RECOGNISING ACHIEVEMENT

GCSE

Mathematics A

General Certificate of Secondary Education **J562**

OCR Report to Centres

June 2012

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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General Certificate of Secondary Education

Mathematics A (J562)

OCR REPORT TO CENTRES

Overview

General Comments

Performance on both Unit A and Unit B has improved at both tiers. Candidates appear to have more confidence with the work as centres become more aware of the demands of the specification. This was the first examination series for Unit C. It was encouraging to see very many high scoring scripts at both tiers with the majority of candidates being able to access all questions and achieve much success.

It is pleasing to be able to report that the majority of candidates, on all units, were well prepared and entered at an appropriate tier. Work was, in general, of a high standard with candidates showing a good knowledge of the unit content and showing that they can use that knowledge in sometimes unfamiliar situations. Presentation was, in general, logical and concise. The longer questions gave candidates the opportunity to show their skills and many rose to the challenge with clear working and accurate solutions.

A feature of all units is the increase in the number of unstructured, problem solving questions. On Units B and C these are complemented with a smaller number of questions where the Quality of Written Communication (QWC) is assessed. For all these questions, candidates are expected to structure their working and supplement all numerical work with clear written explanations and conclusions. Though many candidates presented their arguments clearly, showing the relevant calculations, this was often not supported in words both in the body of the calculation and in the conclusion. Some are still unaware of the requirements of these questions and continue to present their work in a random fashion; this will affect the marks they are awarded. Centres should continue to place emphasis on this in their work with students. Other questions throughout the three units address the functional elements of mathematics where candidates must interpret the real life relevance of the calculations or diagrams they produce. In many cases this was done successfully though, again, more work is needed to make all candidates aware of what is expected.

In general, it appears that candidates had access to a calculator and geometrical equipment where appropriate and could use these accurately and effectively. Some still tried, often unsuccessfully, to perform calculations without a calculator even when the unit allowed the use of one. On Unit B, where calculators are not allowed, many struggled with a range of numerical calculations.

Statistics and Geometry and Measures questions continue to show candidates' best work. Algebra is still a good discriminator with better candidates consistently displaying a rigorous approach in their solutions. Less able candidates find algebra very challenging. The standard of arithmetic is variable; some candidates at both Higher tier and Foundation tier find even the basic routines difficult to perform accurately.

A501/01 Mathematics Unit A (Foundation Tier)

General Comments

Overall, there was a slight improvement in the performance of candidates. Candidates are showing more working each series.

The overlap questions did provide more of a challenge, as would be expected. As in previous series, although there were marks in the 50s, there were few very high marks suggesting that able candidates are being entered for the more appropriate Higher tier paper.

Again there was great difficulty in interpreting candidates' figures. This does seem to be an ongoing and persistent problem with Foundation tier candidates.

However, it was pleasing to see that candidates did generally appear to have and were able to use compasses and protractors.

Comments on Individual Questions

1 The first 3 parts were answered well but in part (d) square numbers were less well known with 8 a common error. Part (e) was even less successful.

2 Parts (a) and (b) were often correct but the rounding caused some problems in part (c). A surprising number calculated the subtraction in part (a) on paper rather than using their calculator.

3 This was the most successfully answered question on the whole paper. Most candidates gave the correct coordinates and points C and D were clearly plotted and labelled.

4 Part (a)(i) was usually correct with 250 as the most common error. Part (a)(ii) was far less well done. Some candidates earned the units mark after incorrect subtractions but those who used 1000g rather than 1500g still scored 0. Another common error amongst weak candidates was to subtract 1.5 from their 260.

Part (b) caused many problems with candidates unable to read off the time or to convert ¼ hour to minutes. Many candidates earned just 1 mark for the correct number of either hours or minutes. An answer of 10:05 was a common error.

5 There was some confusion between the range in part (a) and the mean in part (b) with reversed answers sometimes seen. Other wrong calculations were common. Candidates sometimes managed to misread their own figures.

In part (b), many of those who did not score full marks did manage to score the part marks for the sum and/or for the division.

6 Part (a) was done well by most candidates, although the answer was sometimes given in a correct but only partially simplified form.

Part (b) had very few correct answers although many candidates scored one mark for $^{-}10$ seen. The usual mistake was to use $3 \times {^{-}5}^2$ or $(3 \times {^{-}5})^2$ for $3c^2$.

7 Overall, this proved to be a more successful pie chart question than on earlier papers. It was pleasing to note that most candidates appeared to have the necessary geometrical instruments. Better candidates answered well with correct angles and labels. Those who were less accurate usually managed to score 2 marks for 2 correct angles along with the correct labels. However, some candidates did not use the line given on the diagram as one of their radii and consequently it was sometimes difficult to see if there were 4 or 5 sectors.

Part (b) was usually correct, although there were occasionally incorrect extra zeros.

8 Marking this question was far easier than with similar questions in the past, primarily because candidates are improving their presentation. However, that does not imply that that the question usually scored full marks. Indeed, there were very few fully correct solutions. Even those who did all the correct operations failed to reach the 36 minutes and left the answer as 327h 6min. The most common error was in converting the time to 63 minutes or 1.05 hours. Instead, candidates used 1.03 or 1.3 as the time. Those who used 63 minutes or kept the hours and minutes separate reached the M2 stage but most then failed to go on to divide by 60. Other occasional errors were to use 7 times rather than 6 and, despite the hint given, 48 weeks instead of 52. On a positive note, most candidates scored at least one mark.

9 Parts (a) and (b) were done well by most candidates. Even those who had incorrect answers in parts (a)(ii) and (a)(iii) usually scored the M1 for one of the correct values seen.

On the other hand, part (c) was rarely correct; most candidates had no idea what to do. The fact that 1 metre is roughly the same as 3 feet was hardly ever used. A common error was to divide or multiply by 10 or powers of 10.

Finally, part (d) was done very well.

10 In part (a), there very few correct responses. Using 30 instead of 0.3 was the most common error.

In part (b)(i), very little algebra was seen but better candidates reached the right answer and hence scored all 3 marks. Many earned only the M1 for 30 seen. An answer of 7.5 was commonly seen, from dividing by 4 rather than 0.4.

In part (b)(ii), the better candidates appreciated that “Don’t” was the problem and were able to explain that. They then went on to reword the question as “Do you think…” hence scoring both marks. Weaker ones tried to answer the question themselves with comments about the cost or the distance, and it appeared that there was little understanding of the word “criticism”.

11 There was very little evidence of candidates using Pythagoras. Many reached an answer of 5.4 but this was clearly from measuring and so did not score. Although Foundation tier candidates can usually deal with Pythagoras, most did not appreciate that they needed to construct a right-angled triangle in order to tackle this question.

12 There were very few fully correct diagrams. Many candidates made a good attempt at the circle arc and the line parallel to AB but unexpectedly a common error was to use 2.5cm for both rather than 3cm. Constructing the perpendicular bisector proved beyond most candidates. In fact, few appreciated that some sort of line across the middle was needed and various spurious arcs appeared.

A501/02 Mathematics Unit A (Higher Tier)

General Comments

This summer's cohort contained more weak candidates than usual, as well as an encouragingly large number of very strong candidates. About half the cohort were year 10s, with years 9 and 11 each comprising a quarter of the cohort.

It was pleasing to see that most candidates made an attempt at all the questions, including the AO3 questions. The four-part algebra question also proved to be a good discriminator, with some candidates showing consistently strong algebraic skills across all aspects tested.

All candidates had time to finish the paper.

Comments on Individual Questions

1 Nearly all candidates used the correct order of operations in part (a), but errors in rounding 0.0186... correct to three decimal places were common. Some candidates simply truncated, or used the wrong number of decimal places, but a few misunderstood the idea of rounding and after rounding the 8 up to a 9 they also rounded the 1 up to a 2, giving 0.029.

Many fully correct solutions were seen in part (b). Where errors did occur it was usually in the second response – often with brackets around 2 × 2.

2 Factor trees were the usual method used in part (a) but some candidates failed to write out their values as a product. A few made a calculation error but often gained one mark for finding at least two of the prime factors. A small number of candidates thought 9 was prime and gave an answer of 2 × 5 × 9 while others included the value 1 in their answer.

The majority of candidates made a good attempt at part (b). The method of finding the LCM of 90 and 150 was not often seen. Some found the prime factors of 150 but went no further. Others found the HCF of 90 and 150. Lists of times or intervals were frequently seen. This method was successful for many but others made at least one error. Some went further than the first common time/interval and often reached the next common value of 900 mins or 12 midnight. Conversion between minutes and hours proved difficult for some candidates and even when a common interval of 450 mins was reached this was often changed to 4h 50m. Another common error was to write the final answer in an incorrect form of 16:30 pm or 4:30.

3 In part (a), the answer $C = 30n + 120$ was more common than the correct $C = 0.3n + 120$. Many candidates included £ and p, perhaps in an attempt to consider the units – this inclusion was not penalised on this occasion.

In spite of the problem in part (a), many were able to use the formula in part (b)(i) correctly, with the most common error being to use 30 × 0.4 as the final step instead of 30 ÷ 0.4.

Many gained full marks in part (b)(ii). Candidates were more successful with improving the question than criticising it. Some had difficulty putting their criticism into words but those who used 'leading' or 'biased' gained the mark easily. Many correctly realised that using 'Don't you…' was persuading people to say that the bus was good value. Many candidates gained the mark for improving the question by replacing 'Don't you' by 'Do you'. A few candidates misunderstood the nature of the question and made comments relating to how expensive the coach was or similar.

4 The majority of candidates were able to use Pythagoras correctly and round the answer to 2 decimal places. A few miscounted the sides of the triangle but used Pythagoras correctly and gained some marks. Some gave 5.3 or 5.4 without working, probably from measurement, and this gained no credit. A few found the gradient of DE or attempted to use trigonometry.

5 This practical question represented a challenge to candidates and was, on the whole, very well attempted. Nearly all candidates used a pencil, ruler and a pair of compasses as instructed. The circle and parallel line were often drawn accurately with a few failing due to incorrect use of the scale. The perpendicular bisector proved difficult for many and often a line parallel to the house was drawn through the midpoint of TW or a correct line drawn without the use of compass drawn construction arcs. The mark for shading the region was often gained as a follow through from their line.

6 Many knew what to do to calculate the estimate of the mean in part (a) although fewer than half of the candidates had fully correct answers with clear working out. Additional columns were usually added alongside the table for midpoints and *fx*. Some candidates made a calculation error but managed to gain 3 method marks. Others did not use midpoint values but consistently used values from the correct groups or used the group width of 5 leading to 250/50 = 5. A few reached the total of 910 but divided by 4 while weaker candidates often simply divided 50 by 4.

In interpreting the cumulative frequency graph, nearly all candidates got part (b)(i) correct.

Most knew what to do to find the median in part (b)(ii), but there were more errors made in reading the scale eg 20.1 rather than 21 given as the answer. As expected, finding the interquartile range in part (b)(iii) was done less well, with some candidates giving just one quartile or giving 25 from 37.5 – 12.5; those who knew what to do sometimes read the scale inaccurately, but usually gained at least one of the two marks.

7 Some candidates (including some stronger ones) did not attempt part (a). Many did attempt the question and quite a few gained one mark, but generally only the stronger candidates gained both marks because of the need to cope correctly with the negative signs and the brackets.

In part (b), many candidates started by subtracting x from both sides without regard to the 2 in one of the denominators. Those who did start by × 2 often did so incorrectly, producing $2x – 1$ or $x – 2$ on the right, or $10x + 8$ on the left. Many candidates did try to gather terms together but often made errors with signs. Follow through marks allowed credit for correct algebra following wrong steps.

Most candidates gained 1 mark in part (c), but very few realised that there was a negative root also required.

In contrast to part (b), there was some good work in part (d), with fully correct solutions being seen regularly. Nearly all candidates who correctly obtained $H^2 = 10p + c$ as a first step gained full marks. A few who tried to square both sides at the start gave $H = 10p^2 + c^2$ or similar as their first step, with some of these able to then gain some follow through marks. Another common error was to begin with $H - c = \sqrt{10p}$, often following this with the further error of $\frac{H-c}{10} = \sqrt{p}$.

8 Nearly all candidates coped well with the ratios in part (a) and gained both marks. Those who did not usually began with 325 ÷ 23 instead of 325 ÷ 25.

Some good work was seen in the AO3 problem in part (b) with a reasonable number of candidates scoring full marks. Most of the successful candidates chose the efficient $\tan^{-1}$ method, although there were instances of Pythagoras followed by $\sin^{-1}$ or $\cos^{-1}$. Many others, however, jumped immediately to solving the right-hand triangle with an incorrect assumption that the opposite side was 6.35 km.

9 Many candidates drew a correct histogram in part (a), although there was often a lack of written evidence for the frequency densities. Most candidates drew bars of the correct width even if they made no attempt to find a frequency density.

Part (b) was generally reasonably well answered although some candidates either did not mention which car park was being commented upon or mixed the two up. Many tried to pick out the modal class in each car park and/or make a comment about the range; 14.5 instead of 15 was a common error in reading the second graph.

10 This 3D Pythagoras question was well answered by the stronger candidates, whilst others merely found the volume of the shed, summed the side lengths or even just compared one dimension of the shed against the pole length. Of those who correctly found the longest distance available within the shed, a few then lost the final mark by saying ‘no’, despite giving a correct conversion.

A502/01 Mathematics Unit B (Foundation Tier)

General Comments

Candidates appeared to have sufficient time to access all of the paper and a wide range of responses was seen.

Many candidates were able to perform very simple arithmetic operations, draw shapes and interpret simple graphs.

General weaknesses were observed in performing most arithmetic processes (including short division with decimals), knowing properties of quadrilaterals, reading and using the scale of a graph, understanding the role of a scale factor and calculating with fractions.

A surprising number of candidates did not appear to have access to a ruler or to be able to draw a rectangle with any precision.

Candidates appeared to perform quite well on the QWC question, showing clear working and using correct money conventions.

Some candidates did not understand that, for any question requiring working to be shown, this needed to be done carefully with steps in the working clearly identified.

Candidates would benefit from practise in answering questions that require the solution to be structured and in which answers must be supported by evidence or simple deductions.

Comments on Individual Questions

1 In part (a), many candidates were able to draw a rectangle although many were the wrong size and often poorly drawn. A common error was to count dots and not gaps, so many rectangles ended up with lengths of either 6cm or 3cm or both. Some candidates drew a triangle.

A significant number of candidates could not draw diagonals in part (b) and many drew lines of symmetry or left the rectangle blank. Some drew all the possible sloping lines joining dots within the rectangle.

In part (c)(i), many candidates drew a square but some drew rectangles. Throughout the question rulers were in short supply and many freehand drawings were seen.

Few candidates were aware of the properties of diagonals of a rectangle and a square and the common wrong answer in part (c)(ii) was that the diagonals of a rectangle were longer than those of a square or they sloped more in a square. Few were able to describe the intersection of diagonals at a right angle within any square.

2 Many candidates were able to multiply a decimal by an integer in part (a). Methods were often inefficient.

However, more than half the candidates did not have effective strategies to divide a decimal by an integer in part (b) and some were completely unaware of how to do this.

3 Most candidates could read the scale correctly in part (a).

A pleasing number of candidates scored at least two marks in part (b), the QWC part of this question, and many of the more able candidates presented completely correct solutions. Common incomplete solutions involved finding the saving on one parcel, finding the costs of five First Class and five Economy parcels but not doing anything with them, or just finding the cost of five Economy or five First Class parcels. A surprising number of candidates were not able to subtract 18.05 from 22 and get the correct result. Candidates who worked out the saving based upon the total weight of the parcels were awarded a maximum of 3 marks. A large number of candidates did not show the subtraction. Common completely wrong answers involved totalling all the prices given in each column or looking up prices for completely wrong weights of parcels.

4 Most candidates were able to name the angle correctly in part (a).

In part (b), 1 mark was the modal score for a sketch matching one of the criteria.

5 Candidates seem to find this topic quite accessible although, for many, a major problem is the accurate reading of a scale. Thus, although many plotted (10, 103) correctly, a common error was to plot the point somewhere in the region of (10, 103.8).

In part (b), many good answers were seen. Some candidates struggled to express their reasons coherently and some interpreted a drop in the graph as a fall in performance.

6 Many good answers were given for all parts of this question. However, weaker candidates were not able to respond in an orderly manner to either of the first two parts. Many gained 1 mark for attempting $24 \div 3$ (8 was not always the result) or for stating that a teaspoon held 8g of salt.

In part (b), many candidates correctly found 10% and halved the answer but some attempted a method using 50% and then 25% and were either not able to proceed or ended up estimating the answer.

Part (c) saw around a quarter of the candidates failing to score, although many good answers were seen from more able candidates. Few candidates seemed aware that 1kg = 1000g. Many failed to add or multiply correctly within a correct method. Many wrongly added 5 (cups) into the total weight in grams. Many candidates displayed very weak basic arithmetic skills.

7 The term congruent appeared to be well understood in part (a).

In part (b)(i), a large numbers of candidates failed to express a scale factor properly. A common wrong answer was 2. This revealed the misunderstanding that they were comparing sides in the small triangle. Some gave "+ 8" as their scale factor.

The correct answer of 24 was often given in part (b)(ii) even after an incorrect answer in part (b)(i).

In part (c)(i), the reflection was often correct, although rotations, translations and reflections in the wrong axis were all seen.

Many chose the correct statement in part (c)(ii).

8 This question saw the move to more challenging topics and candidates found it more difficult to access the marks.

In part (a), reading scales was a problem and many candidates only completed the number of bags correctly.

Few could work out the cost of a single bag in part (b); £2 and £22 were common wrong answers.

In part (c), despite having a model in the next part, few right answers were seen and $b = 10C$, $b + 10 = C$, $b > C$ etc were amongst many wrong answers that often involved 10.

Part (d) was poorly answered although 7 appeared from nowhere in some cases. A number of candidates tried to multiply 15.40 by 2.2 or subtract 2.2 from 15.4. Few were able to sensibly explain why 27.50 was a wrong value but some scored a mark for noting that only whole numbers of bags could be bought or that the formula only went up to 10 bags. Occasionally a candidate did note that 27.50 was not a multiple of 2.2. A common wrong answer involved "Because it's an odd number".

In part (e), a small number of candidates realised that 10 bags cost the same as 11 so it was not sensible to order 10. Most answers revolved around it not being a good deal or if she bought more it would be cheaper. Answers to this question clearly demonstrated the need for candidates to read questions carefully and realise the importance of key words. In this case they interpreted 10 bags to mean "up to 10 bags" and to be a general case rather than a specific one.

9 This was the first of the common questions with the Higher tier paper. Again, the accurate use of scales was poorly done.

In part (a)(i), many answers of "no correlation" were seen although some candidates left this part blank and used the term in part (a)(ii). Words such as "random" were not accepted. Some candidates said there was no correlation but failed to use this to support their answer in part (a)(ii), preferring instead to attempt a description in words.

In part (b)(i), a number of correct scales were seen with some points plotted accurately. More able candidates scored well when answering the question. Weaker candidates did not provide labelled and linear scales. A common error amongst such candidates was to write the names of the cities at each pip on the horizontal axis. A few candidates plotted Latitude against Height.

Many candidates scored 1 mark in part (b)(ii) for describing a negative correlation or for picking an anomalous point. Few accurately described all the features of the scatter graph.

10 The final question revealed a complete misunderstanding of any of the processes involved in subtracting fractions or multiplying a fraction by an integer.

The most common wrong answer for part (a) was $\frac{4}{5}$ and for (b) $\frac{20}{24}$. A few candidates scored a mark for cancelling in part (b).

A502/02 Mathematics Unit B (Higher Tier)

General Comments

The paper proved quite accessible with few candidates scoring less than 15 marks. There was no evidence of candidates being short of time. Candidates generally used a ruler in graph and transformation questions. Mostly working was clearly shown allowing part marks to be awarded even when the answer was incorrect.

Quality of Written Communication was assessed in questions 8(a)(iii) and (b)(i) and many candidates presented their arguments clearly, showing the relevant calculations. In QWC questions candidates lost marks if they did not explain *why* they drew their conclusions.

Some questions addressed functional elements of mathematics and candidates had to interpret the real life relevance of the calculations or diagrams they produced. This was done most successfully in question 5 with many candidates able to decide if the scatter graphs backed up the different hypotheses. Question 6 proved more difficult and only the strongest candidates interpreted the gradient correctly.

Questions that were well answered include question 2 (percentages), question 4 (angles in a pentagon) and question 5 (drawing and interpreting scatter graphs).

Comments on Individual Questions

1 In part (a)(i), most candidates were able to find the common denominator and subtract successfully. A common error among weaker candidates was to subtract the numerators and denominators to end up with $\frac{4}{5}$.

In part (a)(ii), many candidates scored all 3 marks showing clear working. Some did not gain all the marks as they overlooked one or both of the demands in the question about the required form of the answer. In these cases, part marks were often earned.
Those candidates who did not get the correct answer to part (b) either did not understand the term reciprocal, and generally converted the decimal to a fraction, or showed $\frac{1}{0.25}$ but then could not work it out.

2 This was a very accessible question and was generally correctly answered. The most successful method was to find 10%, then 5% and then add the 2 values to the original amount. As marks are awarded for method, it is good practice to write 10% = 660/10 = 'their answer' rather than 10% = 'their answer'. Common errors were to find 1.5% instead of 15%, truncating 10% to 60 and failing to add their 15% to 660. Some of the weakest candidates said 5% was double 10%. Some approached the question by finding 1% first and a few attempted to calculate 1.15×660. These were rarely successful. An incorrect answer was sometimes due to decreasing the cost by 15%.

3 This question was often totally correct with candidates showing confidence manipulating the inequality and then representing their solution on the number line. Candidates who made an error, but showed their working clearly, would often gain 2 of the 3 available marks. Weaker candidates would solve an equation and then not know how to put their answer as an inequality. Some did a trial and error method to find integers that satisfied the inequality giving an answer such as $x = 56$.

4 There were many fully correct answers to this question often with candidates 'knowing' the angle sum of a pentagon. Nearly all candidates were able to gain the mark for finding the angle of 150°, but finding the sum of the interior angles proved difficult for some and a method was rarely seen. An answer of 80° (from 440° – 360°) was also common. A few tried to split the pentagon into either 3 triangles or a quadrilateral and a triangle and assumed they had to bisect one of the angles. A common misconception was to think that p and 70° were interior angles between parallel lines thus giving an answer of 110°. Occasionally the interior angle with 210° was ignored and 360° – (70° + 90° + 210°) was found. It was rare to see exterior angles used.

5 In part (a)(i), most candidates recognised there was no correlation but the mark was sometimes lost due to poor mathematical language.

In part (a)(ii), it was generally understood that Lizzie thought there was negative correlation but that the scatter graph did not show this.

In part (b)(i), the scatter graph was usually well drawn with many candidates choosing to keep the vertical axis the same as in part (a). Other scales were generally sensibly chosen but there were some awkward scales (eg 10 squares for 6 or 7 units) making it much more difficult to plot the points. Very few candidates failed to have labels and linear scales. Those who chose a scale of 10 squares to 5 units often miscounted squares eg plotting 26 at 25.5.

Responses in part (b)(ii) were very varied. Most candidates recognised negative correlation or described it. Fewer mentioned the anomalies or the unusual shape of the graph. Candidates did have problems putting their thoughts into words and answers were sometimes confused and jumbled. Too much reliance was placed on simply quoting a type of correlation rather than looking at the graph as a whole. Candidates should note that a comment question worth 2 marks needs 2 pieces of information.

6 In part (a), correct ruled lines were generally drawn. Some lines were confined to the range of the points, while others extended to the y-axis helping with part (d). Of the latter, some realised that the origin would be an appropriate point so drew their line through this.

Only the stronger candidates used the correct values of the scales to give the true gradient in part (b). Many others assumed the gradient was 1 but did not score the method mark unless some working was seen.

A quarter of the candidates recognised that the gradient represented the price of a satsuma in part (c), but many incorrectly concentrated on the increase in cost or the correlation between the cost and the number of satsumas bought.

Part (d) was well done by about half of the candidates with those following through from a wrong answer in part (b) able to score full marks. Candidates who drew longer lines found it easier to get their c value correct. Weaker candidates did not realise that an answer of the form $y = mx + c$ was the sensible way to tackle this question.

7 This question clearly differentiated between those who knew about regions and inequalities and those who did not. There were many fully correct answers. For those who appropriately used inequalities, the most common errors were to either reverse all the signs or to use the wrong variable. The weakest candidates simply derived the equations of the boundary lines.

8 Parts (a)(i) and (ii) were usually well answered. Wrong answers seen in part (a)(i) were (+)3, (+)1.5 and (×)1.5. The most common correct answer given in part (a)(ii) was square and it was pleasing to see answers of 'semicircle' and 'sphere' as well as the use of 'regular'. Many incorrect answers were given by candidates who chose possible correct shapes but failed to define them as 'regular'.

Parts (a)(iii) and (b)(i) assessed Quality of Written Communication.

In part (a)(iii), many candidates gained at least 1 mark for identifying the 2 right angles or parallel lines. To gain full marks the solution had to be clear and give the reason for the right angles. Only the best candidates were able to state that a tangent and diameter meet at 90°. Of those attempting this reason the most common error was to say the tangent met the circle or circumference at 90°.

There were a number of good answers to part (b)(i) identifying two ratios or a ratio and a scale factor calculation. Often though the conclusion was missing. Some candidates did not understand the idea of mathematical similarity and used Pythagoras to find the hypotenuses, calculated the areas of the triangles or tried to prove/disprove congruency.

Part (b)(ii) often lacked any working out and consisted of an answer only. Because of this it was unusual for part marks to be gained here. While some candidates had already done the calculations necessary in part (b)(i), many others who had been unable to gain more than 1 mark in part (b)(i) got full marks in this part.

9 In part (a), many candidates were able to give an answer relating to approximating 0.53 to 0.5 and showing that $0.5 \times 6 = 3$ or $3 \div 0.5 = 6$. There was some confusion between halving and dividing by a half. Multiplying by a decimal to give a smaller answer did not explain why the length had to be close to the specific number 6.

Part (b) was mostly correct.

10 Many candidates drew the correct shape with no construction lines while others used rays to work out where the correct points should be. Very few candidates used the correct scale factor with the wrong centre, but some got a mark for using the wrong scale factor with the correct centre (0, 2). Some were confused by the negative scale factor and interpreted it as meaning a reduction in size. Most diagrams were carefully drawn with ruled lines.

11 This question proved challenging to many. In part (a), candidates often did not square the 3 giving an answer of $3a^6b^8$. Some answers involved terms added together following attempts like $(3a^3 + b^4)(3a^3 + b^4)$. The most common wrong answer was $3a^5b^6$.

Many substituted 3 and 1 for x in part (b) and these candidates usually went on to successfully work out $4 - {}^-2$. A common error was f(3) – f(1) = f(2) with 2 then substituted giving an answer of 1. In part (c), it was common to see $\sqrt[3]{125} = 5$ gaining a mark. Candidates were often not able to then deal with the negative power leading to an incorrect answer of $^-5$. A common misconception was that $125^{\frac{1}{3}} = 125 \div 3$.

Many candidates gained 1 mark for multiplying "top and bottom" by $\sqrt{6}$ in part (d). Most then struggled to simplify correctly, often leaving their answer as $\frac{24\sqrt{6}}{6}$.

A503/01 Mathematics Unit C (Foundation Tier)

General Comments

Most candidates had been well prepared for this exam and it was encouraging to see so many very good scripts. Many candidates scored high marks and all candidates were able to access most of the questions and achieve a degree of success.

Work was well presented and logically set out in many cases. The longer questions gave candidates the chance to show their skills and many rose to the challenge with clear working and accurate solutions.

The questions on simple number calculation, reading scales, directed number, vocabulary of probability, coordinates, calculations involving money, listing outcomes, use of a calculator and simplifying algebraic expressions were generally well answered.

The questions involving choosing appropriate metric units, converting between units, expanding brackets, harder probability and relative frequency, volume, solving equations by trial and improvement and the question involving complex pricing that also tested the Quality of Written Communication, proved to be more challenging.

A calculator was allowed for this paper but there was evidence that some candidates were using non-calculator methods in a number of the questions.

Comments on Individual Questions

1 Part (a) proved to be a straightforward start for candidates. Almost all were successful in all three parts. There were occasional slips with part (a)(iii) where 80 ÷ 800 was seen.

The majority scored both marks in part (b). A few candidates were able to correctly find the sum of 47p and £1.99 but then could not subtract this from £5 correctly. A few candidates gave answers only and others did not appear to be using a calculator as an aid. To score method marks, it is important for candidates to show the steps in their working.

2 There were many excellent answers to part (a) although this proved to be quite challenging for some candidates who confused area with perimeter. A common error was to give a length and width with a product of 24 such as 6cm and 4cm.

Part (b) was well answered with most candidates understanding that the length of the square was the perimeter divided by 4.

3 Only a small number of candidates were able to score all four marks for part (a); the topic of units generally was a weak area for many. The common errors were to give pounds, ounces or even grams in part (a)(i), millimetres in part (a)(ii) and miles was very common for part (a)(iii). Part (a)(iv) was answered best.

Parts (b)(i) and (ii) were very well answered. There were a few errors in reading the time in part (b)(ii) such as 5 50 or 10 24.

4 Almost all candidates gave the correct city of Moscow in part (a).

Many were successful in part (b) where a strategy used by some candidates was to draw a number line. The common error was to give an answer of 19 from 21 – 2 instead of 23 from 21 – ($^-2$).

Part (c) was the weakest of the parts in this question and although Toronto and Chicago were picked by many, a number placed the cities in the wrong order for the sentence.

Part (d) was well answered. The common error was to give an answer of $^-5$°C.

5 Part (a) involved choosing the correct probability word to complete each sentence and was very well answered. The most common error was to use "certain" instead of "likely" in part (a)(i).

Part (b) caused some difficulties. Many candidates wrote two numbers that fitted just one of the criteria for the eight cards i.e. both cards written were bigger than 7 or one of the cards written was a multiple of 3. This gained partial credit. The most common error was to give the two cards as 6 and 9.

6 The whole question was well answered. The only common error in part (a) was to give the coordinate as (3, $^-2$).

In part (b), occasionally the point ($^-3$, $^-1$) was plotted at ($^-1$, $^-3$) or ($^-3$, 1).

Candidates found part (c) more challenging and some were unable to understand the properties of a parallelogram, often drawing a trapezium instead and giving the coordinate (4, $^-1$).

7 This question was well received by candidates who generally had a good understanding of the context and were able to read values accurately from the table before calculating the cost of the season tickets. The most common error was to find the price for one adult and one child rather than two adults and one child.

Part (b) was well answered generally, many gave fully correct solutions. Partial credit was given to those who made the error of working with one adult and one child as in part (a). Some candidates wrote down a completely correct method but made processing errors despite being allowed the use of a calculator. A few misunderstood the question and simply found the cost of buying individual tickets for the matches and did not go on to find the difference in cost between the individual tickets and the season tickets.

8 This question was well answered by most candidates. Many adopted a systematic approach in part (a) to ensure that all of the combinations were considered. A few, who adopted a more random approach, had omissions or repeated a combination.

Some did not use the correct conventions for writing a probability in part (b). Answers should be given as fractions, decimals or percentages and answers such as 1 in 9 or 1 out of 9 or 1 : 9 will not score. A few gave non-numerical responses such as 'unlikely' or 'evens'.

Those candidates that answered part (b) correctly invariably were successful in part (c). The few that were unsuccessful made errors similar to those outlined in part (b).

9 Part (a)(i) was better answered than part (a)(ii). Errors in part (a)(i) included 4.5 and 4500.

Correct answers were fewer in part (a)(ii) where common errors were to give 3 or 3000. Many candidates are insecure in their knowledge of conversion between metric measures.

Candidates were less successful in part (b) than in part (a). In part (b)(i), common errors were to give answers of 1100 or even 11000.

In part (b)(ii), a number of candidates obtained 640 but did not appreciate that the unit associated with this answer was also required. Other errors resulted from an incorrect conversion of 1.5 kilograms to grams. Part (b)(ii) was omitted by around 10% of the candidates.

10 Many candidates scored well in part (a) and were able to match the correct expressions together. Almost all candidates scored one mark with the most common errors being to match $3(a + 1)$ with $a – (6 – 3)$ and $2a – a – 3$ with $3a + 3$.

Part (b) did discriminate between candidates. Many were successful in part (b)(i) although some gave their answer as $36x$.

In part (b)(ii), the most common answer was $^-24$ from the error that $(^-3)^2 = {}^-9$. There were a large number of omissions to part (b).

11 Many candidates answered the whole of this question well. In part (a)(i), some candidates rounded their answer and provided they rounded it correctly to at least one decimal place they were given full credit. Answers such as 74.08 did not score as they were incorrectly rounded.

Some candidates halved instead of calculating the square root in part (a)(ii).

A common error in part (a)(iii) was to give 3.8625, obtained by those who omitted to evaluate the numerator before dividing by 8. Many candidates were successful here but a full decimal answer of 0.7125 was required and some rounded or truncated their answer without showing the full answer first.

Errors in part (b)(i) included answers of 3.600, 3.5, 4, 0.4 or 3.56.

Fewer were successful in part (b)(ii). Common errors were to omit the zeros and give an answer of 7 or give answers of 6890 or 6900. This part was omitted by over 10% of the candidates.

12 The first three parts of part (a) were answered well. In part (a)(i), a few candidates gave $12a^2$, and in part (a)(ii) some made errors in multiplying 8 by 2.

Correct answers were much fewer in part (a)(iv) and the most common errors were in processing the directed terms. Candidates often got one of the combined terms, $2a$ or $5b$ correct. Some gave a final answer in terms of ab.

Part (b) was not well answered. The most common error was to give an answer of $56x$. Most candidates did not appreciate that two terms within a bracket multiplied by a single value results in a two term answer.

13 Some candidates misinterpreted the fraction $\frac{2}{5}$ (litre) as one litre every two days and then incorrectly multiplied 7 by £0.86. Some simply attempted 14 multiplied by £0.86 and never considered the fraction. More successful candidates used their calculators accurately arriving at 5.6 litres before rounding this up to 6 litres and then multiplying by £0.86. A few did not round up and gave answers in the range £4.81 to £4.82 from 5.6 multiplied by £0.86. Some used a diagram approach which often proved successful in finding that 5.6 litres of juice were needed.

14 Part (a) was very well answered. Almost all candidates appreciated that the probabilities for red and white counters should add to 1.

Part (b) did discriminate between candidates. Most did not make the link to part (a) and gave answers such as 60, 60 or 50, 70. Some made the link to part (a) but then incorrectly gave 40 and 60 from 0.4 and 0.6. A number of the more able candidates found this straightforward however and multiplied the probabilities from (a) by 120 to arrive at 48 and 72.

15 This question tested the Quality of Written Communication and although a number of candidates tried to structure their answers by considering the three factors in pricing the window, answers were usually spoiled by errors in using and applying the mathematics required. A large number of candidates simply wrote random figures with no explanation of where they had come from or what they represented. The most common error in finding the price of the glass appeared to be 0.42 + 0.68 = 1.1, 1.1 multiplied by 55 = £60.50. The most successful candidates firstly considered the area of the glass and explained this was what they were doing and often earned three marks for correctly pricing the glass as £42.35. Some thought that they had to buy 1m^2 of glass rather than 0.77m^2 and others tried to convert to different units in the middle of the calculation. The pricing of the frame caused considerable difficulty. Some continued to incorrectly consider 'areas' rather than a 'length' and those that correctly obtained the total length of the frame as 4.6m then had great difficulty in interpreting how a pricing of £3.20 for every 0.1m could be applied. The width of the frame often proved to be a distraction for some candidates when this did not affect the calculation. Almost all candidates were able to consider the fitting charge within their method for which they gained some credit.

16 This question was usually very well attempted with many candidates scoring full marks and showing full working leading to the answer £490. Others were able to convert £850 to dollars correctly and then subtract $625 to reach $735 but then were unable to use the reverse exchange rate back to pounds correctly. A few weaker candidates were unable to use the unitary conversion ratio to dollars correctly and appeared to be using an estimation technique with ratios equivalent to 1 : 1.6 without ever correctly reaching 850 : 1360. A few candidates were able to obtain a method mark for a division by 1.5 but were not sure how to link this with the initial part of the question.

17 Many candidates achieved full marks and used the correct notation for money throughout. Most were able to get the first mark for the cost of the carpet. Fewer were successful in finding the cost of the underlay by subtracting the cost of the carpet and fixings from £1112.00. A follow through mark was allowed for those candidates that divided the cost of their underlay by 35 to give the cost per m^2. Attempts at finding the VAT were more mixed and some candidates attempted non-calculator methods for finding 20% of £1112.00. The final mark required candidates to record their answer in the correct money form i.e. £1334.40. Many did not score this mark by omitting the essential final zero from their answer. A follow through was allowed for the final total from £1112.00 added to the candidates answer for the VAT. Some subtracted the VAT from the cost of all items however. A few added all of the values in the column for the final total instead of just the cost of all items and the VAT.

18 Part (a) was very well received by candidates and most were able to score marks here. The scale was generally interpreted well. The front elevation was usually drawn correctly. A common error was to have 2 by 1 legs rather than 3 by 1 legs for the bench. Most candidates earned one mark only for the plan by drawing a rectangle of width 3.5 cm and length 9 cm. Almost all did not realise that the plan should indicate the hidden edges in some way in the plan.

The volume of the bench in part (b) was poorly attempted and many candidates had little idea of how to find the volume of the required cuboids in this context. Many attempted to add the dimensions or had products of two of the relevant values only. The independent units mark for this part was overlooked by 40% of the candidates and only a few gave the correct unit, cm^3, with their answer.

19 There were a number of candidates that were well prepared for this question and had been taught a standard writing frame for tackling algebraic trial and improvement problems. They invariably scored either 3 or 4 marks here. The final mark was often not scored as candidates were expected to justify why the answer was 2.7 by either referring to the trials at 2.7 and 2.8 or by showing a trial to more accuracy between 2.71 and 2.75. A few candidates did everything correctly but ignored the request for an answer to one decimal place and gave answers such as 2.75. A few did not show the results to their trials which was essential to earn method marks. A common error for many was to evaluate $x^3 - 6$ instead of $x^3 - 6x$.

20 Only a small number of candidates gave a correct response in part (a) that referred to a large number of observations being made so that the results would be more reliable. The majority referred incorrectly to the location of the survey or that the values were roughly the same over the three observations.

In part (b), many candidates realised the need to find the totals and were able to give 771 for the total of the cars going to the town centre; this was usually used incorrectly, however, as the total cars seen was not considered. Some attempted to work with the mean values for the town centre and the ring road, which was a valid method, but never actually used them to make a probability.

A503/02 Mathematics Unit C (Higher Tier)

General Comments

It is pleasing to report how well candidates have performed on this paper. Many scored very high marks showing an excellent level of mathematics and few scored low marks. This is a clear indication that schools have entered candidates at the correct tier. All candidates had a good working knowledge of the unit content and were capable of applying that knowledge. Very few, if any, questions were not tackled. Though the later questions in the paper seem to have challenged even the better candidates, some good, well thought out attempts were made.

This paper contains a number of unstructured, problem solving type questions and questions assessing Quality of Written Communication (QWC). Though the majority of responses to these questions showed an understanding of the mathematics required, the presentation of the work was often disappointing. Setting out was haphazard and little written explanation was given to support the method being used.

Number, Statistics and Geometry and Measures questions continue to be answered well and with confidence. The more demanding topics in Algebra still cause problems for candidates, with many unable to cope with the rigorous approach required. Equipment, including a calculator, was used carefully and successfully when required.

Comments on Individual Questions

1 This question was answered well by most candidates. However, a large number did not write money as a two decimal place number and lost the final mark. A less common error was to obtain 1334.40 as the VAT through multiplying by 1.2 rather than 0.2.

2 In part (a), the front elevation was drawn well with very few errors. For the plan view, the majority of candidates did not show the two hidden edges.

The calculation of the volume of the bench in part (b) was done well and the appropriate units were included in the answer. The most common method was to find the volume of the top and the two legs separately though some inadvertently only included one leg. Some candidates tried to change their answer from centimetre cubed to metre cubed but very few were successful.

Many candidates showed a good understanding of bounds in part (c) and gave the upper and lower bounds correctly. A value of 75.49, rather than 75.5, as the upper bound, was condoned. Of more concern was the common use of 75.4 as the upper bound. A small number of candidates wrote the bounds the wrong way round.

3 This was a question requiring candidates to show a high quality of written communication. This means not only presenting their working systematically and clearly but also with a full explanation of the process undertaken. Though there were some excellent answers, many candidates just wrote the calculations with little, incorrect or no commentary. The majority of candidates could calculate compound interest but it was disappointing to see how many did not calculate the simple interest, or did so incorrectly. As in question 1, many failed to write a money answer to two decimal places.

4 Both sections of part (a) were invariably correct.

Weaker candidates struggled with part (b), many adding instead of multiplying the probabilities. Those who tried to multiply without the use of a calculator often failed. A small number misread the question and worked out the probability for two yellow pencils.

In part (c), more able candidates found the total number of pencils by 8 ÷ 0.2. The more common method was to equate 8 to 0.2 and use proportions to find the number of each colour. Those who followed this method sometimes omitted the number of green pencils or the number of yellow pencils.

5 Part (a) was almost always correct.

Part (b) proved a little more challenging though most candidates could multiply out the brackets correctly. Any errors that did occur were usually in collecting the like terms together. Some took a correct answer and divided each term by 2 and others put a correct expression equal to zero and solved the equation. These did not score full marks.

6 This question was answered well and it was very rare to see an error in working out the values. Most candidates showed sufficient trials but many failed to justify their choice of 2.7. It was common to see a final answer given to more than one decimal place. Presentation was varied, those adopting a table format faired best.

7 The majority of candidates missed the point in part (a) that it was the large number of observations that made the probability reasonable. Most gave statements such as 'he repeated it three times' or 'the results were similar' or 'it was too busy to count the cars accurately'.

A number of different methods were employed in part (b), all equally valid. The most common approach was to find the mean number of cars going to the town centre and the mean number of cars going on the ring road. Some, however, did not add these to find the mean for all cars and failed to complete an acceptable method. A small number chose to round the values given in the table and did so thoughtfully. These often continued with a completely correct method.

8 In part (a), the third of the coordinate points proved to be the most challenging but most candidates had little difficulty in getting all three correct.

Part (b) caused few problems with only a small minority using incorrect lengths or making the question much more complicated than necessary with the introduction of Pythagoras' theorem or $\frac{1}{2}ab\sin C$.

There were many correct answers to part (c). A large number saw that the required length was equivalent to the space diagonal of a cuboid. Those that did not recognise this often realised the need to use Pythagoras' theorem and correctly applied this at least once.

9 Converting from standard form to an ordinary number in part (a) was completed successfully by most candidates. Less aware candidates used too many or too few zeros.

There was a mixed response to part (b). Too many candidates multiplied the values of m and c together first and then squared. Others ignored the square completely. Those doing the calculation without their calculator often made errors when trying to square the value of c; 3×10^{16} and 6×10^{16} were common wrong answers.

Though many achieved the correct final result in part (c), quite a number of candidates made an incorrect first step. This was usually $E - m = c^2$, $\sqrt{E} = mc$ or $c^2 = m/E$. Very few omitted the new subject of the formula in their answer.

10 In part (a), some candidates attempted a purely numerical method to verify that the formula was correct rather than establishing the formula from first principles. Those using a correct algebraic approach used two or three rectangles and were, in general, able to write down correct expressions for their chosen areas.

In part (b), a small number gave $A = 6$ when $x = 1$ but the vast majority completed the table of values correctly.

Almost all candidates plotted the points accurately in part (c). The standard of drawing of the curve was very good with only a few joining the points with ruled lines.

It was common to see the appropriate line drawn on the graph in part (d) leading to an answer within an acceptable range.

11 It was clear that many candidates did not read the question carefully enough. Some factorised the quadratic expression correctly but then did not proceed to solve the equation. Others ignored the instruction to factorise and used the quadratic formula or a completing the square method; these rarely produced the correct answers. Even so, there were a good number of fully correct solutions.

The simultaneous equations in part (b) proved to be more challenging. The equations were set out to encourage candidates to use a substitution method and those that used this method often went on to obtain the correct answers. Where candidates attempted to equalise coefficients, the success rate was much lower.

12 Part (a) was answered very well with nearly every candidate gaining full marks. A very small number of candidates thought that there should be a common difference between the corresponding values rather than a common factor.

In part (b), better candidates instinctively knew that enlargement preserved angle but far too many multiplied by the scale factor to get an unreasonable angle of 156°.

As in part (b), many just multiplied the area by the linear scale factor in part (c). More aware candidates correctly used the simplest approach and multiplied by 3^2. A large number used the much longer method of finding the radius of the smaller circle, multiplying this by 3 and using the answer to find the area of the larger circle. Those using this method often made errors. Even more unsuccessful were those trying to use ½*ab*sin*C*.

13 Virtually all candidates answered part (a) correctly. However, it was surprising that many did not use this answer to help them with part (b).

Most attempted to write down the four terms of the multiplication and usually gave at least three of them correctly. The working out of $5\sqrt{3} \times 7\sqrt{3}$ was handled less well, many not using their answer to part (a) or not using their calculator. Even after a correct, exact surd answer, many went on to write this as an approximate decimal equivalent.

14 Success here depended on which method was chosen. Those candidates who either used a two-way table or listed the possible outcomes were usually able to write down the answer with little problem. Those who produced a tree diagram with the associated probabilities were less successful. Branches were missing and probabilities (often not the correct ones) were added when they should be multiplied and/or multiplied when they should be added. Some candidates preferred to add or multiply fractions 'by hand' rather than use a calculator. The standard of presentation of work often contributed to the success, or otherwise, of the solution.

15 There was a mixed response to this question. There were some clear, concise solutions given. Most candidates understood that they needed to work with triangle ABT and so calculated either one or both of the angles ABT and ATB. Fewer candidates were then able to identify that the Sine rule was the appropriate method required to move their solution on. Those that did usually gave a correct first step but then had difficulty in transposing their equation into a form that would give the answer. A common error was to assume that BP was 25 and then use right-angled triangle trigonometry to get to a solution.

16 Many candidates found the correct values of *a* and *b* though some gave the value of b as $^-5$. There were not so many correct answers for *c*. It was common to see numerous trial and error attempts, covering the page, to find *c*. These, in the main, were unsuccessful. Very few candidates could write down the equation $5^2 - 4 \times 2 \times c = 73$ to help find *c*. Those that did try this often ended up with $c = 6$ and others simplified the equation incorrectly to $17c = 73$. Some misunderstood the formula and worked with $5^2 - 4 \times 2 \times c = \sqrt{73}$.

17 It was encouraging to see the majority of candidates making some attempt at this question, though with varying degrees of success. The formula for the surface area of a cone was given in the formula sheet and this helped candidates to successfully find the area of material required for the roof. Finding the area of the walls caused problems; many used an incorrect formula and found the volume of the cylinder by mistake. Pleasingly, many of the better candidates chose to work more accurately with areas in multiples of pi. Some added in the area of the base of the tent (or the volume of the cylinder and/or the volume of the cone) even though the question specified walls and roof only. A number of candidates thought it necessary to round their total area to the nearest whole number of square metres. Unlike in the earlier questions, all gave their answer in proper monetary form to two decimal places.

18 This algebra question was found to be very difficult. Though some candidates were able to give the correct denominator, a sign error in the numerator often spoiled the final answer. It was common to see candidates subtracting numerators and denominators while others used ‘false cancelling’ to simplify their answers.

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