GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres

March 2013

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General Certificate of Secondary Education

Mathematics B (Linear) (J567)

OCR REPORT TO CENTRES

Overview

General Comments

This is the first and last March session for this specification, which has given centres the opportunity for a different entry pattern than normal. It appears that many centres were taking the opportunity to enter their candidates a little earlier than usual as the entry was larger than expected and also included a number of candidates who had already attempted the examination in November. The standard of work was variable however and for some candidates the examination may have come too early, as they appeared to have been left short of valuable revision time. Some candidates performed very well and they will be pleased to have fewer examination papers to sit in the summer session. It may be that many will be given a second opportunity later on this school year. Centres must now formulate their entry policy based on just two sessions over the next school year, November 2013 and June 2014.

As with the November 2012 session, the questions that tested the recall of knowledge, the AO1 questions, were answered well. The exception is still in finding the solution of linear equations, where there is now a demand for algebraic structure and too many candidates rely on trial and improvement methods here. The questions which required the method to be selected and applied in a context, the AO2 questions, were not answered as well as the AO1 questions. These questions highlighted the poor technique that many candidates have in reading a question and extracting the relevant information. There are many techniques for assisting this process, such as underlining or ringing essential information, but candidates would often use the wrong information in their solution or they would find the wrong side or angle or unknown. When a correct solution has been obtained, some questions require that the answer is given to a certain degree of accuracy and many candidates fail to do this. This is more common to the Higher tier and in particular questions which involve irrational solutions; examples include the use of π (pi) or the solution of quadratic equations using the ‘formula’. The intention is to prevent candidates either writing out long decimals or making their own decision about the degree of accuracy, however once a question specifies a certain degree of accuracy, credit is lost if candidates do not give a correctly rounded answer.

The questions that set a problem to be solved, the AO3 questions, are still the main concern for examiners and many candidates are still unable to show the skills necessary to successfully answer these questions. They have to extract the information similarly to in the AO2 questions, they have to identify the information to be found and there may be more than one stage to be solved or more than one piece of information to be found. Their solution also needs to be organised and set out so that an examiner can follow the solution and there is a specified requirement in the QWC questions that the solution is set out clearly and all the stages can be seen. There have been three sessions for this specification and there are now plenty of these questions to use for practice.

There is a growing concern that many candidates do not use a calculator correctly. Too many rely on calculators to apply the hierarchy of operations (BODMAS/BIDMAS). Very few estimate the answer to calculations and few candidates check that the answers are reasonable. The best example is finding the mean of a grouped frequency table, where the answer given is not within the range of the data presented. The standard of arithmetic processes is also worse than expected and usually accounts for some lost credit in the non-calculator papers, J567/01 and J567/03.

Questions in geometry are often used to test reasoning and candidates should use the correct terms. The correct terms can be found in the specification; other acceptable terms can be found in the mark schemes. We do occasionally accept a variety of terms, but this does depend on the nature of the question being asked. Many candidates at Foundation tier cannot differentiate between a method and a reason, often explaining the value of an angle by going through the calculation already done. Reasons require the appropriate geometrical properties to be named, such as “the angles of a triangle add up to 180°”.

There has been much good work this session in both tiers. The performance in some algebra and statistics topics has improved. We did however notice a number of instances of candidates producing a perfect solution to a question, but then crossing it out and replacing it with an incorrect solution; a candidate’s first thoughts are frequently correct and we recommend that they double check before crossing out work. Candidates should not insert false information that is not given in the question; the best example of this comes from J567/04 where many candidates treated an angle as a right-angle even though it was not given as such an angle. There have been an increasing number of candidates who attach an extra sheet of working to their paper. The use of additional sheets should only be necessary when a candidate wishes to replace a rejected solution, bearing in mind what has been said above, for which there is insufficient space left on the paper. In such instances, the question should include a statement linking the two together, such as “see additional sheet 1”, and on the additional sheet there should be the candidate details and the question number. The final answer should only be written once; if there is an answer on the question paper and another different one on the additional sheet the candidate must cross one of these answers out.

Centres requiring further information about this specification should contact the OCR Mathematics subject line on 0300 456 3142 or maths@ocr.org.uk.

J567/01 Paper 1 (Foundation tier)

General Comments

Candidates were generally well prepared for this paper and were able to attempt most of the questions; very few appeared to run out of time.

Most candidates attempted to show some working for their answers and consequently we were often able to award part marks for questions where the answer was incorrect. Sometimes however their method was not well ordered and this was particularly true of questions that involved some form of problem solving, solutions here often being haphazard and difficult to follow.

Some candidates showed that they did not have good understanding of place value with decimal numbers; their equivalence to fractions was not always appreciated. There were many who found questions involving the manipulation of fractions beyond them.

There was some improvement in the attempts at the Quality of Written Communication (QWC) question. Candidates showed an increased awareness of the need to show a full and detailed solution using appropriate language, although there is still a need for further development in this respect.

Comments on Individual Questions

1 Nearly all candidates were able to round to the nearest 10 and 100 in part (a). The majority knew how to multiply a decimal number by 100 in part (b)(i), but some moved the figures an incorrect number of places, giving answers such as 3600 or 36; a few candidates just added two noughts and gave an answer of 3.600. Dividing by 10 was done better in part (b)(ii), however some used the traditional algorithm for division and gave the answer in a truncated form, not knowing what to with the remainder. A variety of approaches were used to find 25% of 52 in part (c), those who halved and halved again were usually successful, although there were some computational errors. Those who found 10% and then 5% had mixed success, as some became confused in their method; for instance some found 10%, then 20% and finally 5% and added all three figures, effectively finding 35% altogether.

2 Nearly all candidates were able to give the correct grid reference in part (a) and most were able to give the appropriate compass directions in part (b). The majority gave a sensible distance in part (c); some gave an answer of 40 m, possibly resulting from a misreading of the scale as 1 cm to 10 m, rather than to 20 m. Most gave sensible directions in part (d), with only a few making an occasional error.

3 There were mixed responses to finding the differences in height in parts (a) and (b). Some had a clear approach and there were many correct answers, although a few did not appreciate the significance of place value and gave answers of 18 m and 27 m, rather than 0.18 m and 0.27 m. For those who did not give a correct answer, it was not always possible to award a method mark as the working was not always clear enough to indicate the process that they were carrying out.

4 The majority of candidates gave correct answers in all parts to this question, although a significant number gave answers that were an hour too long or an hour too short for the given baking times.

5 Few obtained full marks on this question. The problem solving aspect of this question made it difficult for candidates to find an appropriate approach. It was common for candidates to find the area of the rectangle in square metres and then to convert, often incorrectly, to square centimetres and then to divide by 50. Those who found that there would be 4 tiles needed for the width and 6 for the length were more successful, although some added rather than multiplying at this point. Generally those who adapted a practical approach, often dividing the rectangle into a grid were the most successful.

6 Most read off the correct values from the graph in parts (a) and (b). Only about half the candidates found the difference between the temperatures in part (c). Common errors were to give answers of 1.1° or 9° rather than the correct answer of 0.9°. Most recognised that the temperature increased and then decreased over the day, which was all that was required for the mark in part (d).

7 Candidates generally struggled to recognise the correct pairs of triangles in part (a). In (i) most appreciated that triangle C contained a right angle, but were unable to spot that D was right-angled as well. Candidates responded poorly in identifying the two isosceles triangles for part (ii). Most were able to identify the square in part (b)(i), but few were able to distinguish between the quadrilaterals for (ii) and (iii), finding the rhombus particularly hard to identify.

8 Most found the correct answer to the simple equations in part (a) and could also simplify the expression in part (b)(i), although there was a small number that answered $9p^3$ instead of $9p$. The majority of candidates gained one of the two marks for a partially correct answer in (ii); $11x + 2y$ was a particularly common response, showing that candidates had a fair idea of how to simplify the expression, but were not able to cope with the negative sign.

9 In part (a) nearly all candidates showed that they could solve problems involving temperature changes. Few however could solve either problem in part (b), candidates generally lacked the skills necessary to manipulate directed numbers to be able to find a solution.

10 Part (a)(i) was not answered well, some candidates had a confused approach and appeared to lack an algorithm to solve multiplication problems of this type. A few showed a weakness in understanding place value by giving an answer of 270.18 rather than 271.8. Again in (ii), there was not always a coherent method for divisions of this type and the majority of candidates did not find a correct answer, however some gained a part mark for showing some understanding in their method. A common incorrect method was to divide by 10 and then by 4. By contrast, more candidates had a sensible approach to solving the problem in part (b). A variety of algorithms were used and most candidates gained some marks, with many obtaining the correct answer. More candidates are using a grid method, rather than the traditional algorithm and this was often successful.

11 Most candidates gave the correct probabilities in part (a)(i) and (ii). It was encouraging that nearly all candidates gave their answer as an appropriate fraction; it was very rare to see answers as ratios, which, as always, were only able to obtain limited marks. In (iii) many candidates did not appreciate that their answer should be the same as in (i), often giving the answer as ½. For those who had some idea of how to answer part (b), a variety of methods were used. Some found two thirds of 12; others found fractions that were equivalent.

12 Nearly all candidates were able to find the next terms in the sequences in part (a). They read the rules carefully in part (b) and consequently most were able to continue the sequence successfully and gained 3 marks in (i); when asked to reverse the sequence in (ii), many adopted a sensible approach and gained at least one mark.

13 There were a significant number of candidates who had a very limited idea of how to approach this question. Often, they just added the data for Lizzie's five trials and Megan's six trials and compared the two, not realising that this would not give them a meaningful result. Some paired the data and compared their results, for which they gained some credit. Others realised that finding an average would be sensible. Unfortunately, they often chose the mean, not realising that the median would be just as good in this particular situation and errors were made in computing this. There were some good answers, however just a few realised that using a measure of spread and an average would give an appropriate full response. Candidates still need to be aware that how they set out their work and their interpretation of their results, using appropriate language, such as mean, in this context is important.

14 Although many candidates obtained the correct answers in part (a), it was disappointing that there were some who could not recall fraction to decimal equivalents for familiar simple fractions, giving answers such as 7.10 for 7/10 and 3.4 for 3/4. In part (b) only a minority gained both marks; many just gave an answer without any working, for which they could not obtain any marks. Some tried to demonstrate their answer with the use of pie charts, but these were nearly always inaccurate and could not be used for comparative purposes. Those who converted to equivalent fractions, decimals or percentages were often successful. There was a general inability to add fractions in part (c), which resulted in few candidates gaining even part marks; 2/5 + 2/3 = 4/8 was a very common error.

15 A small number demonstrated good algebraic skills in parts (a) and (b), but most candidates failed to gain any marks in solving the inequality in part (c).
Although there were reasonable attempts to collect like terms, these were rarely seen as part of an inequality or equation. Candidates need to demonstrate a clear step by step method if they are to gain part marks in solving inequalities or equations.

16 Most candidates attempted this question and obtained some marks. Most plotted the heights correctly, but failed to plot midpoints or join their plots with straight lines. A few failed to label the scale; others were not consistent in their linearity. Some drew a bar chart rather than a frequency polygon. Only a minority identified the modal class correctly in part (b), with most candidates giving a specific value rather than a class interval. For those who showed any working in part (c), most failed to identify from the table that Sofia took more than 10 000 steps 9 times out of 30 and consequently few candidates achieved any marks on this part of the question. There were very few correct responses to the longest possible walk in part (d), with nearly all candidates being unaware of what was required.

17 There were very few attempts at an algebraic approach and nearly all made some attempt at using a substitution approach, generally with random trials from which only a minority obtained a correct solution. Candidates need to be aware that if they use such an approach, it is important that they set their method out clearly and that they do not cross out incorrect trials; this will lead to evidence of method, for which part marks can be obtained even if they do not find the correct solution. Some candidates were not able to manipulate the negative numbers that were generated by low starting numbers, which led to them making errors.

18 Some candidates made an attempt at an enlargement, for which they gained marks, but few were able to demonstrate the technique for obtaining an enlargement with a particular centre. Those who did attempt to enlarge the triangle from the correct point did not always use the correct scale factor.

19 Most candidates identified the correct net and then drew an alternative net of a cube in part (a). There were good attempts generally at drawing the correct net of a square based pyramid in part (b), with varying degrees of accuracy; only a few drew a plan or a three dimensional sketch. There were however hardly any correct answers in part (ii) for the total surface area of the pyramid. Most did not have a sensible approach, with some finding the total length of all the edges of the solid. Of those who did have a credible approach, few identified the correct height of the triangles, usually using 6 cm and consequently were only able to gain part marks. A common incorrect answer was 108 cm^2.

J567/02 Paper 2 (Foundation tier)

General Comments

Candidates were generally well prepared for this paper, although it was evident that some candidates did not use a calculator. Most were able to attempt a good range of questions. The majority of candidates showed working, but there are still candidates who give only answers and so lose the opportunity of gaining method marks.

Some candidates' formation of numbers was such that there was doubt about what they were meaning to write, for example 0 and 6 often looked similar as did 7 or 4 with 9. Some candidates struggled with the questions on basic algebra and number, in particular ignoring the rules of BIDMAS or incorrect substitution into formulae.

There was little evidence that candidates made any attempt to check how reasonable their answers were, for example giving '3 and a half taxis' in question 16(c).

The paper seemed appropriate for the candidates; they achieved a good spread of marks and overall the paper was well attempted. Nearly all candidates appeared to have enough time to complete the paper.

Comments on Individual Questions

1 Many candidates gave the correct answers to parts (a) and (b), with hexagon being the most common error in (a). Fewer candidates were able to identify the triangle as scalene in part (c), with isosceles being the most common error.

2 Nearly all candidates scored at least 1 mark, usually from part (b). In part (a) the most common error was 'likely'.

3 The majority of candidates scored both marks on this question.

4 Many were able to measure the angle, however 144 was a common error in (a)(i) from misreading the protractor. In (a)(ii) many gave the correct answer, but common errors were obtuse and right angle. In part (b), despite 'not to scale' being written next to the diagrams, several candidates who had obtained an incorrect answer for an angle gave the reason as "I measured it". There were the usual arithmetic errors and 37 was a common error in (b)(i). However more lost the mark for the reason as they gave answers such as 'it adds to 180°', or in (b)(ii), 'inside the shape adds to 360°'. A small number of candidates stated a line added to 360°, whilst others showed the calculations used, rather than stating angle facts.

5 Many candidates gave the correct answer of 64 in (a)(i). The most common error was to answer 256 from doing 4^4 rather than 4^3; a few answered 16. Very few candidates failed to understand the question at all, but some confused cube with cube root. Part (a)(ii) was almost always correct. In (b), many correct answers were seen, however some did write 8^4 or 4096, from calculating the sum. Part (c)(i) was generally correct, the common error being to use 15 and 34 for the powers. The common errors in part (c)(ii) resulted from poor application of BIDMAS, particularly ignoring the bracket to give an answer of 153, but overall this question was well answered. In part (d) many candidates scored at least 1 mark, commonly with 9.07 and 9.057 reversed. Several candidates wrote all the numbers with 3 decimal places, i.e. adding extra 0s, to assist in the ordering. A common misconception was to start the list with the 2 decimal places 9.07 and 9.75, then to order the 3 decimal places.

6 The majority of candidates were able to answer this question correctly, with *x* and *y* coordinates being interchanged only occasionally. In (a) a rare error was ($^-3$, $^-1$). In (b) a few candidates plotted B at ($^-2$, 4) and there was also the occasional plot at (4, 2).

7 Many candidates were able to correctly answer both parts of the question, but few showed any working to gain a method mark. The most common error in (a) was from adding the 6 to the 2 and then subtracting from 29 to get 21. Part (b) saw few candidates scoring 1 mark, responses generally gained either both marks or no marks. Candidates should be encouraged to write their answer on the answer line rather than leaving it embedded in the equation.

8 Correct answers for this question were frequently seen, although some did try to calculate the surface area or perimeter. Errors also included adding the measurements, finding the sum of the areas of the three visible faces, or only multiplying two of the dimensions.

9 Many candidates demonstrated a good understanding of ratio. Part (a) was generally correctly answered, the most common errors being to multiply and giving answers of 7200, 6 and 480 respectively. In part (b) many candidates gave the answer as 140.

10 It was disappointing not to see more correct answers and the marks awarded were wide ranging. The main reason for this was that candidates did not read the question carefully and subtracted one amount before calculating the other, although the majority who did this had an otherwise correct method for which they did gain credit. Other candidates scored the M1 for 150, but then struggled to get 108 as finding 12% proved difficult. Some tried to find 10%, 1% and 1% and then adding, but this was often done incorrectly, while some simply divided by 12. Many candidates correctly worked out 12% using a non-calculator method, possibly demonstrating a lack of a calculator or a lack of knowledge of how to calculate a percentage using a calculator. Some candidates got mixed up with trying to convert $\frac{1}{6}$ into a decimal or percentage and then made errors, when it was clearly much simpler to divide 900 by 6. Some candidates forgot to subtract their values from 900. There were a small number who were put off by starting from a blank canvas.

11 Part (a)(i) was generally well done, although a common error was to execute the calculation as (36 x 1 + 31) x 2, to arrive at 134. A less common error was to give 0.98. In (a)(ii), a significant number of answers were in pence, 412. Many gave a correct statement, 36 x 8 + 31 x 4, but were not using a correct order of operations and were calculating (36 x 8 + 31) x 4 to give 1276, or £12.76 as an answer. Others who did not show the full string often gained credit for correctly stating 288, before going on to make the same common error. Candidates should be encouraged to write down more interim stages so that errors such as these are avoided. In part (b) many candidates had the correct answer, with several others gaining credit for 21 or 27, but then they went on to add rather than subtract.

12 Candidates must be made aware that in QWC questions they must clearly show all their working; this was clearly stated in the question here. The majority of candidates scored a mark for evidence they had attempted to count the squares and some then gained the second mark for their number of squares being in the required range, however many did not state their number of squares. A simple statement such as ‘number of squares is…’ would have given several candidates an extra mark. Few realised that the real area of one square was 25 km^2 and many incorrectly used 5 as the area, a very small number did score this mark usually by converting their lengths to kilometre before multiplying. Very few candidates gave units of km^2 (or any other unit) and thus lost another mark. Some candidates scored 0 marks as they attempted to find the perimeter. Many candidates did not organise their answers effectively, showing a page full of disorganised calculations

and/or numbers. QWC questions are marked in a different way to the rest of the paper and candidates cannot obtain full marks to these questions without showing a full, correct and comprehensive method that is easy to follow. In part (b) many candidates scored both marks, the most common error was 14.60 from candidates who did not multiply by 8. In (c)(i) many candidates gave the correct answer; common errors were 157 - 61 = 96 and 120 - 61 = 59, while others calculated the mean or median. In (c)(ii) many gave the correct answer, but others lost marks by not showing their working. There is still a tendency to get the order of operations wrong when calculating the mean, so we recommend that candidates press the 'answer' (or equals) button after adding the numbers and before dividing by the total frequency. Most scored full marks in (d)(i), the common error being to have only 3 correct, which did gain credit. Many correct answers were given to (d)(ii), although some scored the mark only as a follow through from their part (d)(i). Some misunderstood the question and only wrote the answer for the group 90 – 109.

13 Many candidates were able to give three correct combinations, although several candidates did not read the question which stated 'exactly 15 packs' needed to be bought and some calculated the cost of 16. Others used seven and a half packs of paper. The majority of candidates did gain credit, but again some lost marks for not showing sufficient working, the question asking candidates to 'show how you decide'. It was important to see a total and how it was obtained.

14 In part (a) a number of candidates answered correctly. Candidates need to be encouraged to show their working for calculating the size of the angles; several drew incorrect pie charts with little or no working, which prevented the awarding of method marks. Some tried to just use the number of people as their angle size and ended up with a pie chart with a large 'empty' sector. The majority worked in degrees; only a few candidates converted to percentages and usually unsuccessfully. Where candidates were successful, some lost marks for not being able to measure the angles accurately. It was pleasing to see the majority of candidates had labelled their pie charts with the names of the countries. Part (b) was poorly done, the most common error was 45.6 from calculating 38% of 120. Some gave the answer 31.6, which came from completing the calculation, but failing to correctly round to 1 decimal place.

15 This question challenged candidates' reasoning abilities. Many were able to give the correct answer, with others gaining credit, usually for an answer of 2, but also more rarely for 6 or 12.

16 In part (a) several candidates were able to identify 2, 3 and 7 as factors, but failed to write them as a product for 2 marks. Many gained credit for a factor tree. Some candidates appeared not to understand the term 'prime' and listed all the factors of 42 (not just the prime factors) or wrote down factor pairs. In (b) many confused multiples with factors. Some candidates did not answer part (a), but in part (b) were able to show a correct factor tree for both numbers, however candidates generally had little idea how to proceed. A few listed multiples, but had often made an error before reaching 168 so the common multiple was not recognised; candidates should be encouraged to check their working on their calculator. Most candidates made a good attempt at part (c), many scoring both marks. A number of candidates attained a single mark for one correct value or one of the two incorrect combinations that would carry more than the required 95 exactly. Only a few candidates wrote logical lists; most working was scattered around the page.

17 The majority gave the correct answer to part (a), the most common error was to misread the scale and write 49 or 40.8. In part (b) however there were very few correct answers. Several candidates seemed to show an understanding of what 'gradient' means, but had no idea how to calculate it. Many answered with words such as 'increasing' or 'positive' and some measured the angle between the *x*-axis and the line. Part (c) was done slightly more successfully than part (b), although many candidates did not attempt this question.

Most were able to correctly read some values from the graph and add them, but where marks were earned it was usually from partitioning 152, usually into either 76 + 76 or 3 × 50 + 2.

18 Few recognised that Pythagoras' theorem was required and various manipulations of the figures were seen, such as estimates and also quite a few ½ base x height attempts at the area. Those who did attempt the correct method usually got it right, although some stopped at 28.25 and others multiplied their squared numbers rather than adding. In part (b) there was a lack of understanding of 'plan view', so many end or side views or 3D drawings were seen, while others just made no attempt. Several candidates who drew the correct outline then omitted the internal line.

19 The vast majority of candidates did recognise the sequence was increasing by 6 each time, but showed no idea of where to go from there. Of those who did have some knowledge of what was required, common errors were confusing the 11 and 6 giving an answer of 11*n* + 6, or not finding 11 and using 17 instead such as 6*n* + 17. However, far more candidates just gave an answer that was another term in the sequence, with 41 or 65 being the most common.

20 Part (a) was well done by those candidates who knew the method, but many candidates showed little understanding of the question. The most common response was 10.75, from finding the mean frequency. Some candidates scored a mark for the midpoints, but did not know what to do with them. Others knew they had to multiply something but seemed unsure what to use; lower and upper limits of the class intervals were often used. Some candidates added extra columns to the table, which helped them show their working leading more clearly to their answer. Those who got as far as multiplying the mid-value by the frequencies usually went on to get the correct mean, often given as 72. There was little evidence that candidates checked how reasonable their answer was from the table of results. Others added the midpoints and divided by 4 or 10. There were many errors in summing their products and dividing by 4 instead of 43. In (b) whole number answers of 18, 15 or 25 were often given. Wrong answers involved fractions with 73 as the denominator. It was pleasing to see only a small number of candidates giving the answer in the wrong format, which was generally a ratio. Many answers involved using the scores rather than the frequencies. There were a lot of no responses, along with answers of 'likely' or 'evens'.

21 This question was poorly answered; most candidates managed to obtain a mark for finding the area of the square, but many then appeared unsure of what to do next. If a candidate was able to find the area of the circle they generally scored the full 4 marks, but many appeared not to be familiar with the formula for the area of a circle. A number of candidates rounded their numbers as they progressed through the question, incurring errors. Several calculated the perimeter rather than the area of the square.

22 Several candidates failed to attempt this question, but those who did often scored credit for correct trials. Some had the answer of 3.8, but did not write it to 1 decimal place. The other main error was in not recording the negative sign for some results.

J567/03 Paper 3 (Higher tier)

General Comments

The paper was accessible to candidates of all ability levels. Most candidates were well prepared for the paper, particularly for the lower demand questions at the start. Candidates had time to complete the paper, as is evidenced by the number of good answers to the final question, however many were unable to attempt some of the more demanding questions on transformation of graphs, surds, perimeter of sector and trigonometric graphs.

Presentation was generally good with working often shown, enabling method marks to be awarded. Many good constructions of the net and neat attempts at the frequency polygon were seen. Calculations were usually clearly laid out, but in the more demanding algebra questions working could often be difficult to follow. Schools might benefit candidates by insisting on structured setting out in geometry questions, such as in questions 13, 15b and 19, as working was often muddled.

Questions requiring explanations were answered better than in the November session, although when making a statistical comparison candidates need to be aware that they must refer to the context. In the Quality of Written Communication question candidates need to ensure that they show full and carefully annotated working, leading to a clear and concise answer to the question, in order to obtain full credit.

On the whole, candidates demonstrated a good grasp of basic arithmetic, although some problems calculating with decimals and negative numbers were seen.

Comments on Individual Questions

1 Many candidates scored well on this question testing their understanding of two-way tables, ratio and probability, as well as their ability with basic arithmetic. Very few errors were seen in part (a), although some candidates ignored the given ratio and gave an answer of 100 and 200. Those candidates who realised that their answer to part (a) completed the bottom row of the table had little problem with part (b)(i). Almost all candidates expressed the probability in part (b)(ii) as a fraction, which was sometimes correctly simplified, although a significant number used a denominator of 300 rather than 120, thus finding the probability that the visitor was an adult male rather than the probability that the adult was a male. In part (b)(iii) many candidates correctly identified the ratio as 132 : 168 although it was not always completely simplified, with 33 : 42 a common final answer. Other misinterpretations of the two-way table were seen in this part with a common answer of 13 : 17, where candidates had correctly simplified the ratio of adult males to adult females.

2 Many candidates were able to correctly write down $3.5n + 15$, although some were penalised for omitting '$F =$' to complete the formula. Very few candidates added the £3.50 and £15 before multiplying by n or simply answered $n + 15$.
Most candidates understood what was required in part (b) and many correct substitutions were seen, although candidates were let down by poor arithmetic, particularly in the multiplication of 25 by 1.5 or 3.50 by 8. Most candidates, however, did use the two values they had calculated to identify the cheaper firm and find the correct difference.

3 There was a pleasing response to this question on algebra with most candidates being able to correctly expand and factorise in parts (a) and (b). More errors were seen in part (c), with answers involving many combinations of T, 5 and 4 common. Candidates need to take care to indicate the division correctly as it was common to see answers of $T – 5 \div 4$ or $T \div 4 – 5$. Sign errors were also common with + in place of the required –. Candidates who showed the correct first step of $4p = T – 5$ usually arrived at the correct answer.
Many candidates began to solve the inequality by replacing the < with = and then solving the resulting equation; they usually remembered to convert back to an inequality for the final answer and so could receive full credit. Common errors were in collecting the x terms as $4x$ or the constants as –2, but where clear working was seen credit could be given for following through with a correct solution. Those few candidates who resorted to trial and improvement rarely achieved any success.

4 The term ‘frequency polygon’ was misinterpreted by many candidates and bar charts/histograms were commonly seen. Although the requirement to add a numerical scale to the vertical axis was not stated, candidates should be aware that a diagram is incomplete without one and a disappointing number of candidates were penalised for this omission. Some candidates lost a mark as they did not plot at the midpoints, or they joined the points with curves rather than straight lines. The modal class was often correctly identified, although common errors were stating 9500 (the midpoint) or 8 (the frequency for the group). In part (c), a common error was to misinterpret ‘at least 10 000 steps’ as either the frequency of 7, the group containing 10 000, or the total of the frequencies of the top three groups. Those who identified the need to use 9 and 30 could not always convert 9/30 correctly to a percentage. In part (d) many candidates did not realise that they could give 7.5 as the upper limit and tried to attempt to write $7.4\dot{9}$, although it was very common also to see the unacceptable answers of 7.4, 7.49 or even $7.\dot{4}$.

5 Candidates made good attempts to solve this problem, with algebraic and numerical methods, or a combination of both, being equally common. There were many correct answers seen, often from clear working. Using the algebraic approach, most candidates could give a correct expression for Kate as $3n + 3$, but there were more problems with $6(n – 5)$ for Leo, which often became $n – 5 \times 6$ or $6n – 5$. The common errors with a numerical approach were to ignore negative signs, leading to a common answer of 3 and 12, when Leo’s value for 3 should have been –12. When using a trial and improvement approach, candidates should be advised to clearly annotate their trials and their outcomes.

6 Most candidates knew that four triangles were required to complete the net, and many accurate diagrams were seen. Only a very small minority of candidates attempted to draw a plan view. In part (b) many candidates ignored the instruction to use measurements from their diagram to find the surface area and assumed that the height of the triangle was 6 cm. Only in very rare cases did candidates measure the height and so full credit for the question was seldom awarded. Some candidates attempted to use Pythagoras’ theorem or trigonometry, but, without the use of a calculator, these methods were usually unsuccessful. In this question, methods were often very difficult to follow, with no clear indication of what was intended as the area of a square or a triangle or what the numbers being added together were. Some candidates were clearly trying to calculate a volume.

7 Almost all candidates recognised the need to find 120% and usually reached the correct answer from finding 20% of £64.50 and then adding it on. Some arithmetic errors were seen, for example incorrect doubling of £6.45 or incorrect addition of £12.90. Occasionally the £12.90 was subtracted from £64.50 or a reverse percentage was attempted. In part (b) it was very common for candidates to simply add the percentages to get a 20% increase without realising that 3 marks for such a simple calculation was unlikely. Candidates who realised what was required often used a value which they increased and then attempted to find the overall percentage increase. If they had not chosen a sensible number (such as 10, 100 or 20) they were usually unable to find the overall increase. Some candidates reached 121%, but did not give the answer as a 21% increase.

8 Many candidates recognised the calculation that was required here, but incorrect answers to the division were sometimes seen or, more commonly, the correct answer of 30 was then subtracted from either 360 or 180. In part (b) many candidates realised that the sum of the interior and exterior angles would be 180° and so correctly followed through from their answer to (a), if possible. Some candidates started again in this part, rather than realising that they were intended to use their answer from the previous part.

9 Most candidates understood how to find the midpoint, and usually arrived correctly at $^{-}5$ for the *x*-coordinate. There were more problems with finding the *y*-coordinate, with 5, 0.5 or 10 being common answers. Many candidates did not know how to begin in part (b), perhaps because there was not a line drawn and omitted this part. Those candidates who attempted the equation often scored for a correct *y*-intercept, but finding the gradient was beyond many. Working for the gradient was often not seen and hence method marks could not be awarded; candidates could be advised that drawing a triangle and indicating the lengths needed in the gradient calculation is a good start in this type of question. Common incorrect gradients were +0.5, +2, $^{-}2$, +5 or $^{-}5$. Some candidates were penalised for omitting the '*y* =' from their final answer.

10 Many candidates realised that the correct first step in the division in part (a) was to convert the mixed numbers to improper fractions, but then did not know how to progress correctly and either multiplied the values, attempted to divide the numerators and denominators, or inverted the incorrect fraction. Some candidates ignored the instruction to give their answer as 'a mixed number in its simplest form', so were penalised for final answers of $\frac{16}{15}$ or $1\frac{3}{45}$. It was not unusual to see candidates attempting to deal with the integer and fraction parts separately. Some candidates found no difficulty with the reciprocal, but others did not know what it meant and answers such as 25, 0.5, $^{-}5$ and $\frac{5}{1}$ were commonly seen. Part (c) was reasonably well done with many attempting to subtract the indices, although not always successfully.

11 Most candidates read the scale correctly in this question and the median was usually correct. Candidates were less successful with the interquartile range, with some errors in subtraction seen. Some candidates found the range, or just stated the lower quartile or the upper quartile. It is common to ask for comparisons between two distributions and it should be noted that one comment comparing the average and one comparing the spread is usually expected, with some interpretation of the context. Comments such as 'the salary in B is higher' are not sufficient and candidates need to state, for example 'the salaries in B are higher on average'. Comments about the IQR were often confused, with range used in place of IQR or statements such as 'the IQR is higher in A than in B'; further explanation was required, for example 'the salaries in A are more spread out because the IQR for A is higher than for B'.

12 Candidates should be encouraged to read the question carefully; those who stated the correct answer in this case were not given credit as the question asked them to explain without giving the correct answer. In (a), most identified that A was incorrect although reasons given were not always sufficiently clear. Although a reasonable number of candidates identified that D was incorrect in (b), again they could not give a clear explanation why. Some used rounding, which was not acceptable in this case. Explanations in part (c) were better, with candidates identifying that the index in F was incorrect because the values had been divided rather than subtracted.

13 Some candidates were successful in part (a), but most struggled with parts (b) and (c). In particular, many candidates thought that angle BCD was equal to angle BOD and gave an answer of 116. It was rare to be able to award method marks in this question as values were rarely linked with named angles; candidates should be encouraged to either mark angles they have calculated on the diagram, to add extra lines such as AO or BD where required, or to state the name of any angle they have calculated, such as ‘reflex angle BOD = 244’.

14 It was clear that many candidates were well drilled in the solution of simultaneous equations with many correctly multiplying to equate the coefficients. However, they were then let down by poor arithmetic skills, particularly in the use of negative numbers, leading to incorrect coefficients and hence incorrect solutions. Many of those who did arrive at the expected expressions $19y = {}^{-}38$ or $38x = 57$ could not continue to the correct answers. Using the method of substitution was rare, but, when used, was usually done with success. In part (b) many candidates were unclear about the method to factorise, and did not know how to deal with a coefficient of x^2 other than 1. Systematic methods to find the correct factors were rare and trials often included $6x$ and x rather than $2x$ and $3x$. When a pair of quadratic factors had been found, many candidates failed to give the correct solutions, for which a follow through mark was available; signs were often incorrect or the coefficient of x was ignored, e.g. $10x – 1 = 0$ led to $x = 1$ or $x = {}^{-}1$. It was not uncommon to see candidates attempting to use the quadratic formula, despite the instruction in the question to factorise.

15 Those candidates who attempted to find a multiplier often struggled to convert 15/12 into the decimal 1.25, however they were given credit for showing the method and the subsequent attempt to multiply by 10. Ratios of 4 : 5 were sometimes seen, which were often used to reach the correct answer, often by adding ¼ of the length to the original length. A very common error was to use differences and add or subtract 3, i.e. 10 + 3 = 13 or 15 – 3 = 12. In part (b) it was very clear that many candidates did not know what was meant by similar triangles and very few gained full credit. Those candidates who did score had usually indicated the angles correctly on the diagram. Few then went on to state the pairs of angles clearly, such as angle CAD = angle BCA, to show that the triangles were similar. Very few clear, valid reasons were seen; statements such as ‘the angles are the same because of parallel lines’ or ‘alternate angles’ with no reference to the angles that were related by this rule were common. Some confusion between similarity and congruence was seen.

16 This question was very well answered for a more demanding topic, although again errors were seen from candidates failing to work correctly with negative numbers. Candidates could correctly evaluate 3**p**, but then subtracting 5 from ⁻6 or ⁻3 from 4 caused difficulties.

17 Candidates who attempted this question usually knew that some form of parabola was required in part (a), but a wide variety of incorrect answers were seen, such as translations to the left or right, or stretches of the required graph. Some graphs inside the $y = x^2$ graph were seen, but they did not always pass through the origin. In part (b) many candidates did not correctly refer to the translation, but implied one by giving a description such as 'move 3', '3 right' or '3 left'. The word 'transformation' was seen in place of 'translation' in some cases and answers did not often include a correct vector.

18 A general unfamiliarity with surds was noted. Some candidates realised that they needed to multiply the numerator and denominator by $\sqrt{2}$, but few could show this clearly or simplify the resulting expression. 6 was frequently not multiplied by $\sqrt{2}$, $\sqrt{2} \times \sqrt{2}$ was not simplified to 2 and the denominator was often ignored.

19 Few candidates made any progress with this question. Even those who appreciated that the fraction 80/360 was required seldom went on to write it as a fraction of the circumference, i.e. $80/360 \times 2\pi r$ and then equate this with 12π. The radius or diameter was seldom stated, although some realised that the answer would be $12\pi + d$. Some candidates tried to use area rather than circumference and others tried to substitute a value for π. This is another case of a question where clearer working may have gained candidates more marks.

20 This was another very poorly answered question. Many candidates realised that they could use the graph to help them find the required values, but often estimated values of x at $y = {}^{-}0.8$, rather than using the given value of 53 and the symmetries of the graph. Some answers that were very close to the required answers were seen, but only the exact values could gain any credit. Incorrect answers found using 53 included ${}^{-}53$ and 270 ± 53.

21 It was pleasing to see some correct, concise answers with clear explanations of the probability and the expected takings, however a wide variety of responses were seen. Some candidates who had struggled to answer some of the more demanding questions made an attempt at this question, stating at least one or two possible winning outcomes and attempting to find a probability. The most successful methods of obtaining the correct probability involved listing outcomes or using a sample space diagram, although these sometimes led to extra or missing outcomes. Tree diagrams were less common, and were often incorrect as candidates found it difficult to deal with the conditional probability needed after using the probability of the first card being a 5 or a 6. Some candidates were able to use correct fractions without having shown any list or diagram. Some candidates went on to compare the takings with the profit either from a correct or incorrect probability and some very clear explanations were seen. A common misunderstanding was to discuss the game from the player's point of view, commenting on the amount of money a player would have to spend before winning anything. In a QWC question, candidates need to be aware that as well as giving a clear final answer, they have to show clear working that can be followed easily in order to gain full credit.

J567/04 Paper 4 (Higher tier)

General Comments

Many questions on this paper required the use of an electronic calculator, however some candidates did not use the one they had as there were many calculation errors, especially in the first half of this paper. Candidates also did not read the questions as carefully as they should have done. Some questions required the answer to a certain degree of accuracy and this was ignored by many. This paper also required the candidates to read scales on graphs and this was not done accurately by some.

It is expected that most candidates for this paper will have completed the entire higher content and are at least of grade C standard, but this was not the case. Some candidates left much of the second half of the paper blank and of those who did attempt these questions, some appeared not to have learned the topics.

Some errors were obvious and a quick check would have established that they were not reasonable, for examples in questions 3(d) and 7(a). Again the problem solving questions were not well structured and working was often difficult to follow, a particular example of this being the Quality of Written Communication question, 15(b). In this type of question working needs to be set out in an orderly fashion and with numbers clearly described such as ‘the number of candidates getting a grade C or better is 18’.

The candidates had sufficient time to complete this paper. They should be encouraged to use any spare time checking answers and labelling their working. In particular they could double-check calculations and ensure that answers are to the required degree of accuracy.

Comments on Individual Questions

1 In part (a), many candidates gave two transformations, ignoring the instructions in the question for a single one; usually the first one was a rotation and the second a translation. The angle of 90° sometimes did not have a direction, but the centre of rotation was usually correct. They should avoid the use of the term ‘move’ as it will not be credited even if the transformation had been a translation, which in this case it was not. In part (b), few had any idea how to construct an enlargement, but many drew a correct sized enlargement in the wrong position and were partially rewarded for this.

2 Most answers in part (a) were correct, though some misread the scale and gave 49 or 58 as their answer. Part (b) was not answered well; although many knew it was eight DKK to one pound, many did not know how to work out a mathematical gradient. Some attempted to divide the vertical difference by the horizontal difference, but counted the lines and did not read the scale so we often saw 8 ÷ 10 or 0.8, or equivalent, as the answer. Some thought this was similar to correlation and so gave a statistical meaning in part (c), however most knew that it was a conversion graph and secured the mark comfortably, the most usual response being ‘steepness of the line’. In (d), few showed their working and so if they were outside the tolerance they gained no credit. Many attempted to do 3 × 50 DKK and add 2 DKK, although in looking up the 50 DKK some misread the scale and most did when they attempted to look up the 2 DKK. The best attempts looked up 76 DKK and doubled the value, this being the most efficient method. Few candidates used the gradient and there were some arithmetical errors in working out the final figure as very few candidates used their calculators.

3 It was surprising how many candidates answered part (a) incorrectly, usually giving 91 or 111 as possible prime numbers; use of a calculator would have eliminated these numbers. Part (b) was seen as a standard text book question, yet many struggled with it. The question asked for the product of the prime factors, but this was rarely seen and many candidates just listed all or most of the factors of 42. Part (c) was answered better; incorrect answers were either higher common multiples like 1008 or common factors such as 2 or 6. In (d) there were a variety of methods; the most successful involved the use of multiples of 7 and 15, the least successful divided 95 by 7 and 15. Some responses had empty seats, while some did not have enough seats and a quick check, with a calculator, would have established these errors.

4 In (a), those who realised that this was a question on Pythagoras' theorem answered it very well and from these, there were few incorrect attempts. However, some did not fully comprehend the demand of the question and tried to calculate the area of the triangle or the area of the compound shape. In (b)(i), many did not understand the term 'plan view' and so we saw some three dimensional sketches and some front elevations. Some drew the correct rectangle, but then did not draw the line across the middle to show the apex. Attempts at (b)(ii) were better; the lower rectangle was usually correct but the top rectangle was often at a height of 4 cm or 5 cm rather than 3.5 cm.

5 Most realised that the difference between terms was 6, but about half knew that this meant $6n$ was the first term in the general term. Some wrote $n + 6$ instead. Some candidates found the ninth term, which was 65.

6 The brackets in (a) were usually expanded correctly, although some omitted to multiply the final number and $5x - 15 + 2x + 5$ was seen. Many however found it harder to simplify from here; $3x$ or $8x$ was seen instead of $7x$ and -25 instead of $+ 5$. In (b), there were many unsuccessful trial and improvement attempts instead of the expected algebraic manipulation. In manipulating, some candidates did not use the inverse operations and simplifications such as $16x = {}^{-}2$ (or $+2$) were seen.

7 This is a standard question and in part (a) they needed to use the midpoints, which form their estimate, and combine them correctly with the frequency. Those that attempted this usually obtained an answer that was correct or nearly correct. Many, however, attempted to add the frequencies and divide them by 4. Some misunderstood the word estimate and rounded their figures during the calculation process, while others added the midpoints and then divided by 4. In (b) the answers were better and many gave the correct answer. Probability is usually appropriate to be given in a fraction form, however some candidates spent time trying to convert their fractions to percentages. The main incorrect answers were $\frac{1}{2}$ or $\frac{10}{43}$.

8 Some candidates divided this shape into semicircles or quadrants and made the task more difficult. Most calculated the area of the square correctly as 144 m^2. For the circle, we saw the incorrect radius used with $\pi \times 12^2$, or an incorrect formula, such as $2 \times \pi \times$ (6 or 12). A few attempted to work out the perimeter.

9 Most answered (a) correctly, although a few found the square root of 18.5^2 only and others did not square root at all, giving an answer of 219.04. In (b) they usually calculated A and B correctly, but C was often the square root of 0.06 or 0.2449…. .

10 Part (a) was well answered, demonstrating candidates were well practiced at this type of question. The common error was to omit the negative sign before some of the key values calculated. Some tried to give the answer correct to two decimal places, even though the question clearly states ‘correct to 1 decimal place’. In part (b) there was a lack of clear algebraic manipulation. The initial step should have been putting the fractions over a common denominator, or equivalent, however the first step was often to collect terms on each side. Many tried to use trial and improvement, but this question was more demanding than the previous one on this topic.

11 Many candidates found this question to be difficult, although many gained one mark by identifying graph A. The common incorrect responses were $y = 4x$ for graph A, $y = {}^{-}4x + 4$ or $y = x^3 – 4x + 4$ for graph B and $y = 4x – 4x^2$ for graph C.

12 Part (a) was answered well; some left out a single power of 10, possibly by counting the zeros, giving 1.6×10^3. In (b)(i) many subtracted instead of dividing, giving 9.28 – 6.08 = 3 or 3.2. The question asked for an answer correct to three significant figures, but this was ignored by many candidates. In (b)(ii), few knew how to calculate the density and this was answered poorly; many simply compared the mass or the volume.

13 The common error was to square root first or square root incorrectly, giving an answer of $\frac{\sqrt{E}}{m}$. Candidates tried to do both steps in one go and they should be encouraged to show each step as they work it out.

14 Although it clearly states ‘directly proportional’, many candidates attempted to work out ‘inversely proportional’. Those who did attempt the direct relationship failed to write down the equation $y = kx^2$ first. Many obtained the constant value of 5, but did not have a relationship to insert it into.

15 Part (a)(i) was usually answered correctly, but many looked up the values the wrong way round in (a)(ii) and (a)(iii). They looked up the median using the 50 on the marks axis, giving an answer of 21 and then did similarly for the interquartile range, a common answer being 27 from 30 – 3. In (b) the two best approaches were to find 55% of 32 (=17.6) and compare to the value obtained from the graph, which should have been 18 or 19, or to calculate 18 or 19 as a percentage of 32 and compare to 55%. Errors were incorrectly reading from the graph and obtaining 15 rather than 13 or 14 and then failing to subtract this from 32. Some used 35 rather than 32 even though they were told that there were 32 in the class. Most calculations involving percentages were correct and most conclusions were correct as well. This was the QWC question, but still there were many scripts that had little or no structure and explanation to the work.

16 In (a), many had seemingly not studied this topic as this was left blank; others calculated the heights correctly, but drew the first bar wrongly, usually at 2.2, or the last bar was too wide and went to 350. In (b), comparisons between individual bars are not usually illuminating. We were looking for a comment on the ‘average’, which need not be stated, but should be obvious from the graph or the modal class, or alternatively a comment about the range or at either extremes. Many candidates did receive at least one mark and this part was seen as accessible to many candidates.

17 Few candidates were able to attempt part (a) correctly, but this was aimed at the likely grade A or A* candidates and those who knew what to do answered this very well. The key was to form $(3x + 2)^2$ and equate this to the quadratic expression. In (b), those who tried to factorise found it very difficult to do. The key was in the question, as 'to 2 decimal places' indicates that use of the formula is expected. Many did write out the formula and most inserted the values of a, b and c correctly too, however many of these could not then evaluate the expression correctly.

18 The angle at C did look temptingly like a right angle and some used it as such, but there is no indication in the question that it is such an angle. The cosine rule cannot be used without further calculation, so the only direct method is the use of the sine rule, which many candidates did use with success.

19 In part (a) some did obtain the correct answer, whilst others calculated 2% of 4 500 000 and used that each year, similarly to the 'simple interest' method. In (b), accuracy was important and some candidates were careless about some of the figures. It is important that the figures are maintained in full on the calculator at each stage. Those who used the multiplier method (× 1.02) had an advantage over those who calculated the increase and added it on.

20 This is a standard question, but it involves realising that the full height is 15 cm and some good attempts used 9 cm in the place of 15 cm. Some did not know the formula, which is partially given on the formula page. This is aimed at the very top candidates, but many did make a decent attempt at it and with practice many candidates are able to answer this type of question correctly.

21 A correct start is required here and the calculation of AF or AG is needed. Many candidates could do this using Pythagoras' theorem, notably including some who did not do question 4(a) correctly. At this stage the final trigonometry is not that demanding, but many simply used $\tan(x) = \frac{6}{9}$ rather than looking at the diagram more closely.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

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