Examiners' Report
March 2013

GCSE Mathematics 1MA0

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Foundation Tier: Paper 1F

Introduction

Some very good work was seen from many candidates in this paper.

Many candidates were able to give good answers to a range of questions.

The standard of working out for the quality of written communication (QWC) questions, when seen, was often easy to follow and led to many candidates receiving the majority of marks available.

Overall, many candidates lost marks through:

- failing to add and subtract correctly (single, two-digit and three-digit numbers) giving answers only which were incorrect despite being close, indicating that they had used the correct method but had made errors in their number work
- poor literacy skills and, on occasion, such poor handwriting that it was impossible to decipher what was written. There were also occasions where candidates seemed to answer a different question to the one asked
- producing working out in a random manner, which makes it difficult to see if the calculations given are valid for that part of the question.

Reports on individual questions

Question 1

The vast majority seemed to answer part (a) easily. Again, part (b) was well answered.

The vast majority also seemed to answer part (c) easily. However, the standard of candidates' responses was variable. Many struggled to draw a quarter-circle and this was usually why they lost marks. Common errors were half-circles, squares and sectors more like a third or fifth of a circle.

Question 2

A noticeable number of candidates did not attempt part (a). Various combinations of incorrect lines were chosen, including lines that met on the diagram.

Part (b) was more successful with very few candidates failing to get the mark.

Part (c) was generally well answered with spellings such as 'accute' still gaining the mark. However 'cute' was not accepted. The most common errors were 'obtuse', 'right angle' and 'reflex'. There were also a number of candidates who misunderstood the question and measured the angle instead.

Part (d) was not so well answered with some candidates giving inaccurate readings of values around 130˚ or reading in the wrong direction and giving an answer of around 60°.

Question 3

Almost all the candidates gave fully correct answers for part (a).

Part (b) was well answered, with only a small number of candidates not able to order the negative numbers.

There was a majority of correct answers for part (c). However, some candidates showed a lack of understanding of fractions, decimals and percentages and few candidates showing any working out.

Question 4

Part (a) was accessible to all with most candidates scoring the mark. Part (b) was also accessible to most with the majority scoring the mark.

In part (c)(i), most candidates were able to list the outcomes correctly and gained the two marks here with very few mistakes. The most common error was to go past 6 as a score on the dice or to use three different letters as well as numbers.

For part (c)(ii), many candidates failed to see the link with their combinations and gave the answer as a half, or equivalent. One or two attempted to calculate the answer using other methods such as a tree diagram. An answer of $\frac{3}{6}$ was a common response, as was $\frac{3}{11}$, when the candidate did not include the given combination.

Only occasionally was the answer given as a ratio or in words.

Question 5

A huge variety of approaches were seen here. The most successful candidates set out their work in a logical way, with a few words of explanation at each stage, rather than relying totally on the calculations to explain their thought process.

The first method on the mark scheme was the most popular. However, where the 'knocking off coins' method was seen, it was generally successful. Candidates who failed to realise that the price for the apples needed halving ran into problems, often stating that Sarah would not have enough money to buy both items. They should realise that if the question asks how much change will be left, then a positive/possible value is expected.

This was a QWC question that clearly asked for all working to be shown. Candidates who did not show any working for the total of the fruit and simply wrote £1.50 lost marks, as it was possible for them to have got the answer by simply adding the given two values, 30p and £1.20. Encouragingly, even where £0.20p or 0.20p was seen in the working, most candidates were able to express their answers using correct money notation.

Question 6

Part (a) was accessible to all. Most candidates scored two marks. Those who scored one mark usually lost the other mark because they only drew two lines or through very inaccurate drawings. A ruler would have helped produce straight lines.

Part (b) was well answered. The most popular incorrect answer was 4.

In part (c), it was evident that many Foundation candidates continue to confuse area and perimeter, and many answers of 34 were offered. Some candidates calculated 70 and then doubled, some combining concepts of both area and perimeter.

7×10 on its own was awarded a method mark.

Question 7

Part (a) was accessible for almost all candidates. The majority answered part (b) correctly and part (c) was also very well answered.

Part (d) showed a wide variety of answers. The most common misconception was that the range was calculated by finding the difference between the largest and smallest frequencies, i.e. $5 - 2 = 3$. Another error was taking the same two frequency columns and finding the difference between the two marks, i.e. $13 - 12 = 1$. Another error was to take the total number of students and divide by 5 to obtain the answer 3.4. On occasions, candidates thought that the range and the median were the same and wrote the full list of marks in order, starting with the smallest, and crossed them off from each end to obtain a range of 13.

In part (e), some candidates thought that the total number of students was found either by $10 + 11 + 12 + 13 + 14 = 60$ or the previous calculation, and dividing the 60 by 5 to get the answer 12. Many added the vertical axis values as opposed to the bar heights getting $1 + 2 + 3 + 4 + 5 = 15$. Of those who tried the correct method, too many could not add the five single-digit numbers correctly and an incorrect answer of 18 was commonly seen.

Question 8

Part (a) was well answered.

Part (b) was generally poorly answered. Many candidates did not seem to be able to deal with the concept of time correctly.

A disappointing number of candidates chose to do $7 - 3$ minutes and $45 - 28$ minutes, thus just taking the smallest value from the largest in each time unit. Additionally, a large number of candidates completed this task assuming that time is a decimal unit. They tried to half or double the times given but too often arrived at 6.90 or 3.64. The use of time units was also a challenge for most candidates.

Question 9

Part (a) was quite successfully answered and, although some candidates gave $a4$ rather than $4a$, this was not penalised. The most common error was to write 4^a or a^4.

Parts (b), (c) and (d) were also well attempted with most realising what was expected.

Part (e) was not well done on the whole. Most candidates showed no working; those who did mainly chose not to solve the question using a traditional algebraic technique. Very little use of the flowchart method was seen, but it was successful where used. It was common to see 5 given as an incorrect answer, especially following an embedded approach.

Question 10

In part (a), many candidates were able to give one of the two acceptable answers. The most popular incorrect answer was rhombus.

Part (b) was slightly better answered than part (a). However, spelling was a challenge.

Many predictable misconceptions were seen in part (c). Again there was confusion between area and perimeter. Also, some candidates used the sloped edge instead of the vertical height multiplied by 3. Other candidates gave the area as 8, indicating the rectangle around the parallelogram.

Far too many candidates showed no working out. Also careless errors such as $2 \times 3 = 5$ were seen.

Question 11

Part (a) was well answered. Most candidates were able successfully to write down the coordinates of G and many also found the coordinates of H correctly.

In part (b), candidates who had drawn a line between the two points were generally more successful at finding the midpoint. Many gained part marks by either indicating on the diagram or by writing one correct coordinate. The most common answers that scored no marks were (1,0) where candidates had not made any mark on the diagram.

Question 12

Part (a) was well answered, with the majority of candidates scoring both marks.

Many candidates scored some marks on part (b). However, fully correct answers were less common in this part of the question.

In part (c), candidates who chose to show working out scored well, although a good proportion thought there are 380˚ in a quadrilateral. All too often candidates lost all marks, although their answers were close, because there was no working out to mark.

Question 13

In part (a), the majority of students managed the substitution and gained both marks. However, a common error was to multiply the 16 by 5, leading to an answer of 80.

More seemed to struggle with part (b) with many errors in number work. Common errors were $40 - 12 = 38$ or 28 divided by 4 equalling 6 or 8.

Where the common error in part (a) was seen (giving an answer of 80), this usually resulted in an incorrect answer of 2.5 hours in part (b).

Question 14

On the whole, part (a) was successfully answered.

In part (b), a variety of approaches was seen: some were very succinct and easy to follow, others were a mass of numbers and exchange rates.

A variety of exchanges was used and it was clear that candidates were confident in using conversion graphs to convert one value, but not as a tool in a multi-stage problem. The scaling of the exchange rate often led to further inaccuracies.

The other major issue was that a large number of candidates seemed to be confused about which currency they were using and converted in the wrong direction.

Question 15

This question was well attempted by all, with most gaining at least part marks.

A large majority of candidates managed to identify three numbers that totalled 20, although some failed to realise that these had to come from the given list. A few misunderstood the question and instead found three pairs. However, even if the pairs they had selected contained no more than one incorrect prime, they were still awarded the first method mark.

Additionally a lot of candidates were able to correctly identify two primes as part of their answer, but a large number thought that '1' is a prime number, suggesting that this topic needs further reinforcement.

A number of candidates correctly identified three primes that did not total 20. For those who correctly identified three primes that did total 20, 2, 7, 11 was the most popular choice.

Question 16

In this question, simply listing multiples of 9 and 12 would have gained two marks, but unfortunately candidates made simple arithmetic errors.

When candidates tried to list the times, they again made careless errors or struggled to deal with changing the hour. A few pictures of clocks were drawn.

A good proportion of correct answers were seen.

Question 17

This was well answered, although some candidates drew elaborate diagrams. A tally chart was all that was required. Some candidates just drew two columns and so scored part marks.

Question 18

This question wasn't answered as well as expected, bearing in mind that this type of question has been in the last few exam series. Finding 70˚ seemed to be quite easy; most candidates who found 70˚ knew which angle it applied to, but following it with a complete method to find *x* was rare.

Candidates are getting better at using the correct terminology, as the reasoning for angles in a triangle and angles on a straight line was often correct. However, candidates are still struggling to gain the communication by not giving **complete** explanations of their reasoning. Parallel lines were often mentioned despite not being present.

Question 19

As expected, a wide variety of methods was employed for this question, some to great effect, others less so. The decimal point caused a problem for many candidates trying to employ a grid method, often ending up with 1, 80, 3 × 40, 7. Those who chose to ignore the decimal point and reinsert it at the end were significantly more successful. The grid methods proved popular and were carried out by many reasonably well. Candidates who used repeated addition often either incurred too many errors or seemingly lost sight of what they were doing, and so scored nothing. With the 'traditional' method, a number of errors came from answers in the wrong columns or confusion over which number to put down/carry forward. Most candidates remembered to 'leave a gap' or 'add the zero'.

The candidates who made no more than one multiplication error were largely successful at placing the decimal point and thus many scored two of the available marks. The most common multiplication error was 7 × 8.

Some candidates treated this as an estimation question. Whilst an estimation might aid candidates to see if the answer achieved was sensible, it was not an estimation question.

Question 20

Part (a) was relatively well answered with many candidates being able to give at least one correct answer. However, some candidates repeated the same reason twice, just using different words to mean the same thing. Only one mark was awarded.

Part (b) was less well answered. Too many candidates continued to discuss the questions rather than the concept of bias. Few candidates seemed to be comfortable with the concept of bias.

Question 21

A fully correct answer was rare for this question a most Foundation candidates struggled to use all three pieces of information. Few candidates managed to get the two relatively simple marks for both the line 3 cm from *DC* and the arc 5 cm from *C*, as many chose to draw only one. A few candidates lost marks for not extending the line/arc far enough.

It was rare to see a good attempt at the angle bisector; a few candidates believed they could just join *A* and *C*. For those who did draw the bisector, construction lines were not necessary for the mark. Common incorrect answers included random patches shaded in or small pictures of trees.

Question 22

This was a multi-stage problem but using relatively easy mathematics. Very few candidates did formal percentage calculations, with most stating '10% is...'.

Candidates who were able to follow the question through were often successful.

Most candidates used the method of 6 × 200 and 4 × 350 first and then worked out the percentages and a number got to £200 and did not add this to £530.

Occasionally candidates worked out 10% and 5% of £530. Others mixed up the calculations for the car and home insurance. Too many added 1200 and 1400, and gave an answer of £2600.

Question 23

As the last question on a Foundation paper, this was still accessible to a lot of candidates.

Many managed to get started and work out 32 girls and 48 students. Some stopped at that point, gaining only two of the marks. Others then multiplied by 4, forgetting about the first school. However, many were able to carry on to successfully find 240 students. Those who tried the ratio method often came unstuck after stating three parts, commonly continuing to then divide 16 by 3. All too frequently, answers that gained no marks included those where candidates had interpreted the ratio the wrong way and proceeded to halve 16 as well as those who simply did 16 × 5.

Summary

In summary, based on their performance on this paper, candidates should be advised to:

- Show full working out. More evidence of working out should be offered to allow part marks to be awarded.
- Check arithmetic working for careless mistakes.
- Clearly answer the question asked.
- Produce working out in an ordered manner.
- Use short, clear sentences to answer descriptive questions.

Foundation Tier: Paper 2F

Introduction

All questions on this paper were accessed by the great majority of candidates.

Presentation of work was much improved compared with that of November 2012, although at times it was difficult to distinguish between figures, eg 4 and 9, especially in Q19(a).

Failure to show working is still a major issue and this does prevent candidates gaining the marks their understanding probably deserves. This was particularly true in the quality of written communication (QWC) questions, Q4(c), Q14 and Q24(b), where many candidates lost marks by not explicitly showing their methods. Centres should impress upon candidates that, in these types of question, a written statement in conclusion that also includes correct units is often required, numerical answers alone being sufficient to gain full credit.

Candidates need to be aware that premature rounding can cause inaccuracies and marks lost in final answers.

Q20(b) and Q22(c) showed that very few candidates at this level understood the concepts of bearings and gradient.

Lack of equipment, including ruler, compasses and protractor, caused some problems. There appeared to be a large number of candidates who either did not have access to a calculator or chose not to use it for some arithmetical calculations. Centres need to encourage candidates to state explicitly where any calculation is being carried out with a calculator.

Question 1

Most candidates gained at least 3 of the 4 available marks in this question. For part (b), although most answered correctly, a common incorrect answer was 'Nine thousand and fifty'. Although slight spelling errors are overlooked, candidates need to ensure that slips do not lead to ambiguity in meaning. In part (c), a common mistake was to write 28.75 to the nearest 10 (30) instead of the nearest whole number. In part (d), rounding up was not uncommon.

Question 2

This was very well answered with the majority gaining the full 3 marks. There were very few errors in parts (a) and (b); if marks were lost, it was usually for a poor explanation offered in part (c). 'It goes up in 2s' or '82 is not in the 2 times table' were not uncommon incorrect explanations. Quite a number of responses demonstrated logic that would have been incorrect if the sequence had been $2n$ + anything other than zero.

Question 3

Reading of the dials in parts (a) and (b) was usually accurate but a significant number of candidates made mistakes with their placement of an arrow in part (b), with 225 and 120 appearing as common incorrect answers. Very few candidates indeed failed to earn the mark in part (c).

Question 4

Parts (a) and (b) were usually answered correctly. In part (c), the majority of candidates scored at least 2 marks, usually for correct addition. Many failed to achieve full marks as their solutions often did not include a statement explicitly stating who spent the greater amount of time on their mobile phone. Centres must understand that when quality of written communication (QWC) is being assessed, simply underlining or circling, in this case 'Nick', is not enough to gain the credit; nor was the statement 'Nick used his phone for 64 minutes and Dave used his phone for 58 minutes.' Centres should encourage candidates to double-check calculations to prevent the loss of the accuracy mark from arithmetical errors that are avoidable on a calculator paper.

Question 5

A very straightforward question, but many candidates failed to shade the required number of squares to illustrate three quarters; 3, 4 and 8 shaded squares were the most common mistakes. Some candidates risked losing the mark through very minimal or inconsistent shading styles, which might have made their intention unclear.

Question 6

This question was very well answered indeed with few candidates failing to achieve full marks. Any errors made were either arithmetical, which should not occur on a calculator paper, or in assuming that the 15 and the 9 were all getting on the bus.

Question 7

This question was, in general, answered well. Errors made were usually through dividing by 2 or 4 instead of 3 after subtracting Sally's share, or by dividing the full amount by 3, ignoring Sally's share. Arithmetical errors were also made by a significant number of candidates and some whose final answers were very close to the correct figure lost all marks through lack of working shown, despite the likelihood that a correct method had been used. It was not uncommon to see candidates using 'tally' marks to try to split the amount into equal shares, perhaps implying that candidates did not fully understand the concept of dividing the amount by 3, as this would have been a simple calculation on a calculator.

Question 8

Part (a) was usually correct, with occasional errors seen with one or two of the intervals or with completing the tally but not the frequency column. This is another example of where candidates could be encouraged to carry out a check of their work, in this case by checking their total frequency matched the number of candidates in the raw data given. Some less able candidates simply transcribed each of the test marks into the respective tally rows and then totalled each row to complete the frequency column. In many of these cases, however, part (b) was correct. Many of the errors in part (a) suggested that no simple checking had been carried out.

Question 9

Although the majority were able to construct an accurate circle of radius 5 cm, it is of concern that many candidates either did not have access to a pair of compasses or, if they did, were unable to use them efficiently. In addition, a few drew smaller circles, indicating possibly that they thought the diameter was 5 cm, ie confusing radius with diameter.

Question 10

Part (i) was usually answered correctly, but in parts (ii) and (iii) many candidates showed a lack of understanding of factors and multiples and the difference between the two. In part (ii) 5 and in part (iii) 90 were the most common mistakes made. In part (iv), 100 and 30 were common errors as candidates showed their lack of understanding of a cube number.

Question 11

Most candidates scored at least 1 or 2 marks here, usually for 9.39 × 10 and correct units in their answer. Mistakes were made, however, by candidates either failing to understand the need to buy just 10 cartridges or assuming that the pack of 3 cartridges could be readily split. So many found the difference between the cost of 4 packs (12 cartridges) and £93.90 and many found the 'cost' of one cartridge from the pack (£24.30 ÷ 3) and added this to the cost of 3 packs. It must be noted here that correct monetary notation is an issue; 9.39 × 10 often became £93.09 which led to unnecessary inaccuracies.

One independent mark was awarded in this question for correct units; the correct answer of £11.61 often came without.

As candidates have become more familiar with 'better buy' type questions, there was evidence that some did not read the question with enough care; many failed to find the difference in prices and some just identified the cheaper option.

Question 12

Very few candidates gained full marks in part (a); the majority, however, gained 1 mark for the selection of shapes B and D in either part (a)(i) or part (a)(ii). In selecting B and D in part (a)(ii) only, many candidates failed to show complete understanding of the differences between congruence and similarity.

Although the correct answer of 16 was the most common response in part (b), many candidates still mix up area and perimeter, with an answer of 7 being seen many times.

Question 13

All parts of this question were answered well. There were very few mistakes in part (a). In part (b), 10 was a common error, maybe through misreading am for pm. In part (c), errors tended to be either from calculating −1 + 5 or from a possible misread in using 10am instead of 10 p.m.; however when an answer of −7 was seen, it had to be supported by explicit working before any credit was given. Calculating errors were common.

Question 14

The vast majority of candidates were able to score 1 mark for summing the given weights of the five ingredients. Very many candidates could go no further. The most common approach thereafter was to work out the number of pots the 96 kg of yoghurt could fill. This was usually correctly calculated but often the final mark was not awarded since the mark scheme did insist on a correct decision and the correct units being quoted for the two totals used for comparison; 'pots' was often omitted. Other equally valid methods were less common but again, in questions assessing Quality of Written Communication, full working and units used must be shown. Some candidates did not explicitly show how they arrived at 768 pots and scored only 1 instead of 3 or 4 marks.

Question 15

The completed two-way tables were usually correct. Most candidates gained at least 2 marks in this question.

Question 16

Many candidates are still confused between edges, faces and vertices of 3-D shapes. In part (a), the most common error was in getting the number of edges and vertices the wrong way round. In part (b), a reasonable sketch of the net of the pyramid was usually seen. Some were confused and offered a 3-D sketch or a plan view.

Question 17

In part (a), although the actual calculation was often performed correctly, many candidates were unable to write their answer correct to two significant figures. The most common error in part (a)(ii) was to write their answer from part (a)(i) correct to two decimal places. Some gave an answer of 13.0 or 13.00, showing that they do not fully understand the concept of significant figures. Some gave 12 as the answer instead of 13. Sometimes in part (a)(i), insufficient digits were written down to gain the mark.

In part (b), a surprising number of candidates failed to give a correct answer, with 50 or 1 million being the most common mistakes made.

Question 18

The most common incorrect answer seen in part (a) was 35 (28 + 7). Many candidates ignored the value of f given and simply tried to simplify the given expression, $9f$ being a much-seen example of this. In part (b), algebraic simplification was also attempted with answers such as $8gh$ and $15gh$ seen. The most common mistake made by candidates attempting the substitution was in the substitution of -2 into $3g$. Often $3 - 2$ or 3×2 were seen and no marks were then available. Even when the substitution was correct, it was not uncommon to see the error of $-6 + 20 = \pm 26$ made.

Question 19

Because of the nature of this question, many candidates attempted to find the actual amount of time Gill spent cutting the grass, so an answer of 2 hours was not uncommon in part (a). Those attempting to find a fraction often gave $\frac{40}{100}$ or $\frac{1}{8}$ or $\frac{1}{4}$. Some candidates simply gave the given angle of 40˚ as their answer. In part (b), many candidates gained only 1 mark for correctly working out the angle of the 'weeding' sector. Of those attempting to find the time, $3\frac{1}{2}$ and 5 hours were common errors. Often an answer of '4' was seen without any working. This did gain full marks in this question, but it is a risky strategy. Many candidates found the angle of 140° but were unable to go any further. Only a few candidates actually measured the size of the angle.

Question 20

In part (a), the correct measurement of 10 cm was usually seen or implied but with subsequent errors in the use of scale factor, including multiplication rather than division by 4. However, an incorrect answer of 2.2 km was common and with no supporting argument, showing clearly how it had been obtained, no marks were awarded. In part (b), the vast majority of candidates picked up 1 mark for plotting a point 6 cm from *B* (quite often actually on the line *BW*), but very few scored the second mark for a correct bearing. This clearly is a topic that candidates find difficult at this level. Even when knowledge of bearings was apparent, accuracy in the use of a protractor was often poor (or missing). Many took the bearing from line *BW*.

Question 21

Readings taken from the travel graph were usually correct and the majority of candidates gained full marks in parts (a) and (b). The success rate in the completion of the graph using the given information in part (b) was lower. Many correctly identified the 30 minutes when stopped but were often confused in knowing where 'home' was. Some lost marks by drawing lines that were broadly correct but inaccurate. Candidates need to be encouraged to take care with accuracy as some lost marks for drawing too long a horizontal line, with subsequent inaccuracies in the gradient of the return journey home, with the final section of the graph having a positive gradient rather than negative.

Question 22

Very few candidates correctly drew the equations of the given lines in parts (a) and (b). The best of the 'near misses' was to draw the graph of $y = 3$ in part (a) and $y = -x$ in part (b). Some candidates did not seem to understand that they needed to draw a line, as asked for in the question, rather than just plot a point.

In part (c), only a very few candidates showed any understanding of gradient. Many simply gave the coordinates of the intercepts on the coordinate axes, or just quoted ±2 and 3 without any real relevance. Many candidates just gave the coordinates (2, 3) or drew a right-angled triangle on the graph but failed to label each side with the correct length or go any further to calculate the gradient. Some specified the correct equation of the line with 1.5 as gradient but lost a mark for not specifying separately the actual gradient on the answer line.

Question 23

Only a few candidates showed any knowledge of the basic rules of indices; n^{15}, $8n$, $15n$ were the most common incorrect attempts in part (a). Similarly in part (b); $n^{3.5}$, $3.5n$, n^{9}, n^{14} and $14n$ were often seen. It was also not uncommon to see numerical answers only, where candidates had assigned a value to n. Some candidates, showing some understanding of indices, gave working such as $n \times n \times n \times n \times n$ and $n \times n \times n$ but could then go no further.

Question 24

Although the correct answer of 2.5 mph was often seen, many candidates worked out 15×6 (= 90) and some tried to use the information given in part (b) to convert to km, usually without success. Many candidates drew the formula triangle for distance, speed and time incorrectly and calculated 6 divided by 15 instead of the other way round. Part (b) was a QWC question and candidates were required to provide a correct statement and to show all of their working, including correct units. If this was not seen, full marks were not available. A significant number of candidates simply worked out 5×8 and gained no credit. A number of candidates correctly worked out 24 km but gave the answer 'no', mistakenly thinking the answer '= 20' was being sought.

Question 25

Most candidates were able to score 1 or 2 marks in this question for finding out how much oil was needed and then for calculating the full price. However, many candidates then demonstrated their inability to work out a percentage of a quantity. Many correctly tried to find 5% of either 43 680p or £436.80 or 67.2p by a 'build up' method. This was fine if their answers were correct but far too often they were not and often a clear method was not shown. If candidates find 10% first and then 5%, it is important to explicitly state that they are dividing by 10 and then by 2 and not leave it to the examiner to decide. A common error was to divide by 5, thus finding 20% instead. In this question also, many candidates clearly did not know the difference between 'of' and 'off', since they were happy just to find 5% of £436.80 and leave the result as their final answer. Candidates need to be aware of the units they are working with in a problem of this kind. Far too often an answer of £41 496 (expensive central heating running costs) was given; centres should encourage candidates to carry out a final check on answers by considering if they are reasonable in the context given.

Premature rounding caused inaccuracies in the final answer when, for example, 5% was given as 2180p rather than 2184p. Many using 'build up' methods lost marks because they rounded 10% to £44 or £43.70 before halving to find 5%.

Question 26

Most able candidates generally scored full marks in part (a). The most common error was to assume a single decimal place answer and give 0.3 or use a total probability of 10.

Sometimes it was evident from the sum of their probabilities in the table that the use of the sum being 1 was understood, usually by inserts of 0.3 and 0.4, with 0.4 as their chosen answer, but some candidates thought the whole was 10 rather than 1, giving 4.85 as the answer. However, 3.5 was also seen for the probability. Very few candidates showed incorrect working, suggesting that those who did not find the correct answer had little idea what to do.

Some candidates assumed the spinner to be unbiased and gave 0.25 as their answer. This error was also apparent in part (b), where the most common incorrect answer was 50 (200 ÷ 4), assuming the spinner to be fair.

Question 27

No parts of this question were answered well. Algebra is still an area of uncertainty for this level of candidate. In part (a), answers of $3x + 4$ and $7x$ were the usual errors seen. In part (b), $x^2 + 2x$ and $2x^2 + 2x$ were the best of the incorrect answers of candidates showing some algebraic manipulative ability. Some achieved the correct expansion but then incorrectly tried to simplify their answer, losing the mark.

In part (c), $x^2 - 6$, $x(x - 3)$ and $x(x - 6x)$ were the best of the 'near misses'.

Question 28

Few candidates were able to find the correct volume of this prism. Many attempted to find the surface area and many tried to find the volume by multiplying the perimeter of the cross section by the length of 20 cm. A significant number did start by finding the volume of one cuboid, usually 1540 ($11 \times 7 \times 20$) but failed to complete the task. Among the candidates who attempted to find the area of the cross section, errors included the use of incorrect dimensions (not usually shown on the diagram) or working such as $(11 \times 4) + (7 \times 5)$.

Summary

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

- ensure they have all necessary equipment, particularly a calculator when sitting a calculator paper
- show all of their working, however basic a calculation may seem
- avoid arithmetical errors by working or checking calculations with a calculator
- read questions carefully to avoid any misreads
- set out their working clearly and give full explanations, particularly in questions assessing QWC
- check answers and make sure that answers are realistic, eg a fuel bill of £41 496 is clearly not realistic
- avoid premature rounding of interim values that are then used to compute the final answer
- realise that topics such as bearings and gradient of a line are assessed at this level.

Higher Tier: Paper 1H

Introduction

Questions that were tackled with the most success were Q2, Q3, Q4, Q8, Q11 and Q12; questions that were less successfully completed were Q10, Q13, Q17, Q18, Q21, Q22 and Q26.

It was disappointing to see so many candidates not performing well on some of the more straightforward questions on this paper. Many candidates could not perform basic algebraic operations correctly and it was surprising that on this Higher level paper there was a poor standard of numeracy and, particularly, a weak knowledge of tables.

There were many imaginative non-calculator methods of working out situations where multiplication or division was needed; however, many were unsuccessful.

Questions where explanations or proofs were required were not often answered well, nor were questions where more advanced algebraic techniques were being tested.

Many candidates' working was far from clear, and was often disorganised and hard to follow. Several lost marks because they were unable to read their own writing.

Report on individual questions

Question 1

This question was poorly answered with only a third of candidates gaining all 3 marks. As is usual in this type of question, a wide range of different methods were used. The most successful candidates were those who used a structure to facilitate their calculations, particularly the traditional long multiplication method.

Among the more interesting ways seen were those examples where the candidate worked out 1.83×100, then 1.83×50, then subtracted 1.83×3.Those using the 'table' method were less successful because they used the figures 1, 80, 3 instead of 100, 80, 3.

If candidates were able to show a complete method, they could earn 1 mark; as one multiplication error was condoned, about a quarter of candidates were able to gain this mark.

Two marks were awarded to candidates who wrote either the correct digits (8601) or the incorrect answer from their correct method to two decimal places.

Some candidates thought that the question was about estimation and wrote statements such as 2×50 and scored no marks.

Question 2

This question was well answered with three quarters of candidates gaining full marks. Part (a) was almost always correct with part (b) being well understood, although many candidates wrote 'negative relationship', or just 'negative', rather than 'negative correlation' and so did not score the mark.

Some wrote a correct description, eg 'the closer to the centre the more expensive the rent' but then contradicted this by writing 'positive correlation' and so failed to score any marks.

In part (c), 1 mark was awarded for drawing an appropriate line of best fit but some candidates, having drawn a line of best fit, misread the scales and so lost the accuracy mark.

Question 3

Questions on questionnaires are usually well answered and this was certainly the case here. Full marks were obtained by two thirds of candidates with very few scoring no marks.

Many candidates did not understand the concept of a biased sample, which resulted in a large range of incorrect responses relating back to the question, rather than the people being asked the question, or even commenting on the sample size.

Question 4

This question on straight line graphs was very well answered indeed with three quarters of candidates gaining all 4 marks.

Surprisingly, a significant number of candidates, despite constant reminders in previous reports, plotted correct points but did not join them up, scoring 3 marks.

It was a shame to see some candidates realise from part (b) that their points needed to be altered to form a straight line but then not go back to change their solution in part (a).

There were also some candidates who failed to realise that this was the equation of a straight line graph and drew a curved graph instead; many also made mistakes in completing the table by adding 5 to the x value, ignoring the need to multiply by 2.

Question 5

Questions on finding the nth term of an arithmetic sequence regularly appear on our papers so it is surprising to see so many answers of $n + 6$ instead of $6n - 3$.

In part (b), a multitude of solutions fell short of the mark because they were incomplete, eg 'they are all odd', without mentioning that 150 was even or saying that the value of n or $\frac{153}{6}$ is not an integer without stating the equation $6n - 3 = 150$. It was also commonly thought that, because 15 was in the sequence, 150 was as well.

Question 6

Almost every candidate was able to give the correct answer to part (a) but many struggled with the complexity of part (b). Although a third scored full marks in this part, many scored just 1 mark either for establishing that \$400 needed to be subtracted from £800 or for a correct method to change £800 into dollars. A variety of methods were adopted and some candidates were able to make some progress towards a solution and scored 2 or 3 marks.

There was much confusion between dollars and pounds, often shown by incorrect readings from the graph. Even when using a correct method, many failed to read accurately from the graph. Many candidates would have gained more marks if they had stated their method more explicitly.

Question 7

It was disappointing that a third of Higher Tier candidates could not gain full marks for collecting like terms in part (a) of this question and that 8% scored no marks at all. The most common errors seen were + 3y or 6x + − 3y or collecting x + 5x as 5x^2 or 4y − y as 4.

The performance in solving an equation in part (b) was a little better with a quarter scoring one mark for expanding the bracket and about a half gaining full marks for the correct solution, although some were not able to complete the division correctly and gave an answer of 1 or $\frac{-7}{7}$. A few gave the answer embedded in the equation and were penalised.

Question 8

This question on Lowest Common Multiples was well understood with over a half of candidates gaining all 3 marks for a correct answer, usually by listing the two sets of times. Two marks were awarded for listing at least three correct multiples of 9 and 12, with at most one incorrect, and a few gained 1 mark for listing three correct multiples of one of them, with at most one incorrect. A surprisingly large number of candidates listed the times, but did not notice 9:36 was in both lists, so gave an answer of 10:12.

Question 9

This algebra question on indices gave a large range of marks. Almost all candidates gave the correct response to $a^4 \times a^5$ but, when it was made more complicated in part (b), this percentage dropped to about a third for full marks and 1 mark was awarded to those candidates who could write two of the components in the answer correctly.

It was disappointing to see so many candidates dividing the powers to give e^6 or f^4. Most worrying was seeing candidates cancelling the 5 from the 45 to give 4, dividing the 5s to give 41, or even subtracting the 5 to give 40.

Using a fractional index was not very well understood as only a quarter of the candidature gained the mark for the square root of 9, with 4.5 being a common wrong answer.

Question 10

Candidates' performances on this starred question gave a good differentiation of marks. Only a quarter of candidates gained 1 mark for stating either that angle *AED* was 38° or that angle *AEF* was 142˚; a further mark was gained for a correct method to find one of the base angles of isosceles triangle *ADE*. A large number of candidates realised the triangle was isosceles but then failed to identify the correct pair of equal angles possibly because they thought 'base angles' are those at the bottom of the diagram.

Problems arose when candidates had to give their reasons. The most successful candidates were those who wrote their reasons next to the working the reason applied to. It was a pity that only a very small percentage of candidates gained both marks for a correct answer with a full set of reasons, but some gained 1 mark for one correct reason. Many candidates knew the correct reasons but failed to write enough, e.g. 'angles in a triangle' without stating they add up to 180°.

Candidates are realising that Z-angles will not gain them the mark but often confuse corresponding angles with alternate angles, some resorting to talking about parallel lines. Many candidates failed to score as they did not identify the correct angles in the working, by using correct angle notation or by showing them on the diagram.

Question 11

This question was well understood and about half the candidates gained all 5 marks for a fully correct solution. A small percentage of candidates failed to score any marks at all, with the modal mark of 3 being gained by candidates who correctly carried out percentage calculations and established £60 and £140 as the commission. Interestingly, many candidates then subtracted these from the basic pay or added them to or subtracted them from £1200, £1400 or £2600 (the total cost of the insurances).

Question 12

This question on simple ratio was often misunderstood. Candidates who understood that a ratio of 1:2 meant that you had to double 16 often went on to give a fully correct solution but those who halved the 16 failed to score any marks.

Many candidates only multiplied by 4, mistaking the number of schools, and a significant number divided the 16 boys by 3, the total of the ratio components. Despite this, about half the candidates did score full marks, with a smaller number gaining 3 marks for understanding what they had to do with the correct number of boys and girls.

Question 13

Although few candidates gave a fully correct answer to this question, there was much misunderstanding of the relevance of dividing 360° by 5. A small number of candidates found 108˚ as the interior angle in a regular pentagon but could make no further progress and those who understood the question but showed inaccurate calculations scored 2 marks.

It was also clear that many candidates did not use the diagram, as they did not appreciate that the interior angle of a regular pentagon was obtuse and could not be 72°.

Question 14

Questions on cumulative frequency graphs are regularly represented on our papers and this question was a well-tried example. Surprisingly, about a quarter of candidates scored no marks in part (a) because they could not work out the cumulative frequencies; a smaller percentage scored 1 mark in part (b) because they did not draw a correct cumulative frequency curve from their table, with many plotting the points correctly and drawing a line of best fit.

Most candidates were able to read some information from their cumulative frequency curves but only 15% gave a fully correct solution to this standard question. A significant number gave the median as their answer in part (c) and many of the candidates who correctly read from the curve in part (d) then failed to subtract from 80.

Question 15

This question on loci was poorly answered with very few candidates scoring full marks. The modal mark awarded was zero; 1 mark was awarded for the quarter circle of radius 5 cm and a line parallel to *CD* and 3 cm away from it. The most common mistake was to misunderstand 'nearer to *AB* than to *AD'* as few bisectors of angle *A* were given with the diagonal *AC* often seen in its place.

Question 16

This question on standard form gave a good range of marks. In part (a) most candidates were able to change a number written in standard form into an ordinary number but this reduced in part (b) to about a third when a number smaller than 1 had to be written in standard form. The division of two numbers that were written in standard form was poorly understood, with only a few candidates giving the fully correct answer and a few more gained 1 mark, usually for writing 0.5×10^9 or 500,000,000 or even establishing $2.3 \div 4.6 \times 10^{12-3}$, but the very large majority who gained no marks usually failed to realise, due to this being a non-calculator paper, that $2.3 \div 4.6$ was 0.5 and many thought the answer was 2 or 2.2.

Question 17

Performance on algebraic fractions does not seem to get very much better over time, although a few candidates did gain 1 mark for writing the left-hand side of this equation over a common denominator or correctly multiplying out by a common multiple of 2 and 5.

A common error was to see all the left-hand side multiplied by 10, but not the right-hand side. The percentage of candidates who could then turn this into a linear equation of the form $ax = b$ was very small and fully correct solutions of $\frac{12}{13}$ were seldom seen. There were many attempts using inappropriate trial and improvement methods, all of which were unsuccessful.

Question 18

This question was poorly understood, with a large number of candidates failing to recognise which lines to reflect the shapes in. Many candidates frequently used the y-axis or $y = -1$ instead of $x = -1$, or the y-axis instead of $y = 0$. When you compound this with those candidates who ended up with **Q** in the fourth quadrant rather than the second, it is easy to see why fully correct solutions were given by only just over 10% of candidates.

Those candidates who ended up with only **R** or both **Q** and **R** correctly drawn and placed gained 1 mark and earned a further mark if they could write 'for rotation of 180°' or 'for an enlargement of scale factor −1'. It was disappointing that three quarters of candidates scored no marks on this question.

Question 19

This question testing circle geometry gave a good distribution of marks, with some candidates being able to recognise that the angle between a radius and a tangent is 90°, mostly seen on the diagram. A further small percentage were able to establish, by using a correct method, that angle AOC or angle BOC was 56° or that angle AOB was 112°, while only a quarter could gain all 3 marks for a fully correct solution and identify the answer as 68°.

Some candidates incorrectly assumed $OC = BC$ and tried to use an isosceles triangle. Most candidates were not good at naming the angles that they were finding and as a consequence some lost marks by not identifying correctly which angle they were trying to calculate.

Question 20

It was disappointing to see that less than a quarter of candidates could factorise a three-term quadratic expression correctly and then solve the associated quadratic equation. However, some managed to factorise correctly and about the same number were able to give a solution where the 3 and 9 in the factors had the incorrect signs.

A surprising number of candidates did not realise that part (ii) followed on from part (i) and gave a solution involving the quadratic formula. In part (b) only a quarter of candidates were able to correctly factorise a quadratic expression where the terms were the difference of two squares (a popular question to include on a Higher Tier paper).

Question 21

In this question on algebraic proof there were very few fully correct answers. One mark for establishing n and $n + 1$ or equivalent was awarded to a few candidates and another small number of candidates who were able to write $(n + 1)^2 - n^2$ gained 2 marks. Some candidates were then able to correctly expand the brackets and correctly simplify the expression to $2n + 1$ or equivalent, scoring 3 marks. For the fourth mark candidates had to establish and state that both elements of the original statement were equal.

A significant number of candidates used an arithmetic approach and gained no marks. There were also many nil attempts.

Question 22

This question on transformation geometry was not very well answered with a small percentage of candidates giving a fully correct answer. More than three quarters of candidates scored no marks but 1 mark was awarded for showing a similar-sized shape in the correct orientation in the third quadrant or for a shape of the correct size in the correct orientation. If they showed both of these, they scored 2 marks.

The negative scale factor of this transformation proved a major stumbling block with many candidates instead using a scale factor of $+\frac{1}{2}$.

Question 23

Candidates struggled to bring both elements of this question together. One mark was earned by the one third of candidates who wrote an expression for either the area of the circle or the surface area of the hemisphere and 2 marks were gained by candidates who did both of these.

Very few candidates could go one step further and give the answer as 75π, although 235.5 was also accepted as many candidates ignored the instruction to leave answers in terms of π, and attempted calculations using an interesting variety of decimal approximations.

A significant number of candidates used the formula for the volume of a sphere, once again confusing area and volume.

Question 24

This probability question without replacement was recognised as such by most of the candidates, although a surprising number did give a denominator of 121, showing that they thought one of the sandwiches was replaced before the second one was taken. An answer of $\frac{76}{121}$ was awarded 2 marks for the work in dealing correctly with the numerator.

If candidates were able to correctly show a denominator of 10 on a tree diagram or use it as part of a second probability then 1 mark was earned and some candidates earned this 1 mark.

A second mark was earned by candidates who could write the probability of one combination of correct probabilities as a product and a further mark was gained if those, or at least three of them, were shown to be added.

The fourth method mark was awarded if all six combinations were added or if they were working from 1 − probability of both of the same types taken. Fully correct answers were given by only a small number of candidates.

Question 25

Candidates in GCSE Mathematics usually struggle with transformation of functions and this question was no exception. In part (a), less than a quarter could show that they understood that $-f(x)$ was a reflection of the curve in the x-axis and that (0, 4) and (−4, 4) reflected to (0, −4) and (−4, −4) respectively, but half of these could show an inverted parabola with a maximum point shown at (−2, 0). Many candidates lost a mark as their inverted parabola was hastily drawn and did not pass through the required points.

In part (b), very few candidates could write $y = f(x - 6)$ as the required equation of the translation with $y = f(x + 6)$ and $y = f(x) + 6$ being the most common wrong answers, with a few gaining the mark for writing $y = (x - 4)^2$.

Question 26

The straightforward part (a) of this vector question was correctly answered by only a few of the candidates; when a proof was required in part (b), the percentage of successful candidates dropped even lower.

One mark was awarded to those who could establish that vector AX was a third of vector AB or that vector OY was equal to the sum of vectors OB and BY.

A further small number gained 3 marks and were able to show that vector OX was equal to $2\mathbf{a} + 2\mathbf{b}$ and vector OY was equal to $5\mathbf{a} + 5\mathbf{b}$ but were unable to connect the two with a convincing statement of proof as is required in a question testing quality of written communication (QWC).

Summary

Based on their performance on this paper, candidates should:

- improve their skills in long multiplication using decimals
- improve their skills in the manipulation of algebraic expressions and the solution of equations
- practise questions on enlargement by a negative scale factor
- write the geometric reason next to where it is used in questions requiring an explanation of geometric reasons
- improve the organisation of their working in those questions where a logical proof is required
- take care with their handwriting and the forming of their figures as many candidates could not read their own writing and made transcription errors.

Higher Tier: Paper 2H

Introduction

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

The early questions (Q2 and Q7(b)) testing quality of written communication (QWC) were generally well done with the majority of candidates showing ordered working. It was noticeable that some candidates had the correct working present but then made the wrong decision or forgot to include units with their answer or decision. It is equally important that all working is shown in other questions as well, not just in QWC questions.

Disappointingly, some candidates showed a lack of understanding of three-letter angle notation in Q13(b). In a similar vein, the usual problems arose when the formula for the circumference of a circle was needed in Q5 and the area of a circle in Q19; it is clearly important that these formulae are learned by candidates.

There are still occasions when it is difficult to read candidates' writing and digits. For example, it is sometimes hard to distinguish between a 4 and a 7; it is incumbent on the candidate to write clearly.

Report on individual questions

Question 1

The drawing of a stem and leaf diagram is clearly well understood. The majority of candidates were able to give a correct diagram with the key complete. However, candidates would be well advised to count the number of leaves in their final diagram; this would help to cut down on instances of the most common error of omitting one or two values. Incorrect notation in the key caused some to lose a mark.

Question 2

It was encouraging to see well-presented working with a concluding statement from the majority of candidates. Some lost the final mark through not including units with their final answer. It is important that, where appropriate, units are included with answers.

The most common methods used were to work out that 500 g of flour would be needed or that the given amount of flour was enough to make only 19 cakes. A minority of candidates did produce correct working but followed this with the wrong conclusion. Some candidates found the amount of flour needed for 18 cakes and stopped there; this approach did not gain any marks.

Question 3

The vast majority of candidates gave the correct answers for parts (a) and (b).

Part (c) was also well done. Common errors included using six squares rather than five squares for the horizontal line and showing the wrong amount of time for the journey home. A few continued away from home while others went back in time to (2 p.m., 0). Nevertheless, it was pleasing to see that a large majority used a ruler to draw the lines.

Question 4

Many candidates demonstrated a good understanding of probability in part (a) and scored full marks. Some were able to demonstrate the correct method but made an arithmetic error. Another common error was to leave 0.7 as the final answer. Sometimes the correct answer was seen in the table but a different answer was written on the answer line; in this circumstance the answer on the answer line had to be considered as the candidate's final answer.

A common error in part (b) was to work out 0.35×200, using the answer from part (a), rather than 0.1×200. Another equally common error was to give an answer of 50 from $200 \div 4$.

Question 5

The most common error was to use the formula for the area of a circle and then multiply by the cost per metre or just to multiply the diameter by the cost per metre. Neither of these approaches gained any marks. Those candidates who were able to recall the correct formula for the circumference of a circle generally went on to gain full marks, although a small minority did divide rather than multiply by the cost per metre.

Question 6

A significant number of candidates worked the question all the way through in pence but then failed to realise the necessity to convert to pounds at the end, giving an answer of £41 496 rather than £414.96 – it was disappointing to see this error occurring so frequently on the Higher paper. Other candidates did realise the need to work in pounds but did not always carry out the conversion from pence to pounds accurately.

There is still a high number of candidates who find 5% by finding 10% and then halving their answer. If correct values are given for 10% and 5% then full marks can be awarded; however, in the event of the values for 10% and/or 5% being incorrect, no marks can be awarded unless a full method is shown. There were also many candidates using multipliers for 5% rather than for 95%. One consistent error was to stop once 5% had been found, not realising that this amount had to be subtracted from the original cost.

Accuracy was often lost by premature approximation, especially by those resorting to the ‘build up’ method for multiplying or finding percentages.

Question 7

Part (a) was well answered. Common incorrect answers were 0.4 (from 6 ÷ 15); 9 (from 15 − 6) and 90 (from 15 × 6). A number of candidates changed 6 hours into minutes.

Part (b) was testing QWC. Candidates were reminded in the question to show all working but not all remembered to do so and thus failed to gain full marks. All working, no matter how trivial, should be shown in QWC questions.

On the whole, this part of Q7 was well tackled, with most candidates gaining full marks. Those who had the correct decision with a distance of 24 km or 12.5 miles but failed to show working gained 1 of the 2 marks available. Occasionally, the wrong decision was made following correct working or no decision at all was given. Additionally, candidates sometimes failed to include units, which caused them to lose marks, and some confused km and miles following correct working. Candidates who changed 20 km into miles were more likely to reach a wrong conclusion.

Question 8

The vast majority of candidates showed all their supporting working. Typical reasons for failing to gain full marks remain the same as in previous series. The most common error was showing correctly evaluated trials for $x = 2.8$ and $x = 2.9$, then concluding that the correct answer was $x = 2.9$ as this trial gave a value closer to 15. This is an incorrect method for a non-linear function. Candidates must carry out a final appropriate trial (for example, in this case, at $x = 2.85$) in order to gain full marks. Other frequent errors included giving the final answer to more than one decimal place and giving the result of the evaluation rather than $x = 2.9$.

Question 9

It was disappointing to see a significant number of candidates fail to gain full marks in this question through not being able to find the area of a relatively straightforward compound shape correctly. In order to find the area of the cross section, it was necessary to work out at least one missing length. Candidates would be well advised to show any length that they calculate on the diagram so that it can then be followed through in subsequent calculations. Many just used the measurements given on the diagram in some way and so gained no marks. It was common to see attempts to work out the total surface area or the sum of all the edges rather than the volume.

A common mistake was to calculate 7 × 11 × 20 and stop there.

Question 10

Descriptions such as 'moved six to the right and one down' and incorrect notation gained no marks. In questions where the demand is to describe a transformation, there is always 1 mark available for the correct mathematical description of the transformation; translation in this case. When the transformation is a translation the second mark is for the correct vector, which must be given in a vector form $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.

A common error was to give the vector $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$, which came from moving from the top right-hand vertex of **P** to the top left-hand (rather than right-hand) vertex of **Q**. A significant number of candidates used coordinates instead of a column vector. There were also many who included a fraction line in the vector.

Question 11

Success in all three parts of this question was very variable.

The most common error in part (a) was to fail to expand both brackets correctly. Of those who did expand correctly many seemed unable to simplify, with 12 and −2 being combined incorrectly to give −10.

In part (b), candidates who knew how to find the product of two linear expressions frequently made arithmetic errors when simplifying, with $-8x + x$ often being simplified to $9x$ or $-9x$ rather than the correct $-7x$. Another common error was to give −3 as the product of 1 and −4, adding rather than multiplying the numbers.

In part (c), some candidates failed to factorise fully but did gain 1 mark for a correct partially factorised answer. A significant proportion of incorrect answers occurred when candidates tried to factorise into two brackets.

Question 12

In Q12(a), the two common errors were to omit the number 1 or 0 from the list of integers or to include −3.

Q12(b) was about solving an inequality; it was therefore vital that the final answer was an inequality. Failure to write the final answer as an inequality, instead writing $p = 6$ or just 6, meant that the accuracy mark could not be awarded. There was much evidence of poorly organised work, even on those responses where the correct answer was obtained.

Question 13

Part (a) was answered correctly more often than part (b).

The common error in part (a) was to apply Pythagoras' Theorem incorrectly, adding rather than subtracting the squares of the lengths.

In part (b), it was evident that a significant number of candidates were unable to identify angle *RPQ* correctly and, instead, attempted to find angle *RQP*. Candidates at this level are expected to be able to use three-letter notation for angles. The majority of candidates who realised that they had to use cosine in part (b) went on to gain full marks.

Many candidates used Pythagoras' Theorem, finding the missing length and giving this as their answer, clearly not understanding the need to use the trigonometric ratios to find angles. Other candidates did complicate their answer by using Pythagoras' Theorem correctly to find the third side and then used sin or tan correctly; in this case the final accuracy mark was often lost due to premature rounding.

Question 14

Those who carried out the substitution into the formula rather than going straight into calculations without showing an equation were generally more successful in getting to the correct answer in part (a). The most common error seen was to subtract 8 from 100.

Part (b) was poorly attempted by candidates, largely because of an inability to deal with the square root. Some candidates arrived at the correct answer from flawed algebra; such approaches gained no marks. The common error was to start by multiplying by 4 rather than $\sqrt{4}$ to get $4m = \sqrt{k+1}$ and then make a second error in squaring to get $4m^2 = k + 1$; candidates who made one or both of these errors gained no marks. Candidates who used a flow chart approach to identify the order of operations usually gained full marks.

Question 15

The most common error made in using the formula for the area of a trapezium in part (a) was to use the adjacent sides of length 4 cm and 10 cm as the parallel sides rather than the correct lengths of 4 cm and 12 cm. Thus, 84 cm^2 was a common incorrect answer, possibly because the trapezium was not in the same orientation as the trapezium on the formula sheet.

Some candidates failed to answer the question because they did not know the formula for a trapezium despite the fact that it was given on the formula sheet.

Some candidates were finding the area of the trapezium by splitting it up into a rectangle and a right-angled triangle. This actually proved to be a more successful strategy than using the formula for the area of a trapezium, which a large number did incorrectly.

The most common correct method seen in part (b) was to draw a line from *Q* parallel to *TS* and use the 'top' triangle with triangle *PQT* to come up with a scale factor of $\frac{1}{2}$ and then the correct answer. The majority of candidates made no progress in part (b) although some were able to write down a correct scale factor, usually 3 or $\frac{1}{3}$ although this was then frequently used incorrectly to give the common incorrect answer of $3.\dot{3}$.

Question 16

The majority of candidates were able to gain a mark in part (a), most often for working out the profit. Following this, some candidates successfully used a 'build up' method to arrive at 3% but many were unable to make further progress. Some just divided 4500 by 100 and gave an answer of 45%; others worked out 150 000 ÷ 4500, giving 33.3% as their final answer. Some responses reached 103% but stopped there, failing to realise that this was an increase of 3%.

In part (b), many used simple rather than compound interest, for which they gained 1 of the 3 available marks. Evaluating $154\,000 \times 0.04^2$ was seen from some candidates rather than the correct $154\,000 \times 1.04^2$. The most common approach, however, was to calculate the interest year by year.

Question 17

The most common incorrect answer was 1.04, which resulted from candidates forgetting to put in a bracket after the 60 in tan(60) on their calculators and, in effect, working out $\sqrt{\frac{\tan 61°}{\tan 59°}}$ rather than $\sqrt{\frac{\tan 61° + 1}{\tan 60° - 1}}$. The main misconception arose when candidates took the square root of the numerator rather than the whole quotient. Marks were available for the correct intermediate steps. There were a number of incorrect responses with no working out that might have otherwise gained a mark.

Question 18

In part (a), it was common for candidates to draw a box plot with the correct minimum and maximum values. The median was correct more often than the lower and upper quartiles.

In part (b), it was common to see very general comments rather than comments comparing the medians and the ranges or interquartile ranges. Specific mathematical language should be used. Many responses compared numbers from within the datasets rather than comparing the distributions, eg 'the median at Rose's was 25 and at Green's it was 21' should be presented as 'the median at Rose's was higher'. Some candidates used incorrect terminology, e.g. the word 'average' instead of 'median' for comparisons, so did not gain the mark.

Question 19

Errors included using 30 cm as the radius rather than 15 cm, dividing the area of a circle by 6 rather than 12 (focusing on 180° rather than 360°) and using the formula for the circumference rather than the area of a circle. A common error was to divide the total circle area by the angle 30 rather than multiplying by $\frac{30}{360}$.

Candidates tended to earn either no marks or full marks. Of those using the area formula correctly, a significant number failed to attempt any division, giving their answer as 706.(...), so failed to gain any credit.

Question 20

The most common correct method seen was the use of the cosine rule; other candidates used the sine rule successfully; others dropped a perpendicular line and used the two right-angled triangles. The majority of candidates who could see an appropriate method to use went on to gain full marks. Those who used the sine rule method often substituted the numbers correctly, but were unable to proceed further. The most common incorrect method was to attempt to use Pythagoras' Theorem.

Question 21

Many candidates who started with a correct method of using area focused on the middle three blocks and gave an answer of, usually, 32.4, not realising that this is not a proportion. Some candidates who would have scored full marks spoiled their answer by taking incorrect readings from the *y*-axis. Many merely read the column heights and added these.

Question 22

A popular incorrect method was to evaluate $\frac{1}{3} \times \pi \times 15^2 \times 20$. Some candidates were able to write down a correct expression for the volume of the large cone but then did not realise that the radius of the smaller cone was 7.5 cm and so failed to make further progress. There was evidence of the wrong formula being used for the volume of a cone despite this being given on the formula sheet at the front of the paper; formulae for the volume of a cylinder or surface area of a cone were commonly seen. It was common to see the volume of the large cone being found correctly, and then halved for the volume of the frustum.

Question 23

Those candidates who knew how to work out the number in a stratified sample generally gained full marks although some candidates gained the method mark only if they failed to give an integer for their answer. The most common incorrect answer was 8, resulting from rounding the answer to $50 \div 6$.

Question 24

Many candidates simply substituted the given value into the formula and so gained no marks. Those who showed an understanding of bounds generally gained at least two marks for showing a correct upper and/or lower bound for each of the variables. Some candidates then found all four possible combinations using their upper and lower bounds, not appreciating that only the combinations leading to the upper and lower bound for the calculation should be considered. A further error was to give the correct degree of accuracy after finding the mean of the upper and lower bound rather than considering the accuracy to which they agreed. Many candidates who understood how to find upper and lower bounds of an individual number did not realise that the upper bound for the quotient required the upper bound for *s* combined with the lower bound for *t*, and vice versa.

Question 25

At this level in the paper it was disappointing to see some candidates who realised that they had to find an expression for the area of each triangle fail to give the correct expression for the area of the right-angled triangle; it was common to see the $\frac{1}{2}$ forgotten. Candidates who did give and then equate two correct expressions then frequently made algebraic errors and so arrived at the wrong quadratic equation. A significant number of candidates who used the correct expression for the area of the first triangle did not evaluate sin 30°, making manipulation and simplification much harder.

Summary

Based on their performance in this paper, candidates should:

- include units with their answers, particularly in QWC questions
- show all necessary working in all questions
- learn the formulae for the circumference and area of a circle
- be able to identify angles using the three-letter angle notation (e.g. Angle *ABC*)
- use vector notation when describing a translation
- use mathematical language (eg 'median', 'range') when comparing distributions
- ensure that they are able to use the trigonometric ratio keys on their calculator
- be able to find the area of a trapezium.

GCSE Linear Mathematics 1MA0
March 2013

1MA0			**A***	**A**	**B**	**C**	**D**	**E**	**F**	**G**
1F	Foundation tier	**Paper 1F**				72	60	48	37	26
2F	Foundation tier	**Paper 2F**				75	62	50	38	26
1H	Higher tier	**Paper 1H**	83	66	48	31	15			
2H	Higher tier	**Paper 2H**	85	70	51	32	16			

(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				147	123	99	75	51
1MA0H	Higher tier	168	136	99	63	31			

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

Grade boundaries are set by examiners at A, C and F and the intermediate grades are calculated arithmetically. Thus, for example, the overall grade for D at Foundation tier falls midway between 147 and 99 at 123. By the same token the grade boundaries on each of the higher tier papers are strictly 60 and 62.5 but the second one is rounded down for the purposes of the table above.

Boundaries for A* are determined statistically; for more information, see the JCQ Notice to Centres – Setting A* in GCSE.