Principal Examiner Feedback

Summer 2013

GCSE Mathematics (Linear)

1MA0

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2013

GCSE Mathematics 1MA0
Principal Examiner Feedback – Foundation Paper 1

Introduction

The paper proved accessible with many candidates able to give good answers to a range of questions. In future candidates should ensure that, where appropriate, units are given with the final answer to each question. Knowing the conversions between metric units (eg. cm to m, g to kg) proved to be a weakness for a number of candidates. There was evidence of weak arithmetic in a number of questions, for example questions 5 and 13 where many candidates failed to gain full marks due to errors in arithmetic, frequently in subtraction but inaccuracy in basic addition was also seen. In general, candidates responded well to those questions testing quality of written communication (QWC) by showing all relevant working. There is still, however, a small minority of candidates who either fail to show working or else fail to give a conclusion where this is appropriate. For example, in question 13, the demand was 'does Mitch have enough money?' but a significant number of candidates failed to address this and just showed their working out with a numerical answer. In question testing QWC, conclusions must be given as a statement. It is not sufficient to circle the answer in the question or draw an arrow pointing to the answer. There was a noticeable lack of checking in many questions with candidates happy to give completely unreasonable answers. For example, giving the height of a girl as 183 m, 1.83 cm and 6.78 metres in question 7, the total cost of the tickets as £24 in question 17, the cost of 200 g of cheese as £1120 in question 19.

Report on individual questions

Question 1

The success rate in part (a) was very high. Some candidates clearly confused an isosceles triangle with an equilateral triangle as *C* was the common choice from those who got the question wrong. In part (b) a number of blank responses suggested that not all candidates had a protractor with them. There was evidence that those who did have a protractor sometimes had problems with using the scale; some candidates used the wrong scale and so gave an answer of 62^{o}, others read the correct scale incorrectly and gave an answer of 122° rather than 118°. Part (c) was well answered with 15 cm and 11.5 cm common errors from those who failed to gain the mark.

Question 2

The majority of candidates gave the correct answer but a sizeable minority gave an incorrect answer of 6, the height of both bars representing cheese sandwiches but not the total. A significant number of candidates gave 47, the total number of sandwiches, as their answer suggesting that they had not read the question carefully enough. In (b) a common error was to evaluate $28 - 19$ as 11 rather than 9. The majority of candidates found the number of white bread sandwiches and then subtracted the number of brown bread sandwiches although some employed a method of differences within each type of filling. Significant numbers of candidates gave an answer of 28 or 19 rather than finding the difference. Some candidates did struggle to take accurate readings from the graph when the bar was halfway between 10 and 12, for example, this was sometimes written as a frequency of 10.5 rather than 11.

Question 3

In part (a) significant minority of candidates either gave the name of one of the relevant caravans or else wrote down 6 and 8. It was rare to see an incorrect answer in part (b). Errors in part (c) were most likely to arise from the selection of the wrong figures, there were also a surprising number of misreads of 449 as 499 and lack of accuracy with the subtraction. In part (d) the majority of the candidates realised the need to multiply 12 by 30 (although not all could do this correctly) but the change from centimetres to metres proved more difficult. Some candidates just gave their answer as 360 metres and so ignored the need to convert from centimetres to metres while others used the wrong conversion factor.

Question 4

Many candidates made effective use of numbers lines to get to the correct answer in both parts of this question. However, errors in the counting along number lines were common.

Question 5

Many candidates were let down by their arithmetic in this question. It was not uncommon to see the correct method being attempted but with errors usually, but not always, occurring in subtraction. A significant number of candidates gave their answer as 77 - the number of boxes in the store room rather than the number that could be added to the store room. A common error was to start by adding 65, 17 and 29.

Question 6

The majority of candidates gave the correct answer to part (a). Of those who were incorrect the most common answer was 19 minutes which seems to be the time taken by the 10.30 train. A surprising number of students got part (a) incorrect – mainly due to poor arithmetic, not because they couldn't read the timetable. In part (b) the majority of answers were correct. However, 10 29 and 10 39 were also occasionally seen.

Question 7

When no units are given on the answer line then it is down to the candidate to provide these where necessary. In this question, many answers were given as 183 or 1.83 both of which scored one out of the two available marks. A common error was to add 1.78 and 5 rather than 1.78 and 0.05 or 178 and 5. Some candidates subtracted the 5cm instead of adding it. Common errors included 183m or 1.83cm, where candidates did not consider the context of the question.

Question 8

Counting the number of centimetres on the perimeter proved a challenge for many with the bottom of the shape causing the most problems. A significant number of candidates failed to give the units of cm with their answer, this was frequently omitted or else the wrong units, e.g. cm^2 were given. A common incorrect answer from the confusion of area with perimeter was 9 cm^2. In part (b) a significant number of candidates drew a shape other than a square with an area of 9 cm^2 or drew a shape with an area of 14 cm^2, again confusing area with perimeter. Others drew a square of the wrong area.

Question 9

(−3, −2) was a common incorrect answer in part (a)(i) although most candidates were able to both identify the point correctly in (a)(i) and plot the correct points in (a)(ii) although many candidates failed to label point *B* this was condones unless they had plotted additional points. Part (b) proved more demanding with relatively few candidates being able to draw the correct line. Most drew a diagonal line, often passing through *A* and *B* or the point (0, 3) alone was plotted. Some drew the line $x = 3$.

Question 10

The vast majority of candidates gained at least one mark in this question. The most common error was to repeat pairs. Some included (apple, apple), etc. though they then usually went on to repeat pairs as well. The candidates who worked methodically tended to get full marks. A few candidates used their own types of fruit rather than those given in the question or explained which fruits they thought would go well together or commented on the relative nutritious qualities of the fruits.

Question 11

This was a question that tested quality of written communication; candidates were also instructed in the question to show all their working. A small minority of candidates did not show their working and were penalised for this. The majority of candidates tackled the question by finding the cost of 30 pens from each shop and then stating their conclusion. Many candidates successfully tackled this problem by listing multiples. Some candidates did not achieve the "C" mark as they did not clearly express their conclusions and simply ticked or circled their choice, which was insufficient. Quite a few students finished this question by circling the part of the question giving info about Shop B instead of writing a conclusion comment – this combined with very poor conclusion statements for many who did attempt to make one suggests that the conclusion aspect of questions like this is a major weakness which really needs to be worked on. A common misconception was to think the prices were per pen and so obtaining 30 × £2 = £60 for shop A and 30 × £3 = £90 for shop B.

Question 12

Those candidates who worked out that each division on the gauge was equivalent to 10 litres generally went on to gain full marks. There was some confusion over where to put 80 on the gauge with a number of candidates putting it at the 'start arrow' position rather than at the full position. Many pupils showed the calculation of 60 – 50 = 10 and then put their final answer as 10. In part (b) carrying out the operation of 180 ÷ 15 proved more difficult for candidates than identifying that this was the correct process. Many used repeated subtraction or repeated addition, too often, errors were made. Some showed the correct process but then gave the answer of 120 rather than 12. Some candidates incorrectly thought that they could evaluate 180 ÷ 15 by working out 180 ÷ 10 and 180 ÷ 5 and adding their answers.

Question 13

As the information about prices was given using mixed units, it was essential that candidates showed units with the answer in this question. It was common to see candidates working with the prices of only three rather than four items, often omitting one cone. The majority of candidates added up the total and compared it with the amount of money available and then using the £4 and £4.10 to conclude that he didn't have enough money or stating that he was 10p short. Others showed Mitch buying one item with one of the coins and so on, this method was perfectly acceptable although it wasn't always easy to follow the working through. A small but surprising number gave the total of the coins as £3 and/or misread the prices given in the question. Probably the most common loss of the ‘C’ mark was for lack of units.

Question 14

Part (ai) was almost always correct. The reasons in part (a)(ii) were generally given as ‘add 5’ or else hinged on the numbers in the sequence ending in 2 and 7 so 27 being the next number to do this. A very few candidates identified the *n*th term and gave that as their reason. Reasons involving $n + 5$ gained no mark. In part (b) the most common reason was to state that numbers in the sequence ended in 2 or 7 which 45 did not. Stating that 45 was not in the sequence because 42 and 47 were was also frequently seen.

Question 15

3.3 and 0.33 were common wrong answers for $x = 0.5$ When the value of x was an integer, there was a much higher success rate. Plenty of success was also evident in the final row in the table where the inverse rule had to be used.

Question 16

Part (a) was well answered. Part (b) proved to be a good discriminator. Some candidates picked up a method mark by showing the intention to start with either 3×3 or 4×5. However, starting correctly did not always mean the correct answer, those who started with $3 \times 3 = 9$ then frequently went onto and 4 and then multiply by 5 to give the common incorrect answer of 65. Another common incorrect answer was 50 from those who started with 3×3 but evaluated this incorrectly as 6 and then went onto add 4 and multiply by 5 rather than add 20. Also, 26 was another common response from those candidates who incorrectly evaluated 3^2 as 6 but correctly evaluated 4×5 as 20 and added the two together. Finally, 15 was a common incorrect answer in part (c). There were a significant number of blank responses in part (d) with 8 being the most common incorrect response from those who attempted the question.

Question 17

It was rare to see an estimation attempted; the majority of candidates worked with the figures given in the question. Much time was wasted by candidates engaging in long drawn out multiplication calculations. Most managed to score at least 1 mark in this question by attempting $2.95 \times 21 \times 39$.

Question 18

Part (a) was well done although a significant number of candidates gave an answer such as 'unlikely or impossible' rather than a numerical value. Incorrect notation such as 1 : 6 was also seen. In part (b) a common incorrect method was to divide 120 by 7 rather than 6. In some case, $\frac{1}{6}\times120$ was evaluated as $\frac{120}{720}$.

Question 19

A common misconception was that 1kg is equivalent to 100g. Candidates who wrote this down then went onto double the given price so that £11.20 was a very common incorrect answer. Some who knew that 1kg is 1000g, then stated that 500g would cost £2.80 and 250g would cost £1.40 but were unable to work out the cost of 200g. A number of candidates realised that the calculation needed was 5.60 ÷ 5 but were unable to carry this out accurately with £1.20 being given as a common incorrect answer.

Question 20

Those who realised that the total of all the numbers on the cards must be 40 generally went on to gain full marks. However, this first stage proved beyond many candidates. Few candidates used an algebraic method and formed an equation. Some attempted it with occasional confusion with the 'range' found instead of the mean. Most frequent answer was 33 or '$\frac{33}{3}$ = 11' Quite a few errors were made in just adding the numbers on the cards!

Question 21

Part (a) proved surprisingly difficult for many, C was a common incorrect answer. Greater success was evident in part (b). In part (c) many of the tessellations were of a hexagon and a triangle or rhombus rather than just a hexagon. When this was the case, no marks could be awarded. Some candidates started drawing what could have been a correct tessellation but failed to show how the hexagons would fit together round a point and so fill an area.

Question 22

The first two parts of this question were almost always correct. Part (c) was also well done although there was some inaccurate reading of the graph. Providing candidates showed working then one mark could be awarded for a correct method if just one of the readings used was incorrect. However, many write down an answer alone so, in the event of the answer being incorrect, no mark could be awarded. In (c) a significant minority misread the second graph. Dropping a line from the end point to the horizontal axis usually led to a correct reading.

Question 23

Success was very high in part (a) but then decreased throughout the rest of the question. 2 was a common answer in (c) where the candidates divided 8 by 4 instead of multiplying. $9t$, $5t$, $6t$ and $6 + t$ were common incorrect answers in part (d). Some candidates although able to expand the bracket then went on to give an answer of $9t$.

Question 24

Some very good solutions were seen to this question with all working present and well organised; a two way table was the most successful (although rarely seen) method where the cast majority of attempts gave full marks. On the other hand, some candidates worked in a very unordered fashion showing multiple attempts. If it was clear which attempt and therefore method resulted in their chosen answer then this would be marked. But if, as on many occasions, an examiner was presented with a mass of calculations with no clear path through these then no marks could be awarded. Equally, some candidates made a correct start to the process but then abandoned this and started again. Again, the final answer determined which working should be marked. The most common incorrect method seen was to add up the given figures of 10, 8 and 13 then subtract the answer from 40. Such an approach gained no marks. Candidates who used a two way table were able to provide an organised solution. Several who did not use a table gave 17 + 5 rather than 17 + 8 for the number travelling by car.

Question 25

In questions testing quality of written communication there is no answer line given. It is therefore important that the candidate makes it absolutely clear which is their final answer and, in the case where an angle is the answer, links the answer with the name of the angle. Too many candidates left 50° somewhere in their working and failed to link it with angle x. Geometric reasons must be given in full. It is not sufficient, for example, to state 'a triangle is 180°. A common error was to sate that the marked lines were parallel instead of equal. Some candidates also identified the triangle as equilateral rather than isosceles.

Question 26

Whilst many candidates did attempt a translation in (a) it was frequently the wrong one. There were many rotations and reflections seen rather than a translation. In part (b) the part of the description most likely to be omitted was the centre of rotation. 'Turn' or 'rotational symmetry' are not an acceptable description of a transformation, 'rotation' must be used. A significant number of candidates gave more than one transformation and so scored no marks.

Question 27

Some very good solutions were seen. However, in many cases, arithmetic errors or incorrect calculations led to the loss of one or more marks. It was disappointing to see a number of candidates get to a correct final calculation of 240 − 216 and then give the final answer as 34 or 124 rather than 24. There were two main methods of solution used by candidates. The most popular was to work through in the order given, working out 15% of 240 and $\frac{3}{4}$ of 240 then subtracting these values from 240. There were two common errors seen by those who took this approach; the first was to work out and use just $\frac{1}{4}$ of 240 , the other was to work out 15% of 240 and subtract this from 240, leaving 204 and then find $\frac{3}{4}$ of 204. Both errors were serious enough to mean that candidates were only able to gain the method mark for the correct method to find 15% of 240. The other common method was to add up 15% and $\frac{3}{4}$ to get 90% and then conclude that 10% of students ‘did not know’. Some candidates stopped here, gaining two of the available marks, other candidates went on correctly to evaluate 10% of 240.

Question 28

The most common method employed by those candidates who attempted this question was trial and improvement. This approach resulted in either full marks or no marks. A minority of candidates did attempt to form an equation from the given information. Some omitted to add all four sides and so equated the semi-perimeter to 32 rather than the perimeter. A significant number of candidates who correctly arrived at $8x = 12$ were then unable to get to the correct solution with 1.4 being a common incorrect answer, which came from using the remainder 4 for the decimal when dividing 12 by 8. A common algebraic error was to simplify $4 + 3x$ as $7x$.

Question 29

There were many candidates who made no attempt at this question. A surprising number of candidates just plotted the point (−2, 4). This is a correct point on the line (a minimum of two correct points were needed to gain a method mark), however, it seemed more likely that candidates were simply reading the last part of the demand 'values of x from −2 to 4' and using this information to plot the point. The most successful candidates were those who drew up a table of values and then plotted their found points. A significant number of candidates who took this approach gave incorrect values of y for negative values of x but usually did enough to gain two marks for the correct line in the first quadrant. A significant minority of candidates did plot a number of points correctly but then omitted to draw a line through these and so lost the final accuracy mark. Others, had difficulty with the scales.

Summary

Based on their performance on this paper, candidates are offered the following advice. They should:

- Ensure that, where appropriate, units are given with the final answer to each question.
- Know the conversions between metric units (e.g. cm to m, g to kg)
- Check arithmetic carefully
- Show all necessary working
- Present working so that it can be followed through, explain what is being worked out where appropriate

GCSE Mathematics 1MA0
Principal Examiner Feedback – Foundation Paper 2

Introduction

The vast majority of candidates completed their answers in the spaces provided and many showed the steps in their working.

It was pleasing to see so many candidates showing the intermediate stages in their calculations.

A significant number of candidates did not use a ruler to draw straight lines or a pair of compasses to draw a circle.

Some candidates used different colours to distinguish information in their diagrams and candidates should be reminded to use different shading or a different style of points instead.

A surprising number of candidates did not use a calculator to check their long hand calculations.

Candidates should also be reminded that, unless they are specifically asked to measure the length of a line or the size of angle in a diagram, they should not expect the diagrams to be accurately drawn.

Report on individual questions

Question 1

Most candidates were able to write the words in numbers in part (a). Common errors were 2058 and 2805.

Most candidates were also able to write the numbers in words in part (b). Common incorrect answers seen were 'fifty one thousand and eight' and 'five thousand one hundred and eighty'.

Part (c) was not done well. Few candidates could write down the value of the 9 in the number. A common incorrect answer seen was 0.9

In part (d) most candidates could write down the number correct to the nearest 10. A common incorrect answer seen was 167.

Question 2

Generally this question was not done well. Few candidates could write down a sensible imperial unit for centimetres, or a sensible metric unit for ounces. The most common incorrect answers here were ‘metres’ (for the imperial measure for centimetres) and ‘pounds’ (for the metric measure for ounces). Many candidates were able to write down a sensible metric unit for pints, usually ‘litres’.

Question 3

Parts (a)(i) and (a)(ii) were generally done well by candidates.

In part (a)(i) many candidates used the right-angle symbol or an angle arc as an additional marking to the letter R. Some labelled the angle on the corner rather than inside the shape. Incorrect answers were rare, with most of these identifying the obtuse angle above the right-angle.

It was more common for candidates not to do this part of the question than it was to see a response where the angle was labelled incorrectly

In part (a)(ii) many candidates were able to name the type of angle indicated. A common error seem was for candidates to measure the size of the angle.

Parts (a)(iii) and (b) of this question were not done well.

In part (a)(iii) few candidates could name the type of angle indicated. By far the most common incorrect answer here was ‘obtuse’.

In part (b) many candidates incorrectly drew a line parallel to the existing line or joined the point T to the ends of the line A and B. Few candidates used a construction method to find the perpendicular line, but most candidates that did use this method did it correctly. A significant number of candidates did not attempt the question.

Question 4

Part (a) of this question was generally done well. A common incorrect answer seen was $m5$.

Part (b) was done well. A common incorrect answer seen was $2p^2$.

Although part (c) of this question was generally done quite well some candidates did not remove all the multiplication signs from their simplified expression.

Candidates should be advised to use standard notation when writing algebraic expressions, i.e. with the number term at the beginning of the expression not at the end.

Question 5

This question was generally done well. The most common approach was to change the information in the pictogram to frequencies and gave the final answer as $\frac{40}{200}$, or $\frac{1}{5}$ after simplification. The most common incorrect answers seen were 40 on its own and $\frac{40}{160}$ where Tuesday's total had not been included in the denominator.

A significant number of candidates were unable to simplify the fraction correctly, but as this was not a requirement of the question and candidates were able to score full marks if a correct fraction had been seen. A final answer of 20% was relatively rare.

Question 6

Most candidates were able to draw a circle with the correct radius using a pair of compasses in part (a), but there were a significant number of free-hand attempts. A common error here was to use the middle of the letter *O* as the centre for the circle rather than the end of the line.

Part (b) of this question was not done well. Many candidates were unable to draw a suitable chord in the circle. The most common correct answer here was a diameter. The most common incorrect answers were tangents, sectors and radii.

Question 7

Most candidates were able to find the shortest route between Ambel and Ford. Many candidates attempted only one of the possible routes between the two towns often resulting in the common incorrect answer 120. Another common incorrect answer was 10, the shortest distance in the diagram. Some candidates, having calculated the three shortest routes between Ambel and Ford did not identify explicitly the shortest of these routes.

Question 8

Both parts of this question were generally done well though some candidates added the 4 and 3 rather than multiplied them in part (a).

In part (b) most candidates were able to substitute $d = 2$ into the formula and calculate the value for P.

A significant number of candidates wrote an answer on the answer line without showing the substitution stage of the calculation.

There was a surprising number of candidates who simply replaced the d in the formula with a 2 which resulted in the common incorrect answer 39, obtained from 42 – 3. Another common incorrect answer here was 3, obtained from 4 + 2 – 3.

Question 9

This question was done quite well. Many candidates were able to find the difference between $\frac{1}{4}$ and 30%, usually by first changing $\frac{1}{4}$ to 25%.

A common incomplete answer for this was to omit the % sign. Most candidates attempting to find the difference of decimal numbers were able to change 30% to 0.3, but many of these were unable to find the difference correctly, giving their final answer as (0.30 – 0.25 =) 0.5.

Few candidates attempted to find the difference as fractions.

Question 10

Most candidates were able to draw a suitable diagram to compare the numbers of cars sold by Kitty and George. The most popular diagram used was a comparative bar chart, usually with the bars for each month drawn together, but also with a separate bar chart for each person.

It was equally common for candidates to identify the individual bars with a name as to use shading and a key. Most candidates were able to draw a suitable linear axis for the frequencies and plot the correct values for at least one of Kitty and George.

By far the most common omission in these diagrams was the labelling of the vertical axis. A different approach to drawing a comparative bar chart was to represent the frequencies as points.

In many of these diagrams the distinction between Kitty's frequencies and George's frequencies was not always clear as the candidates had used different colours to represent each person, and the scanning of their scripts rendered the colours poorly.

Candidates should be advised to use different shading, or a different style of points, to distinguish information in their diagrams and **not** different colours.

Question 11

Generally few candidates were able to score all 3 marks of this question.

A common incorrect answer for part (a) was 18.

In part (b) writing down the multiple of 7 from the list was done best.

In part (c) a significant number of candidates were unable to write down the square number from the list. A common incorrect answer seen was 11.

Question 12

Some candidates got confused between the various statistical measures in this question and correct calculations were often seen in the wrong places.

Most candidates were able to order the given data in part (i) and use the middle values to work out the median. Common incorrect answers seen were 3, 4 (both the middle terms) and 3, 5 (both the middle terms of the unordered data).

In part (ii) most candidates were able to work out the range of the numbers. A small number of candidates gave their final answer as 2, 6.

Part (iii) of this question was done quite well but a significant number of candidates did not show any working. When working was present it frequently lacked a final division by 10.

Question 13

This question was not done well. Many candidates had difficulty interpreting the scale. A common mistake seen was 14 pounds = 6.2 kg (instead of 6.4 kg).

The most common approach to this question was to change 9 stone 6 pounds to pounds (132 pounds) and then divide this total into two or more parts, e.g. 130 + 2 and use the conversion graph for each part.

A significant number of candidates changed 14 pounds into kg, multiplied this by 9 and then added 6 (pounds), i.e. forgetting to change the 6 pounds to kg.

A small number of candidates thought that 9 stones 6 pounds was 9.6 stones, and consequently multiplied this by their possibly correct conversion of 14 pounds to kg to arrive at an incorrect number of kg.

Question 14

Most candidates were able to work out the total amount of money that Angela and Michelle got and state clearly which of these got the greater amount.

Some candidates simply stated the totals without showing how these were obtained. Candidates should be reminded to show all stages of their work and to write their conclusions in words, not just circle their choice.

A common error seen was for candidates to show the correct working for Michelle as $6.5 \times 7 + 15$ but then write the answer to this as 60.05.

The majority of candidates gave their answers with the £ sign included.

Question 15

Most candidates were able to use tallies to record the numbers of coins and complete the frequency column. Some candidates wrote the frequencies in the tally column and used the frequency column to record the total amount of money for each coin, and some gave their frequencies as sixteenths or with money notation.

Question 16

In part (a) of this question many candidates had difficulty writing down the number of vertices on a cube. A common incorrect answer seen was 12, the number of edges of a cube.

Most candidates were able to draw a correct net for a closed box in part (b), usually cross-shaped. A common incorrect answer seen was for candidates to draw a net for an open box.

A significant number of candidates started drawing their nets using 2 × 2 cm squares for each face. This resulted in difficulties with fitting all six faces on the grid. As a result some candidates extended the grid, some reduced the size of one or two faces and some omitted to include the sixth face altogether.

In part (c) few candidates were able to work out the surface area of the cube. By far the most common incorrect answer seen was 27, i.e. the volume of the cube.

Other common incorrect answers were 5 × 9 (the surface area for an incorrect number of faces, 36 (from 12 × 3 the total length of the edges) and 18 (usually from 6 × 3).

Question 17

Most candidates were able to use the information in the table to change £600 to Euros in part (a), usually by calculating 6 × 120.

It was perhaps surprising that a significant number of candidates chose to do this calculation by long addition.

A common error in this approach was to forget to carry the 1 from the tens column to the hundreds column to arrive at an answer of 620. Another common incorrect answer here was 72000 (from 120 × 600).

In part (b) many candidates had difficulty working out the difference in the cost of the laptop in consistent units. The most common approach here was not to use a conversion factor of 1.2 from the table, but to build up a combination of values from the table.

By far the most common incorrect answer seen was 80, where candidates simple subtracted the given amounts without any attempt to change currency.

A significant number of candidates converted <u>both</u> costs into the other currency before doing the subtraction.

Some candidates, having obtained the correct difference in a consistent currency, put the wrong currency symbol with their answer, whilst others did not attempt to include a currency symbol at all.

Question 18

Many candidates had difficulty working out the number of games won for both Caroline and Marc.

A common approach for Caroline was to find a quarter of 52 and either subtract it from 52 (common) or multiply it by 3 (rare).

Many candidates did not realise that the 120 degrees given in the pie chart represented a third of the total number of games won. Most simply calculated a quarter of the total and added a bit on.

A significant number of candidates did not use the information for the total numbers of games played and just added or subtracted the angles, e.g. 360 – 90 – 120.

Question 19

Part (a) of this question was done quite well. The most common approach here was to divide the lengths in the picture by the corresponding lengths in the tile.

A significant number of candidates, having found correctly these lengths (5 and 8) then went on to add them together rather than multiply them. Many of those candidates attempting to compare the areas of the two shapes were unable to calculate 100 × 120 correctly, typically giving this as 1200.

A relatively common incorrect method was to compare the perimeters of the two shapes.

The most common approach in part (b) of this question was to find 10% of 52 and then double it.

Few candidates used a multiplier of 0.2 or $\frac{20}{100}$. A significant number of candidates, having found correctly 20% of 52, then went on to add, or sometimes subtract, this from 52.

A surprising number of candidates did not give their final answer in correct monetary notation, typically 10.4 or 10.04 (often from 10.4 seen); however the use of correct money notation was not being tested in this question.

Another relatively common error here was 32, i.e. 52 reduced by 20.

Question 20

This question had a mixed response. The most popular approach was to calculate the internal angles of the triangle.

A significant number of candidates thought that the triangle was isosceles (some thought that it was equilateral). A common incorrect approach here was to either calculate the angle *ACB* correctly as 45 degrees and then state the angle *ABC* as 45 degrees or to calculate both the angles *ACB* and *ABC* (i.e. the 'base angles') as 55 degrees.

Few candidates were able to state the reasons for their calculations correctly, often omitting to use the word angle, e.g. 'the triangle is 180 degrees'.

Candidates should be advised to state the reasons for their calculations *with* the calculation, not at the end when it is unclear which calculation is being justified by the reason.

Most candidates were able to identify their calculations clearly with the angles by simply labelling the diagram, but candidates not using this approach should be advised to use a suitable unambiguous notation, eg labelling the internal angles *a* and *b*, to identify the angles. Most candidates gave their final answer in the form $x = \ldots$

Question 21

Part (a) of this question was generally answered well. Most candidates could extract the various prices from the table and use these to find the total cost and the amount of change that should be given.

Errors in this question were often due to candidates extracting an incorrect price from the table or for simple numerical errors in the calculations.

As in previous questions it was evident that many candidates preferred to do the calculations without the use of a calculator.

Most candidates gave their final answer in the correct money notation.

In part (b), as in the previous percentage question, few candidates used a multiplier to calculate the percentage.

Most found 10% and then 5% and then added them together. A significant number of candidates did not subtract their calculated value from the original price and just gave their final answer as 0.39.

Some candidates increased the original price rather than decreasing it. A popular incorrect answer here was 2.45, i.e. 2.60 reduced by 15, not 15%.

Question 22

This question was done quite well. Most candidates were able to work out that they needed 2.5 times the quantities in the recipe and were able to scale these quantities accordingly.

A common approach was to add the quantities for 18 + 18 + 9 mince pies. Relatively few candidates used the unitary method to find the quantities. A significant number of candidates lost the accuracy mark because they rounded the amount of butter need to 562 or 563, or they omitted to calculate one of the ingredients, usually the eggs.

Those candidates attempting the unitary method often lost the accuracy mark due to premature rounding. Some candidates lost marks because they did not show how they got their answers.

Candidates should be reminded to show all the stages of their calculations- particularly in questions involving Quality of Written Communication (QWC).

Most candidates were able to identify a shortage in the mincemeat for the pies, but some just stated that there were not enough ingredients to make the mince pies and did not identify which ingredient was short.

Question 23

Most candidates were able to identify at least one thing wrong with the question in part (a), although some candidates had difficulty in stating precisely what they thought was wrong with the question.

Common unacceptable answers here were ‘there isn’t a full range’, ‘there needs to be more options’ and ‘there isn’t a box for don’t buy magazines’.

Those candidates that did well in part (a) generally did well in part (b), usually providing a suitable question with answer boxes to correct the errors they had identified in part (a).

A significant number of candidates either gave only a question or only the answer boxes, even if they had identified errors in both the question and the answer boxes in part (a).

In part (c) few candidates could state clearly why taking a sample of Mason’s friends at school would not give a good sample.

A significant number of candidates continued criticising the question rather than identifying a problem with the sampling method.

A common unacceptable reason here was ‘his friends might not tell the truth’.

Question 24

Many candidates were able to use a trial and improvement method to find an estimate to the equation giving their trials to an appropriate degree of accuracy.

A significant number of candidates compared the answers to their approximate roots at 4.6 and 4.7 rather than attempt a further approximation with an increased accuracy of the root to 2 decimal places.

A surprising number of candidates attempted approximate roots at 4.6 and 4.65 correctly but then gave their final answer as 4.65, ie forgetting to round this to 1 decimal place.

A common incorrect method here was to evaluate their trial solutions by adding 2 to their x^3 rather than by adding $2x$.

Question 25

Few candidates made much progress with this question, though many were able to score at least one mark for $\frac{7}{10}$ or 70% .

The most successful candidates were those who started with an amount of money, usually £100. Many of these attempts resulted in an amount of money being given as the final answer rather than as a fraction of the initial amount.

A common error here was to confuse the shares for Emma and Dave.

Question 26

Few candidates were able to score full marks on this question, though many were able to score at least one mark for expanding the brackets.

Many candidates had difficulty in isolating the terms on either side of the equation. Common errors were based on fundamental misunderstandings of algebraic processes, e.g. $x + 7$ written as $7x$ and incorrectly moving terms from one side of the equation to the other side, usually by not changing the sign of the term.

Most of those candidates who attempted to find the solution by trial and improvement were unsuccessful in their attempts.

Question 27

Few candidates were able to score full marks on this question, though many were able to score at least one mark for $1.35^2 + 3.25^2$. A significant number of candidates did not square and add the lengths of the sides but doubled and squared them.

Some candidates, having used the correct process to work out 12.385, rounded this to 12.4 before taking the square root.

Candidates should be advised to use all the figures on their calculator display rather than an approximation of these figures. A very common incorrect method here was to multiply the lengths of the sides, usually to work out the area of the triangle.

Summary

Based on their performance on this paper, candidates are offered the following advice. They should:

- use standard notation when writing algebraic expressions, ie with the number term at the beginning of the expression not at the end.
- use different shading, or a different style of points, to distinguish information in their diagrams and **not** different colours.
- show all stages of their work and to write their conclusions in words, not just circle their choice.
- state the reasons for their calculations *with* the calculation, not at the end when it is unclear which calculation is being justified by the reason.
- show all the stages of their calculations- particularly in questions involving Quality of Written Communication (QWC).
- use all the figures on their calculator display rather than an approximation of these figures.

GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 1

Introduction

Candidates appear to have been able to complete the paper in the time allowed.

Most candidates seemed to have access to the equipment needed for the exam.

The paper gave the opportunity for candidates of all abilities to demonstrate positive achievement.

Many candidates are setting out their working in a clear, logical manner though there are still some candidates whose performance on questions involving several stages of working might be helped if they improved this aspect of their work.

Candidates are advised to write down their method in detail, particularly in questions which focus on the quality of written communication.

The skill of estimating answers and carrying out checks to see if answers are sensible is invaluable. Many candidates would have gained several more marks if they had shown the ability and presence of mind to do this. For example, not only was estimating expected in question 8, but it could help candidates in question 1. Neither of these questions was particularly well answered. Checking of arithmetic may have helped many candidates avoid a loss of marks in questions 2, 5, 6 and 18.

Report on individual questions

Question 1

Part (a) of this question was well answered with over two thirds of all candidates being awarded the mark for a correct answer. Part (b) was poorly done even by some of the best candidates. Commonly seen incorrect answers included 17.93. An estimate (300 000 ÷ 2) could have helped candidates with this part of the question.

Question 2

Most candidates found this question straightforward and scored full marks. The normal route taken by candidates was to work out 15% of 240 and ¾ of 240, add the answers and subtract from 240. Some candidates took the easier route and converted ¾ to a percentage, added 15% to 75% and so were left to work out 10% of 240 to get the answer. A significant number of candidates left the answer as “10%” Very few candidates worked in decimals. One of the most common errors see was “240 – 216 = 34”. A check of their arithmetic might have helped many candidates to avoid a loss of marks here. Some candidates subtracted the 36 from 240 then calculated ¾ of their answer so 153 was a commonly seen incorrect answer. An incorrect final answer of 51 (204 − 153) was also seen often.

Question 3

This question was well answered by the great majority of candidates. The stem and leaf diagrams seen were generally accurate with a relatively small minority making an error, usually missing one weight out of their diagram. Some candidates did not order the data. Candidates are advised to check that the number of entries in the diagram corresponds to the number of pieces of data given in the question. Keys were nearly always given but a significant number of students left out the decimal point and so could not be awarded the mark for the key. Other candidates unnecessarily included decimal points in their diagram.

Question 4

This question was generally well answered with the majority of candidates obtaining at least 3 marks for their responses. Nearly all candidates were able to expand $3(2 + t)$ in part (a) of the question. In part (b) nearly all candidates scored at least one of the two marks with most candidates giving a fully correct answer. Commonly seen incorrect answers included $6x^2 + 15$ and $6x + 15x$, sometimes simplified to $21x$. Part (c) was also answered well with most candidates being awarded 2 marks though a common error was to write 13 as the constant term. Some candidates lost marks by making errors in trying to simplify $m^2 + 10m + 3m + 30$.

Question 5

Most candidates used the factor tree method in their responses to this question. Though candidates appeared to understand what they needed to do, regrettably many of their attempts were spoiled by their inability to find correct pairs of factors, that is, they were let down by weak arithmetic. Candidates who completed the factor tree diagram successfully sometimes listed the prime factors but did not express their answer as a product so could not be awarded the mark assigned for a fully correct answer. “1” was sometimes included as a prime factor.

Question 6

This question was answered correctly by most candidates. A trial and improvement approach was very common. This sometimes led to students leaving their answer embedded in a numerical expression rather than writing it on the answer line. Of those candidates who did not give a correct answer many were unable to express a complete method clearly, though a significant proportion of candidates were able to show that the “40” had some significance or that adding the 3 given numbers 12, 6, and 15 might help. A commonly seen incorrect answer was “17” (usually obtained from adding the 3 numbers given incorrectly) suggesting that a check might have led to fewer incorrect answers. $(12 + 6 + 15) \div 4$ was also seen frequently.

Question 7

This question was a good discriminator. The great majority of candidates translated the given shape in part (a) of this question, but a significant proportion of these candidates applied an incorrect translation, in many cases moving the shape by 2 places to the left and 5 units upwards or by only 4 units to the right. Of those candidates who used an incorrect transformation, rotation was commonly seen. Part (b) of the question was also answered well. Most candidates gave a single rather than a combined transformation as required. When candidates did give more than one transformation they usually combined a rotation with a translation. This scored no marks. Some candidates who gave a single transformation did not give full details of the transformation so only scored part marks. Other candidates used vector notation to express the centre of rotation. This was not acceptable.

Question 8

Candidates were presented with two challenges in this question. Firstly, they had to decide on the calculations needed to work out the number of bottles that could be filled with milk and secondly, to find an estimate of this. Most candidates gained some credit for their responses, usually for identifying an appropriate calculation. However, the number of candidates who took the easiest route to find an estimate, ie to round values correct to one significant figure then work out $\frac{20 \times 300}{0.5}$, was relatively small. Instead many candidates either failed to round any of the quantities or rounded only one of the quantities, usually 21.7 to 22. As a result they made calculations more onerous and prone to error. Division by 0.5 was confused with dividing by 2. This question clearly identified an area where candidates would benefit from more practice.

Question 9

This question was answered quite well and about two thirds of candidates scored full marks. Most candidates wrote out multiples of 50 and multiples of 80 in order to find the lowest common multiple – they were generally successful. Examiners were able to give some credit to candidates who showed a clear intention to do this but who made arithmetic errors on the way. Some candidates did not count the first pair of numbers and gave 7 and 4 as their answers. Candidates sometimes converted their times to minutes and seconds. This was unnecessary and made the task more difficult. A significant number of candidates identified 800 as their common multiple and went on to give 16, 10 as their answers. This gained partial credit. Candidates who expressed each of 50 and 80 as a product of prime factors often made no further progress; they could not use this to identify the lowest common multiple and subsequently give a correct solution.

Question 10

Not surprisingly this question was successfully completed by the more able candidates and there were many fully correct answers seen. These candidates had generally found the formation and solution of an equation straightforward. However, a significant proportion of candidates either formed an expression or equation involving the area of the rectangle or added the expressions given for the two sides to form the incorrect equation $4 + 3x + x + 6 = 32$. There were many attempts using a trial and improvement approach – these were often unsuccessful.

Question 11

This question was not well answered by most candidates with less than a third of candidates gaining all four marks. There were many possible approaches but by far the most common was to attempt to work out Debbie's speed so that it could be compared with Ian's speed. This was tackled with varying degrees of success. Most candidates recorded a pair of values for the distance travelled and the time taken by Debbie, usually 30 km in 24 minutes and were able to express the speed as 30 ÷ 24 but far fewer could evaluate this and ensure they compared the two speeds using the same units. A significant number of candidates extended the travel graph for Debbie's journey to find that she travelled about 38 km in 30 minutes and deduced that her speed, in km/hour could be found by doubling this figure. Other candidates noticed that 25km were covered in 20 minutes and easily converted this to 75 km/h. A minority of candidates drew the line representing Ian's journey and though this was often done correctly, candidates were not always able to gain the communication mark because they did not clearly draw the comparison between the speeds and the gradients of the lines. Candidates did not always show their method in sufficient detail in this question specifically targeting the quality of written communication.

Question 12

Many candidates taking this paper found this question to be straightforward and they often scored full marks. Lines almost always extended over the full range of values for x. However a significant proportion of candidates made errors when substituting negative values into the equation, when evaluating $\frac{1}{2}x$ or when using the vertical scale on the grid, for example plotting (1, 5.25) instead of (1, 5.5). Candidates who drew a graph which was not linear often failed to score any marks because they did not show a clear method.

Question 13

It is disappointing to report that many candidates could not show a bearing of 037° and so were unable to access the first mark in this question. Many students drew 053° (drawing 37° from the horizontal). However most candidates appeared to know what they needed to show and a good proportion of candidates drew the arc of a circle with radius 5 cm, centre *C*. Other candidates showed that a point on the ship's course would lie less than 5cm from *C* and explained that the ship would therefore sail closer than 500m from *C*. Explanations were usually given in a clear statement drawing on evidence from the candidate's accurate drawing. This was not always the case though and some candidates either left the question unanswered or provided inadequate diagrams, for example drawing lines 5 cm long from *C* without any explanation.

Question 14

Part (a) of this question was quite well done though some candidates were unable to use the correct notation, ie that of empty or solid circles, at each end of the interval. A relatively common error was for candidates to draw a line from −1 to 3. It would appear that these candidates assumed that the values needed to be integers but then drew a continuous line between the 2 values. Some candidates indicated the correct end points of the interval but did not draw a line joining them. In part (b) candidates often found the critical value 3.5 or equivalent and so gained one mark. However 3.5 alone or $x = 3.5$ was often written on the answer line and examiners could not give this full marks. Poor manipulation of the inequality was also commonplace with incorrect simplifications such as $2x \geq 1$ seen.

Question 15

Most candidates made a good attempt at this question. Their approach was usually to find the total thickness of the 500 sheets of paper and compare this with the depth of the paper tray. This was often done successfully with a clear statement made in conclusion. A common error was to write 9×10^{-3} either as 0.0009 or as 0.09. Candidates who had previously shown the product $500 \times 9 \times 10^{-3}$ had already gained some credit and could score a further communication mark but candidates who had just written 0.0009 or 0.09 could not access these marks. Few candidates used the alternative approach of working out the thickness of each sheet of paper if exactly 500 could be stored in the tray and then comparing their answer with the thickness of a sheet of paper as stated in the question.

Question 16

This reverse percentage question provided a straightforward test for many of the more able candidates who found the calculation routine. There was however a large proportion of candidates who did not understand what they needed to do and merely added 30% on to the sale price so £455 was a very commonly seen incorrect answer. Although candidates who equated £350 with 70% usually went on to get the correct answer, some of them then seemed to ignore the statement they had just written down and instead calculated 10% of 350 leading to an incorrect answer. Candidates who wrote £350 = 70% then £50 = 10% were generally more successful than candidates who attempted to calculate £350 ÷ 0.7 Candidates who gave incorrect answers such as £50 or £150 might have found their error if they had carried out a common sense check on the size of their answer after reading the question again.

Question 17

This proved to be a challenging question for the vast majority of candidates on this paper. Many candidates failed to show their working in an organised manner and they rarely made it clear exactly what they were working out. As a result examiners were faced with working scattered all over the working space with little explicit description of the strategy the candidate was using. It was often difficult to make out whether candidates were using volumes, areas or lengths. Some candidates employed methods involving the division of a volume or a rate by a length to find a time. Whilst a reasonable number of candidates were awarded some credit for their responses, only a small number were able to see the problem through to a successful conclusion. Some candidates worked with a cuboid rather than a prism.

Question 18

This question was quite well attempted. About one third of candidates gave a fully correct answer and about one half of candidates gained some marks for a correct method. Generally, the accuracy in working was good though many candidates made errors involving multiplication or division with negative numbers, for example $-19y = -57$ followed by $y = -3$ The alternative method of rearranging one equation and substituting into the other was rarely seen. Methods involving trial and improvement were more commonly seen but were rarely successful.

Question 19

Many candidates showed some understanding of the relative size of the powers of 5 in this question and were able to score at least one mark for ordering three or more of the numbers correctly or for evaluating 5^{-1} or 5^{0} correctly. Unfortunately, a significant proportion of candidates evaluated either 5^{-1} or 5^{0} incorrectly as -5 or 0.5 and 0 respectively and so could not be awarded full marks. A surprising number of candidates did not show that -5 was the smallest of the four numbers listed.

Question 20

The best candidates gave clear and concise solutions to this question. However most candidates were unable to make much headway in giving accurate expressions for the area of the square or for the area of the unshaded triangles or for the sides of the shaded triangle. A large proportion of the algebra seen was spoiled by the omission of brackets, for example by expressing the area of the square as $4x \times x$ or as $4x^2$ instead of $4x \times 4x$, $(4x)^2$, or $16x^2$ or in attempts to use Pythagoras rule. The square root sign was often used wrongly or ambiguously. These errors led to many candidates failing to score any credit for their attempts. Most candidates used the method of finding the area of the square and subtracting the areas of the three unshaded triangles but there were some excellent solutions harnessing Pythagoras rule to find the lengths of the sides *NM* and *BM* and then the area of triangle *BNM*. A significant proportion of candidates did not attempt this question.

Question 21

This question acted as a good discriminator between candidates. Well over a half of candidates were able to gain at least 2 of the marks for completing the cumulative frequencies accurately and making a good attempt at drawing the graph. However there is still a group of candidates who plot frequencies rather than cumulative frequencies and a surprisingly large number of candidates drew a bar chart. Despite the fact that it was stated in the question that the total number of students was 60, some candidates did not check their final cumulative frequency against this and so severely restricted the number of marks available to them for their responses. A minority of candidates plotted the cumulative frequencies against the midpoint or lower boundary of each interval instead of the upper boundary. Part (b) of the question was less well answered, particularly the part requiring candidates to estimate the interquartile range. Less than a half of the candidates gained any credit for their responses to this part of the question.

Question 22

This question was answered poorly by all but the best candidates. Candidates usually found the correct length of the larger prism but then also doubled the cross sectional area rather than multiplying it by 4, so answers of 600 with or without units were often seen. A small number of candidates successfully answered the question by working out the vertical height of the triangle *ABC*, doubling the dimensions of the prism then working out the volume of the larger prism. A large number of candidates were able to score at least one mark for stating the correct units.

Question 23

About one in six candidates scored full marks for their solution to this question with examiners awarding one mark to candidates who realised the need to express the denominator of the fraction as a product of factors and making a good attempt to do this. A good proportion of candidates began by expanding the numerator rather than factorising the denominator so, even if they did go on to factorise the denominator, they did not always identify the common factor.

Question 24

More able candidates often scored full marks on this question. Responses were often either fully correct or fully incorrect. Less able candidates drew diagrams with the heights of the bars proportional to the frequencies. A small proportion of candidates who were unable to produce a diagram deserving of any marks were awarded one mark for working out at least three frequency densities. Where part marks were scored for a diagram, errors seen often involved the bar representing the final class interval.

Question 25

This question was poorly answered. It was clear that only a small minority of candidates were well practised in the technique of completing the square. Candidates who realised what was required often went on to carry out this technique but then spoiled their responses by writing $a = -4$, $b = 5$. Other candidates wrote $(x + 4)^2 + 5$ then $a = 4$, $b = 5$. This was clearly incorrect working and could not be awarded the marks. “8” and “21” were commonly seen incorrect answers. Part (b) was answered correctly by only a small minority of candidates with many of the more able candidates failing to see the connection between the two parts of the question.

Question 26

This question discriminated well between the more able candidates taking this paper. There were many good concise and accurate solutions to this question usually including the use of a tree diagram. Most of the candidates who recognised that a tree diagram was appropriate also realised that the problem involved non-replacement of the coins and so used fractions with denominators 10, 9 and 8. The focus of the question was not on simplification of fractions so answers where fractions which were not given in fully simplified form, for example $\frac{126}{720}$, were awarded full marks. Weaker candidates usually lacked a strategy to follow and often gave answers from little or no working.

Question 27

A significant proportion of candidates could express *SQ* correctly in terms of **a** and **b** though there were a substantial number of candidates who had no idea how to tackle this question. Pythagoras rule, the formula for the area of a triangle and other formulae were used to give incorrect expressions such as $\mathbf{a}^2 + \mathbf{b}^2$ and $\frac{1}{2}\mathbf{ab}$. Some candidates' responses in both parts of the question consisted of numerical ratios. There were some good answers to part (b) of the question but candidates often showed poor communication skills in writing vectors by omitting brackets – for example expressions such as $\frac{2}{5} - \mathbf{b} + \mathbf{a} + \mathbf{b}$ were commonplace. Attempting to simplify vector expressions also caused difficulties for many candidates. It would seem that many candidates could benefit from further practice in the manipulation of vectors.

Question 28

This question proved to be a good discriminator between the most able candidates. In part (a) the most commonly seen incorrect answers seen included (1, 0) and (0, 90). In part (b) candidates were awarded the mark available if they convinced examiners through their sketch that they had applied a one way stretch, scale factor 2, in the direction of the *y* axis. Evidence looked for included the graph intersecting the *x* axis at the same points as the given graph together with a good attempt to show that the range of the graph should be $-2 \leq y \leq 2$ Candidates were not penalised for not labelling the *y*-axis or the curve with the values −2 or 2, as long as the intention was clear. Translations of the curve by 1 unit in + *y* direction were often seen as were graphs similar in shape to $y = \cos 2x°$. This question was often not attempted.

Summary

Based on their performance on this paper, candidates are offered the following advice:

- Check arithmetic carefully
- Make sure they can estimate the answers to calculations
- Give an inequality sign as part of the answer on the answer line when asked to solve an inequality
- Read questions involving percentages carefully in order to decide whether the question involves the use of reverse percentages, for example, finding the original price of a sale item
- Make sure that in questions involving several stages they explain what is being worked out at each stage.

GCSE Mathematics 1MA0
Principal Examiner Feedback – Higher Paper 2

Introduction

This is a calculator paper; however there appeared to be some candidates who tried to attempt the paper without the aid of a calculator. This is not advisable, since calculation errors will cost marks.

Many candidates were able to make inroads into some of the unstructured questions, whilst still gaining marks on questions which had a more traditional style.

Many able candidates lost marks in the easier questions in the first half of the paper, such as misuse of scales in question 3(a). To gain the highest marks candidates had to demonstrate high order thinking skills in a range of questions, not just in those questions towards the second half of the paper.

Failure to show working to support answers is still a major issue and this does prevent candidates gaining the marks their understanding probably deserves.

Report on individual questions

Question 1

There was evidence that some candidates did not read the question with enough care with many calculating the volume instead of the surface area. Of those who worked with area, common errors included poor arithmetic, adding together edges instead of areas, and a failure to include all 6 sides.

Question 2

Candidates employed a variety of methods to solve this question. One method involved finding the scale factor (2.5) and scaling up the ingredients, a second involved finding the number of pies one ingredient could produce, whilst a third method involved finding the number of times batches of 18 could be produced (i.e. $2\frac{1}{2}$).

Question 3

Surprisingly a significant number of candidates plotted the first point at (1,8400) thereby losing the first mark.

A correct relationship was stated by most candidates, who should also be reminded that if a statement of correlation is chosen as an alternative this should include the word “correlation”.

Part (c) was also well answered. Some wrote the answer incorrectly as 660 but as long as some method was given (such as drawing lines on the graph) a method mark could be awarded; candidates should be encouraged to draw lines of best fit when making estimates such as this.

Question 4

A high proportion of candidates gained full marks for this question; however there was a significant minority that lost marks through poor arithmetic.

The most common approach was to add the given probabilities and subtract these from 1. Some stopped at 0.63, but the majority then multiplied by 200.

A less successful method was to find estimates for the individual or combined probabilities of losing or drawing the game; some stopped there, whilst some went on to subtract from 200. Giving the answer inappropriately as $\frac{126}{200}$ was penalised by 1 mark.

Question 5

There were many good answers to this question. In part (a) many made mention of overlapping boxes, missing time frames or failure to accommodate values greater than 12, however stating ‘no option for those who did not buy magazines’ did not attract credit.

In part (b) most candidates incorporated their suggestions from part (a), though not always. The most common loss of marks was through the failure to include a time frame. Those who used inequality symbols were presenting a question that was not fit for purpose.

The most common correct answer in (c) related to ‘his friends being the same age as him’, and the biased nature of the sample. Others referred to the need to have a larger sample.

Question 6

Too many candidates failed to show the fact that 60 × 60 = 3600, with many incorrectly using just 60 throughout their calculations.

Most candidates showed 15000 ÷ 20 (= 750) but often failed to continue correctly after this point. Some tried to calculate by constant reduction, e.g. repeated divisions by 10 or by halving.

A common error was to reach 4.1666 but then multiply by 20, and some calculations suffered from premature approximation which then rendered the final answer incorrect.

The main problem was that very few candidates included units at each stage, probably because they did not understand what their numbers represented.

Question 7

Many candidates were troubled with the combination of ratio and fractions. Many went straight to $\frac{2}{10}$ and $\frac{3}{10}$ as they centred on the ratio rather than the fact they were working with $\frac{7}{10}$ of the money.

Others started with $\frac{7}{10}$ but then failed to include the division by a ratio, some dividing by 2 or 3 rather than 5.

Some made up an amount of money which they then used in calculation, which frequently gained full marks however leaving an answer in a form such as $\frac{2.8}{10}$ was insufficient.

Question 8

Candidates frequently realised that they had to either divide the shape into manageable areas, or take the triangle away from a whole rectangle.

There were a variety of approaches used in this question. In general triangles and rectangles appears to have been more successful than introducing a trapezium, although failure to include the "$\frac{1}{2}$" in triangle calculations cause problems for some candidates.

Weaker candidates chose incorrect dimensions for shapes they had chosen to work with. Most realised it was easiest to calculate the area and then multiply by £2.56; those who introduced this earlier usually lost their way in poorly presented workings.

In presenting answers some candidates did not have sufficient confidence in their own answers and divided by 100, thinking that the final amount was too much for resurfacing the playground, and that it could be done for $\frac{1}{100}$ of the cost.

Question 9

Nearly all candidates worked within the right angled triangle to find angle *ABQ*, and most then went on to give angle *x* as 55°.

The mark for giving an appropriate reason within the context of the question was not always earned since a geometrical reference had to be precise such as "alternative" or "corresponding". Hence merely stating "parallel lines" or "Z angles" was insufficient. It is always useful to show the angles on the diagram as well as in working.

Question 10

Candidates are now aware that they need to show all their working, and the answers to their trials.

Most candidates were able to score either 3 or 4 marks for this question. Common errors included evaluating 4.6 and 4.7 and then to look at differences from 110 rather than evaluate a 2 decimal place answer (e.g. 4.65), or giving a solution to more than 1 decimal place, or rounding incorrectly to 4.6.

Question 11

The only major error was in subtracting rather than adding; however the majority of candidates recalled Pythagoras' correctly, although some failed to perform a square root at the end.

Those attempting trigonometry frequently found this approach difficult and invariably were unable to complete the solution.

Question 12

In part (a) most candidates were able to gain a mark for either multiplying out the brackets or dividing through by 3. Too many then had problems isolating terms.

In part (b) a minority of candidates identified multiplication by 5 as the first step. The difficulty in dealing with a negative y term was evident, with many choosing to ignore the negative sign.

Question 13

In part (a) most understood that they needed to find halfway between the coordinates. Some found half of the difference between the co-ordinates rather than the mean. Most candidates found at least one value.

Responses to part (b) were disappointing. Common errors included confused signs and incorrect division, and even mixing x and y coordinates.

Question 14

The more successful candidates set out their work in a clear manner for each bank, showing calculations from year one and year two. Some candidates failed to realise this was compound interest or added the interest rates before using them. Most candidates made a recommendation of bank at the end of their calculations.

Question 15

The only x-value candidates had any difficulty with was $x = –2$, which usually led to an incorrect 0 for plotting. Though this was clearly wrong on the graph candidates still plotted this incorrect value.

A common error in part (b) was to leave the points unjoined, or to join them with straight line segments.

In part (c) few candidates realised the significance of the graph for finding the solutions, instead most preferred to solve them by either factorising or by using the formula method.

Question 16

Most candidates identified angle *OTP* as 90°, either in working or on the diagram. Many also went on to give *POT* as 58°. The majority also recognised triangle *SOT* as isosceles and were therefore able to move to give the correct answer.

The reasons however were often poorly expressed and candidates need to spend time learning these geometrical rules in order to quote them accurately.

Frequently candidates attempted a description that linked tangent with circle or circumference (rather than radius); a second reason was also needed for full marks, which was again frequently misquoted, or was unrelated to their working.

Candidates who merely listed verbatim lots of rules were penalised unless those rules related to their working.

Question 17

In part (a) most scored full marks.

In part (b) there were some trivial comparisons, but most candidates were able to gain a single mark from comparing the median or interquartile range. To gain full marks at least one of these needed to be expressed in terms of the context of the question, making reference to the money. Simply listing the values for the measures is not comparative and should be discouraged.

Question 18

Many candidates showed poor understanding of the order of the steps required and misplaced signs or lost terms caused errors. The most common first step appeared to be showing an intention to add 4 to both sides. There were some candidates that tried dividing through by 3, however this was far less successful.

Most candidates realised they had to find a square root somewhere, but frequently this was done too early in the process, before an equation of the form $p^2 = ...$ had been formed.

A significant minority found the square root of the numerator only, but of concern are those candidates whose presentation of the answer was ambiguous: it was not clear whether the square root was intended to go over the entire fraction or not; some missed off the “$p = ...$” from their final answer. Full marks could not be awarded in these cases. The use of flow diagrams rarely led to any marks.

Question 19

Part (a) was usually answered correctly.

In part (b) candidates either recognised the link to difference of two squares and were able to give the answer, or failed to recognise it and attempted other forms of manipulation which failed to attract any credit.

In part (c) candidates appeared to find it difficult to recognise that this was a quadratic that would factorise into two brackets. Many flawed attempts at factorising into a single bracket were seen.

Question 20

Many correctly identified Cosine as the method of solution, found the angle and wrote an appropriate statement to go with it. Some candidates however tried Pythagoras with either the Sine or Cosine Rule with varying degrees of success.

Question 21

There were many successful answers to this question. Sometimes a correctly stated process was incorrectly calculated, or a sample size for the wrong key stage was worked out.

Question 22

This was not answered well, with many non-attempts. The biggest problem was an inability to write proportionality statements or equations, especially involving inverse proportion.

The value for r was not squared in many cases; nor were they able to use the reciprocal of r^2.

A common incorrect answer was 5.44 (from a direct proportion solution).

Question 23

Many candidates were able to identify at least one bound, but very few correctly paired the upper and lower bounds. Weaker candidates just calculated 170 ÷ 54.

The most successful candidates used the standard 54.5 and 53.5 rather than attempting to use recurring decimals.

Question 24

Whether candidates gained any marks was dependent on whether they chose the correct formula from the formula page.

They then had to substitute the correct values. Candidates need to be reminded that Pythagoras cannot be used in a non-right angled triangle, and that setting calculators for use of degrees (rather than rad or grad) is also vital to gaining full marks.

There were many correct answers in part (a), though weaker candidates multiplied 6 × 7, showed (6 × 7) ÷ 2 = 21 or 0.5 × 6 + 7 sin 60°.

In part (b) many failed to apply the correct order of operations, or failed to take a square root.

Question 25

Those that understood the method usually applied it and gained marks, but for many haphazard or trial and improvement methods resulted in zero marks.

Too many candidates attempted to create a second equation in order to use the elimination method of solving simultaneous equations and it was not uncommon to see $x + y = 2$ squared to give $x^2 + y^2 = 4$.

Expansions of $(2 – x)^2$ was also sometimes done poorly, leaving incorrect quadratic equations for solution.

Sketch graphs always failed to deliver the accurate required for the solutions.

Summary

- All candidates should ensure that they have all necessary equipment, particularly a calculator when sitting a calculator paper
- Candidates should remember to show all their working in order to support their answers.
- Centres need to continue practicing the solutions to unstructured questions. Many candidates were able to make inroads into some of the unstructured questions, whilst still gaining marks on questions which had a more traditional style
- Centres need to be aware that many able candidates lost marks in the easier questions in the first half of the paper, such as misuse of scales in question 3(a). To gain the highest marks candidates had to demonstrate high order thinking skills in a range of questions, not just in those questions towards the second half of the paper. Centres need to emphasise easier questions as much as the harder ones.

GCSE Linear Mathematics 1MA0
June 2013

1MA0			A*	A	B	C	D	E	F	G
1F	Foundation tier	**Paper 1F**				73	60	47	35	23
2F	Foundation tier	**Paper 2F**				70	57	44	32	20
1H	Higher tier	**Paper 1H**	80	63	43	24	12	6		
2H	Higher tier	**Paper 2H**	85	68	48	29	14	7		

(Marks for papers 1F, 2F, 3H and 4H are each out of 100.)

1MA0		A*	A	B	C	D	E	F	G
1MA0F	Foundation tier				143	117	92	67	43
1MA0H	Higher tier	165	131	92	53	26	12		

(Marks for 1MA0F and 1MA0H are each out of 200.)

Grade boundaries are set by examiners for the whole qualification at A, C and F and the intermediate grades are calculated arithmetically. Thus, for example, the overall grade for B at Higher tier falls midway between 131 and 53 at 92. By the same token the grade boundaries on each of the higher tier papers are strictly 43.5 and 48.5 but are rounded down for the purposes of the table above. Similarly for the E grades at Foundation tier.