 11

In part (a) many candidates knew that the square root of 81 is 9. Unfortunately many wrote their answer as 9 × 9 which lost the mark. Only half of candidates scored the mark in part (a).

Many errors were made by candidates in part (b). The most common error was to give an answer of $7^5$ where the candidates felt they needed to apply the multiplication rule of indices and seeing the addition sign between the integers they thought that they had to add those integers as well. Another common error was to give an answer of 31. This they found by $5^2 + 2^3 = 25 + 6$. However, by correctly squaring 5 and getting 25 these candidates gained 1 mark. Another error frequently seen was to see $2^3$ as 16 with a final answer of $16 + 25 = 41$. This highlighted the fact that many candidates were weak on powers/indices. Overall, 29% of candidates scored both marks with a further 13% scoring 1 mark.

## Question 12

Part (a) was very poorly answered. Not many grasped what the question was asking. It was clear that many candidates struggled to visualise what shape would need to be added to make a cube. Had they realised that 27 cubes were needed in total then many more correct answers would have been seen. Many answers were low such as 6 or 3 indicating that only one layer had been considered. Nearly all candidates entered a number, but there were few in the region of 20, indicating that conceptually or visually this was too challenging.

A greater proportion of candidates scored in part (b). Many drew the required shape indicating that they understood what was required. A few drew a 2-D shape from the side, and a few added an extra cube. A number drew a 3 dimensional drawing of a cube or some cubes, indicating that they were not aware of the requirements of this topic.

## Question 13

Only half of candidates scored both marks in part (a) with 15% failing to score. Some misread the timetable to give a time for the next train (arrival at 07 58). Wrong answers were often times not found in the timetable, as if they were extrapolating to find a missing time for first train. In part (ii) some attempted a “normal” subtraction, unaware that they were dealing with time!

Part (b) was answered correctly by two thirds of candidates. The most common incorrect answer was 08.22 which was also written in various formats.
In part (c) 74% of candidates gave the correct arrival time in Stansted. The main errors came from the candidates not being able to add 27 and 28. The other error was to convert the hours to minutes and then forget that they can only have 60 minutes in an hour.

## Question 14

Most candidates who managed to get the perimeter of 20 went on to get a side of 5 cm. A large number of students showed confusion between perimeter and area, finding the area of the rectangle (8 × 2) and then going on to divide 16 by 4 to get an answer of 4. This was a very common error. A small number of candidates did not have equal lengths for the square. On very rare occasions, candidates failed to divide 20 correctly by 4 and gave an answer of 4. Also seen was a square length of 2.5 where only two rectangle sides were added, but still divided by 4. Overall, 45% failed to score and half scored all 4 marks.

## Question 15

In part (a) nearly all of candidates could correctly write down the correct distance James should sit from the screen. However, part (b) proved more challenging with 43% failing to score and quarter scoring 1 mark for identifying that they had to find the difference between 4.75 and 9.5. Whereas many were able to subtract 4.75 from 9.5 many could not. Many used 9.05 rather than 9.5. Those who tried the decomposition method often arrived at 4.85 or 5.25, both due to a failure to deal with the initial 0 in 9.50. Others counted on and their common error was in dealing with 0.5 as if it were 0.05 often leading to 4.30 or at times 5.30. Clearly time could be well spent in a classroom on such calculations – both formal and informal methods can work if used carefully.

In part (c) when incorrect answers were seen the error was usually arithmetic. There quarter of candidates scored 1 mark on this part.

In part (d) multiplying by 4 was normally seen to be the required approach to this question, but there were alarming arithmetic errors, mostly 4 × 12 = 44 and 4 ×12 = 36. A few candidates divided by 4. Those who looked at an attempt of adding 0.5 for every two inches, frequently had omissions in their patterns. two third of candidates scored both marks and a third failed to score.

## Question 16

Two third of candidates could not write down the mathematical name for the quadrilateral. The most common incorrect answer was 'rhombus'.

It was clear that a significant number of the candidates were unfamiliar with tessellation with 66% of candidates failing to score. Some drew 6 unconnected trapezia, often of varying sizes. Others drew a pattern which amounted to a combined tessellation of the given trapezium and a rhombus. Some did a rotation pattern (resembling a saw blade). It was obviously not a concept many knew as random drawings of rotated trapeziums or enlargements were seen or some simple drawings of every shape they could think of! Some drew rather casually but others were very precise and went well beyond 6 to form an elegant pattern. Only 32% of candidates scored both marks.

## Question 17

Candidates seemed to be aware that they needed to convert to a common format, with the most common method being to convert all the marks to 'out of 40'. Many candidates found either the 14 or 15. The most problematic conversion was finding $\frac{3}{8}$of 40 with the common error seen being 3 × 8, giving Wendy a winning score of 24. Errors in calculating 35% of 40 came from attempting to multiply by 35 then divide by 100. More popular, and for many it proved easier, was to calculate 35% by doing 10% + 10% + 10% + 5%. Any errors here were in finding the 5%. Percentage comparison was the least seen method, and was done with little success.

Working and conclusions were generally well presented, although some did not make clear which mark went with which person. In some instances candidates found the marks for Salma or Wendy, failing to realise that a comparison could only be made when all three had been converted into the same form.

Overall, 24% scored all 4 marks and 50% failed to score. 11% of candidates scored 1 mark for showing a correct method for one conversion.

## Question 18

Many candidates were not able to interpret the given graph correctly with only half of candidates providing the correct fixed charge.

Few candidates drew a graph for part (b) preferring instead to use substitution to calculate prices. Many did not seem to understand the term 'fixed charge' and some stated that Bill charged £11 per mile. The majority only compared one distance for Ed and Bill rather than several distances so that they could not compare long and short distances. Not many candidates found that 20 miles was the same price for Ed and Bill and as a result very few were awarded full marks. Overall 80% of candidates failed to score in part (b), 9% scored 1 mark (generally for a correct method to work out Ed and Bill's delivery cost for a particular distance) and a further 10% then went on to score 2 marks for providing a general statement.

## Question 19

It was pleasing to note that most candidates did show their working on this question. There were many ways to work out which pack gave the better value for money but two third of candidates could not provide one of these methods. The most popular method was to work out 4.23 ÷ 9 and 1.96 ÷ 4 which scored 2 marks. Unfortunately arithmetic errors in this division meant that the final mark was lost. The most common totally incorrect method was to work out the cost of 2 packs of 4 rolls and then just provide an answer of 9 pack or 4 pack, neither of which scored. Only 14% of candidates scored all 3 marks with a further 15% scoring 2 marks for a fully correct method with arithmetic errors.

## Question 20

Two thirds of candidates provided the correct answer to part (a) with 5 being the most common incorrect answer.

In part (b) 40% of candidates could find the median speed. Many counted the number of cars incorrectly when finding the median hence arriving at 43, 45, 43.5 or 44.5 etc.

Part (c) was well answered with half providing a range of 31. Many confused median with mean and mode. Many candidates did provide the two numbers involved in calculating the range, but either did not know what to do with the two numbers or could not do the subtraction correctly.

## Question 21

This proved rather difficult for the vast majority of candidates with full marks being very rare. Some assumed the triangle was equilateral and identified the angles *DAB* and *DCB* as 50. A fair number did realise that the first stage was to calculate (180 –50) ÷ 2, most then getting 65. Of these about half then were able to identify *x* as 45 or provide the working for this. A surprising number calculated 180 – 65 – 65 = 50 and then quoted angles on a straight line add to 180, indicating a misapplication of this theorem. Few scored well for the two communication marks. There were many statements such as a triangle is 180 or a straight line is 180 degrees. Of those who put reasons that were correctly expressed few identified equal base angles in an isosceles triangle.

There were a few candidates who managed to calculate *x* correctly but they were then unable to use the correct mathematical language to earn marks for their reasons. Others provided an answer of 45° without any working shown or any angles identified on the diagram. As this is a 'Quality of Communication' (QWC) question unless working is shown no marks can be awarded for *x* = 45°. This is a concept which needs to be taught strictly in schools as mathematical language must be used properly to gain communication marks. 11% of candidates scored 1 mark for either a correct method to calculate the base angles in triangle *BCD* or for getting this incorrect but then going on to provide a correct method to find *x*. 15% of candidates scored 2 marks. Candidates should be encouraged to write their reasons alongside the actual calculations rather than have a list at the beginning or the end.

## Question 22

Many found this a challenging question even though part (b) was a straightforward long multiplication. Over 50% of candidates failed to score on either part with a further 12% scoring just 1 mark often for 3.6 × 3 in (a). A common misconception by students was to calculate 32 × 60 as the area of the slabs with an answer of 1920 often seen. Quite a few candidates gained 1 mark in (a) for 6 and 5 or 10.8 but could not get any further.

Candidates were usually more successful in part (b). Many candidates used a grid but often made arithmetic errors. The most common 'grid methods' error was to try to incorporate the decimal point in their grid which led to conceptual errors with no marks scored. A significant number calculated 10 × £8.63 × 3 and added 2 × £8.63 but addition errors often occurred. The method involving breaking down 8.63 and 32 was very popular but in some cases there were place value errors by using 8, 60 and 3 which were not corrected afterwards.
Overall, only 12% of candidates scored more than 3 marks over both parts.

## Question 23

In part (a) many candidates got the answer 30. Of those who did not, the process to get from the given recipe to one 2.5 times as big floundered on finding half of 12! Many wrote 12 + 12 + 5. Others wrote 27 simply not using the amount of milk per shortcake, and doing 25 ml – 10 ml = 15. Others applied a build-up process 12, 24, 30 but then added all.

In part (b) many candidates wrote correct scale factors, often by the side of the recipe items, but then many failed to recognise that they needed to choose the smallest scale factor and gave 120 or 600 as their answer. Alternatively, all 4 scale factors were added and the result multiplied by 12. Scale factors were sometimes achieved by writing out the division calculations, but more did so by writing out the converse multiplication calculations.

Overall, 14% scored all 4 marks, a further 20% scored 3 marks, 20% scored 2 marks and 36% failed to score.

## Question 24

The vast majority of candidates found this question accessible, knowing the method to use and were happy to list either multiples or times. However, many made errors when going up in 24s with the most common error being 10 02 rather than 10 12 from adding 24 to 9 48. Some failed to acknowledge during their addition, that time has base 60 and calculated with 100 minutes in an hour. If they managed to get the times written accurately they were generally able to identify 11am as their answer. It was far more common to list times rather than multiples with LCM method rarely seen. A significant number of responses listed correct times well past 11am, and missed this as the next mutual time, as they did not line up in the two lists. However, over half of candidates failed to score, 16% scored 1 mark and 24% scored all 3 marks.

## Question 25

The success rate for part (a) was disappointing with only 37% expanding the bracket correctly. $6y - 5$ was a common error and $6y + 15$ was also seen a number of times.

Factorising is a challenging concept at this level and many answers to part (b) were blank. A number of attempts were made at adding or multiplying the two terms with only 4% scoring both marks and 8% scoring 1 mark. Of those who formed a bracket $8(x^2 + 2xy)$ was a common mistake. Of the rest partially factorising with 4 or $2x$ was the most common error. A few identified 2 as a common factor but went no further and so scored no marks.

In part (c) it was clear that the vast majority of candidates did not know how to answer this question and did not possess the required algebraic manipulation skills. It was rarely attempted and even rarer to see the correct answer with only 2% scoring 2 marks and 1% scoring 1 mark.

## Question 26

In part (a) many candidates missed the "twice a day" instruction, and went on to give an answer of 30.

In part (b) although many candidates recognised that 30 and 40 needed to be substituted into the given formula, many added the two values which meant they failed to score. For those who managed to multiply 30 and 40 together, reaching 1200, the challenge of dividing this by 150 proved too much.

Overall, 6% scored 4 or 5 marks, 25% scored 2 or 3 marks and 26% failed to score.

## Question 27

The last and most challenging question on the paper had only had 4% of correct responses with many not attempting the question at all. Of those who did answer, trial and (little or no) improvement was the most popular attempt – resulting in chaos on a page and rarely getting a correct answer A very small minority realised that adding all the expressions was probably required but they were either unable to add them correctly or stopped at $9x + 9$ with no idea how to form an equation with 360. Of those candidates that formed an equation, most used the sum of the angles of a quadrilateral but there were candidates who used the other properties of the parallelogram. At the other extreme, some candidates could recall that the sum of the angles should be 360, but they lacked the algebraic confidence to express this in the form of an equation. A very small number formed the equation, and solved it, correctly but this was very rare and very few method marks were awarded. 84% of candidates failed to score.

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