GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres

November 2013

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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.

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OCR REPORT TO CENTRES

Overview

General Comments

The November 2013 entry was expected to be stronger than in previous series and this was shown in the candidates' results. The examination papers were of a similar standard to the previous series, with the exception of J567/04, which was seen to be more accessible. The general performance of candidates improved over previous series and the results were better than in any of the previous series.

Attempts at the problem solving questions have improved, yet candidates need to write down their work in a logical order, with each stage clearly identified with a label. There is an over-reliance on the use of trial and improvement methods and candidates should take time to consider the alternatives. Questions with more than 1 mark allocated usually require working to be written down and this is not always done.

The use of calculators needs to be considered by centres. All candidates should have access to a calculator that is appropriate for their ability and should be set in 'degree' mode. Candidates should be encouraged to work out time problems without a calculator; few of them show understanding of which buttons apply to time calculations and it is a common error to use 100 minutes to an hour. Calculations should be written down first and then worked out on the calculator next. Estimation techniques should be used to check the answer. The use of the bracket keys, or the 'equals' key, needs to be encouraged; there are too many cases when candidates rely on the calculator to work the calculation out correctly. A clear example of this is finding the mean of a group of numbers, the numbers to be added should have brackets before them and after them, so that the division is done last. Candidates should be encouraged to round figures when they write them down, but to use the exact number when using them in further calculations.

Candidates still struggle to do basic calculations without the use of a calculator and I encourage centres to persevere in improving these arithmetic skills. In particular, the calculation of fractions needs improvement and time calculations need to be addressed since the common calculator functions will not work properly work with time, as mentioned above. It is recommended that these calculations be done 'by hand'. Estimation should always be used to check calculations on a calculator, as well as common sense approaches, such as remembering "the hypotenuse is the longest side of a right-angled triangle" in checking the use of Pythagoras' theorem, or that multiplying by a number greater than 1 increases a number and multiplying by a number between 0 and 1 decreases it.

There is a concern about the quality of work in solving angle problems. Candidates should write the angles they have worked out on the diagram and then try to state them using the usual three letter notation. A question requesting justification needs the appropriate angle property to be stated and candidates should learn the full definition as these are the definitions expected to be given. Two examples of this would be "The angles of a triangle add up to 180°" and "Opposite angles in a cyclic quadrilateral add up to 180°". The use of slang terms such as 'F-angle' should be discouraged, with the correct terminology of 'corresponding angle' encouraged.

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 all the questions that they could do.

Many candidates obtained some marks on the Quality of Written Communication (QWC) question, Question 21, but responses were not always easy to follow, with a tendency for candidates to write calculations all over the page. Candidates need to structure their response with a step by step approach, which will lead them to further developing the problem solving skills needed to answer questions of this type.

Candidates have a good understanding of how percentages relate to decimals and using percentages to solve problems without the aid of a calculator, but an understanding of fractions and how to manipulate them within a problem continues to be an area requiring development for many of them.

Comments on Individual Questions

1 Many candidates recognised the appropriate terms for the circle in part (a). A small number confused radius with diameter.

The skills needed to use an angle measurer to measure an obtuse angle were not accessible to all and there were quite a few acute angles given in the response to part (b). Candidates need to realise that accuracy is important and an answer of 140° was not accurate enough.

2 The responses to this question were very good with nearly all candidates obtaining the correct answers to the questions on bar charts and pictograms. A very small number made errors in calculating the total number of pupils in part (a)(iii), but most showed some working and were able to obtain the method mark.

All candidates understood how a pictogram worked with just a few making errors in using the key to draw the diagram in part (b)(ii).

3 Many candidates were unsure of how to apply the order of operations in this question. A common incorrect answer in part (a)(i) was a response of 42, where the candidate just performed the operations working from left to right. In part (a)(ii), many appreciated that they needed to perform the calculation in the brackets first, but then went on to find 25 × 4 to get an incorrect answer of 100, for which they obtained one mark. Others found 20 – 30 rather than 30 – 20, which also obtained one mark.

Most candidates attempted to insert brackets into the calculations in part (b). The more straightforward part (i) was inevitably answered better than part (ii).

4 Nearly all candidates demonstrated the skills needed to solve simple equations. A small number in part (a) subtracted ten rather than adding, giving an incorrect answer of 47 or in part (b), divided by 2 rather than multiplying, giving an incorrect answer of 6.5.

Most used a trial and improvement method or an inverse flow chart rather than an algebraic technique in part (c) and were generally successful with these approaches.

5 Most recognised the pentagon in part (a), although hexagon was a fairly common incorrect answer.

Few obtained the correct answer in part (b); many only recognised the vertical line of symmetry and gave an answer of 1.

Rotational symmetry was not understood by all, with a small number giving answers such as ‘clockwise’ or ‘360’ in part (c). Those who understood the concept often gave a correct answer.

There were some correct algebraic expressions in part (d), although they were usually inelegantly expressed and often contained units, for which they still obtained the mark.

6 Some candidates were not proficient in naming special types of quadrilateral and gave answers of rhombus or parallelogram rather than trapezium in part (a)(i). The attempts to find a formula to use when finding the area of the shape often led to incorrect answers in part (a)(ii). Those candidates who simply counted the squares were usually successful.

Incorrect reflections in part (b) were rare. There were, encouragingly, many correct responses in part (c), however some candidates attempted to do some sort of reflection in a vertical line and ended up with a rectangle.

7 Candidates attempted this question with varying degrees of success. Some showed a good knowledge of the relationships with fractions, decimals and percentages. Others knew how to convert between decimals and percentages, but had little idea how to connect these to fractions. Most were able to gain at least some credit for filling in the more straightforward conversions.

8 Nearly all candidates were able to interpret scales on measuring instruments in part (a).

Most were aware that there are 1000ml in a litre and as a result there were many correct responses in part (b).

9 Multiples are well understood and most responses were correct in parts (a) and (b).

On the other hand, prime numbers were not well recognised in part (c). Candidates generally knew that they would be odd numbers, but answers of 33 and 39 were common, not recognising that these are multiples of 3 and hence not prime.

10 Nearly all candidates gave a correct response in part (a), with just a few incorrect answers of 12.

The technique for finding the volume of a cube was understood by about half the candidates, a few had difficulty calculating $3 \times 3 \times 3$ and consequently only obtained the method mark. Some found the total length of all the edges on the cube, or attempted to find the total surface area.

11 Most candidates attempted to simplify the algebraic expressions, with varying degrees of success. There were many correct answers in part (a)(i), although a small number did not fully simplify the expression and gave an answer of $8p - 5p$. There were few correct answers in part (a)(ii), although most obtained a part mark for a partially correct simplification, usually for finding $8x$.

In parts (b) and (c) most candidates demonstrated that they understood the process of substituting into a formula and found correct answers.

12 Nearly all candidates were able to write down the correct coordinates in part (a), with just a small number reversing them.

Most made an attempt to find the coordinates of the centre of square 20 in part (b). Those who were successful often just listed all the centres systematically and few found a correct, more elegant, approach. A common error was to write down the next centre, (9, 5), and see that to make up the *y* coordinate to 20 you had to multiply by 4 and then did the same to the *x* coordinate to obtain an incorrect 36.

13 A significant number are confused by the difference between perimeter and area and went on to get an answer of 14cm. Others went on to find the area of the left rectangle to be 30cm^2, but could get no further. Only a few candidates had the computational and problem solving skills needed to find a correct solution.

14 Nearly all candidates demonstrated skills in finding percentages without the aid of a calculator and half of the candidates obtained all five marks for fully correct solutions. Most candidates were able to find 10% and 5% of 270 in part (a) and appreciated that they needed to find 20% of £1200 in part (b).

15 Many confused marks with frequency, consequently answers of 6 for the mode in part (a), 5 (from 6 - 1) for the range in part (b) and 2 for the median in part (c) were quite common. Those who did work with marks usually found the mode and range correctly, but then did not appreciate the different frequencies of the different marks and gave an answer of 7. Data expressed in this tabular form is more difficult to work with and candidates will need to think carefully about how to apply their statistical skills when interpreting it.

16 Most candidates were able to criticise the questions from the survey, with many sensible answers given on all three parts of this question.

17 Most found the correct angle of 150° for the Game 5000 sector. Some used an angle 30° rather than 10° for each game console and consequently got an answer of 5. There was a significant number of correct answers.

18 The majority of candidates recognised a cylinder from the plan and side elevation in part (a).

Some were confused as to how to draw the front elevation in part (b), with three dimensional drawings being seen. Most candidates obtained some marks for drawing rectangles with the correct width or height. There were few fully correct solutions.

19 Most candidates could not write a number as the product of its prime factors in part (a)(i) or find the highest common factor in part (a)(ii). Some attempted to break down 96 into factors in part (a)(i) and obtained a part mark from attempting a tree diagram or finding a factor pair. Others found a common factor as their solution in part (a)(ii), for which they were awarded a mark.

Addition of mixed numbers, in part (b), continues to be found difficult. Often their conversion to a common denominator was incorrect, but correct addition or correct cancelling to lowest terms gave some credit. A very common mistake was simply to add the two numerators and denominators to get an answer of $4\frac{8}{16}$.

20 There were many good attempts at solving this problem. Inevitably the complicated arithmetic was too much for many candidates, but most obtained some part marks for a correct method and a partially correct solution.

21 Most candidates were aware of some of the properties of angles on a straight line, angles in a triangle or within parallel lines, but did not have the skills necessary to use a step by step solution to work through the problem. Some incorrectly assumed that the triangle or the trapezium was isosceles. Candidates need to look to identify the angles in the diagram with their calculations, either by using conventional lettering or by labelling the diagram in some way.

22 The majority of candidates found the probability correctly in part (a). A few did not realise that a number was required and gave an answer such as 'likely'. A very small number gave a ratio, which is incorrect, as a solution.

Some estimated the number of students successfully in part (b) using an elegant method. Others tried to build up 30 to 120 to 600 to 2400, by adding on multiples of 120, but several made arithmetical errors in this approach.

23 Manipulating inequalities was only understood by a very small minority in part (a). Some obtained a mark by using equation solving techniques to solve $3x - 4 = 8$, obtaining a solution involving 4 in some way.

As there were few correct solutions in part (a), there were consequently few correct solutions in part (b).

J567/02 Paper 2 (Foundation tier)

General Comments

Candidates appeared to have been well prepared for this paper and had sufficient time to complete it. It was pleasing to see many candidates attempting to answer all the questions and quite often showing working, which is especially important on the Quality of Written Communication question, however many candidates still do not show their working and lose out on method marks. Candidates should be encouraged to attempt all the questions and show their working.

There was less evidence of candidates not having a calculator for this session than in previous sessions, but lack of equipment was evident elsewhere; when completing questions involving drawing, candidates should use a sharp pencil and a ruler.

Areas of strength were number, although many candidates were unable to read from a two-way table. Areas of weakness were forming equations, using formulas, bearings and percentages.

Comments on Individual Questions

1 This question was well answered in general. Some candidates lost marks in parts (a) and (b) as they did not show the full answers of 56900 and 56860, but simply wrote the section they had rounded i.e. 900 and 60.

Parts (c) and (d) were generally correct, although a small number gave the answer to part (e) as 4.5. The correct answer was often seen.

In part (f), the most common error was to write 2.7, rather than 2.07.

2 This question was generally well answered. In part (b), candidates needed to state ‘add six’; some simply stated the difference was six, but failed to give the direction. It was encouraging to see some candidates had written $6n + 2$.

3 Many candidates were confused by the negative signs in part (a). Common incorrect answers were 43.7, $^{-}143.7$ and $^{-}34.7$.

In part (b)(ii), $^{-}324$ was common, probably from not using the brackets buttons on the calculator.

4 Several candidates appeared not to be familiar with reading two-way tables. In part (a) the most common error was to add all the numbers in the vertical column from Sydney.

In part (b) many gained credit for correctly identifying one of the two required values, some candidates again simply added lots of numbers.

In part (c) the main error was the inability to realise 9255 needed to be divided by 3. Several tried to divide by one third or multiply by 0.3.

5 The majority of candidates were able to correctly name the triangle. In part (a)(ii) many had written a total for the perimeter, but had the answer 14cm, which may have come from rounding. Many candidates had not written the individual measurements for the sides so that credit could not be given.

In part (b) many candidates had the correct area of 31.5, but failed to give the units. A common error was giving 25, this being the perimeter.

6 Part (a) was generally well answered, a large number of candidates used systematic listing. A small number of candidates gave only 6 listings.

In part (b)(i) many scored credit for $\frac{3}{12}$, but then had not written this in its simplest form.

Part (b)(ii) was less well answered, some candidates just choosing the correct statement without giving any reasons.

7 Parts (a) and (b) were often well answered, although in (a) a small number gave answers such as 'unlikely'.

Parts (c)(i) and (ii) were also well answered. A common error in (i) was 1015, the time they left rather than arrived at the shops, and 75 in (ii) from starting at 0900 rather than 0930. In part (iii) many candidates clearly did not understand the idea of the graph; some ended their line at 1130 or 1200, others went in the wrong direction and a few drew vertical lines.

8 This question was generally answered well. A common error in part (a) was to give the square root rather than the square.

In part (b)(iii), 20 was frequently seen from candidates multiplying 4 by 5 and similarly in part (b)(iv), multiplying 3 by 3 rather than cubing it.

In part (c) the most common answer was $\frac{6}{7}$.

9 Part (a) was generally answered well. The most common error was to confuse 1.6 and 1.06.

In part (b) many candidates were able to give the correct answer. A frequent error was to add 2.5 to each measurement, rather than to multiply by it.

10 Many correct answers were seen to part (a), however a large number of candidates gave the answer 416 as they had multiplied 40 by 8 as well as 12 by 8.

In part (b) very few calculated 160 divided by 12, but used trial and improvement instead.

In parts (c)(i) and (ii) some candidates confused the bearing and the distance. In (iii) several were able to correctly measure the distance, but not the bearing of the cathedral. Candidates should be encouraged to plot the subject of the question with a cross or point rather than just writing the word.

11 Part (a) was generally correct, but part (b) was more challenging; it was pleasing to see some candidates had set out algebra clearly showing their working, but this however was rare with a significant number of candidates using trial and improvement.

12 Many candidates were able to complete the table correctly; if only one value was correct it was usually 2 when $x = 1$.

In part (b) a significant number plotted the points correctly, but then did not make any attempt to join them.

Part (c) was not attempted by several candidates, even when a correct line had been drawn on the graph.

13 Part (a)(i) was generally correct, with the most common incorrect answer being 600. In part (ii), 2 was the common incorrect answer from candidates not scaling the recipe up for 6 people. A lack of method prevented some candidates from gaining credit here.

In part (b) there were many correct answers, however 1280 was often seen from doing the subtraction incorrectly on their calculators.

Part (c) was the question assessing the Quality of Written Communication. A few candidates demonstrated some clear, logical methods leading to the correct answer, although some appeared not to realise it was necessary to show working. Additionally, some candidates failed to realise they needed to use π, while others used the diameter rather than the radius; a small number of candidates assumed the cup held 250ml. Several candidates were able to gain a mark for the volume conversion, although a significant number used 2200 rather than 22 000.

14 On the whole this was well attempted by candidates, with many gaining credit for correctly extending the line on the graph. These solutions were more successful than those who attempted to use average speed.

15 Many candidates had an answer of 6.20, but relatively few rounded correctly. Some did not do the order of calculations correctly, resulting in an answer of 39.05.

16 Very few candidates knew how to calculate a percentage increase and most had an incorrect answer. Almost all candidates identified 6 as being an essential component of the process, but then showed no indication that they knew what to do with this value, either leaving their answer as 6%, or using the value in a number of incorrect ways. Several used 31 as the original amount, rather than 25.

17 In part (a) many candidates were able to score, usually for the midpoints and the sum of the midpoints multiplied by the frequencies added. Some candidates lost the second mark as they did not attempt to add these products. Several then went on to divide by 6 or 180 rather than 25.

Part (b) had a mixed response. Some candidates gave the correct month and reason, while others reversed the answers. Some referred to both the mean and range in the same part, while others were comparing the total of the mean and the range or the difference between them.

18 Marks were awarded for this question frequently across the full range. Many candidates drew the line between A and B, but failed to use compasses to construct arcs.

19 It was intended that candidates would use Pythagoras' theorem, but several did accurate drawings and gained the marks. Despite the fact that 'Not to scale' was printed next to the diagram, some candidates measured the angle in the diagram. Others added the perimeter and stated it did not total 90. Those who knew to use Pythagoras' theorem were not always able to express themselves clearly enough to score full marks.

J567/03 Paper 3 (Higher tier)

General Comments

The paper was accessible to candidates of all ability levels, with most candidates attempting the majority of the questions. In general, candidates answered the more routine questions well, showing a good understanding of topics such as transformations, cumulative frequency and standard form. The more difficult topics such as vectors and surds were found challenging by many.

Most candidates attempted the questions involving problem solving, and clear, well annotated methods were more evident than in previous sessions. Candidates would benefit, however, from always structuring their solutions in an ordered manner and including a few words to explain their strategy. Geometrical reasoning was better than in previous sessions with many candidates being able to define angles using three-letter notation. It is essential that candidates understand what geometrical reasons are acceptable to be awarded full credit.

Many candidates demonstrated that they had a good grasp of basic algebra, although when faced with more challenging questions errors were more common, particularly when dealing with algebraic fractions.

As in previous sessions, candidates were seen to make errors in basic arithmetic, in particular in calculations involving multiplication, negative numbers and decimals. Candidates are advised to check their answers to calculations, particularly when the calculation is part of a more involved question; errors often occur when the calculation is not the focus of the question.

Comments on Individual Questions

1 Most candidates could correctly write 96 as the product of its prime factors in part (a), usually following a factor tree method. In part (b), most candidates realised that the highest common factor would be a number smaller than the two given; many gave a common factor as their answer, although it was not always the highest common factor. Few candidates appeared to have used the prime factorisation from part (a)(i) to help find the solution in part (a)(ii).

Candidates often had a good idea of how to approach the addition of the two mixed numbers in part (b) and many reached the correct answer. Not all read the question carefully as some answers were left as improper fractions or mixed numbers not in their lowest terms. Some errors were seen in converting the mixed numbers to improper fractions with a common denominator, usually when the denominator was greater than necessary. Candidates would benefit from looking for the most efficient denominator, in this case 12, however 48 was often used as a common denominator from simply multiplying the denominators of the two fractions.

2 In part (a) some candidates gave an answer of 7 rather than $^-7$, perhaps because they had not read the question carefully. Similarly, it was also common to see an answer of 25 in place of 125, presumably from reading square root instead of cube root.

Most candidates showed some working in part (b), enabling method marks to be awarded when the final answer was not correct. There were a number of predictable errors seen in the substitution, including $(^-3)^2 = {}^-9$, $18 - {}^-3 = 15$ and $2 \times (^-3)^2 = {}^-6^2 = \pm 36$.

3 In part (a) fewer candidates than might be expected reached a fully correct answer, because arithmetic errors often occurred. Most candidates identified that they needed to multiply 1.9 by 4 by 12.8, and those who first multiplied 1.9 by 4 to get 7.6 were generally the most successful in reaching a correct answer. Some candidates attempted to multiply in stages, for example 12.8 by 7 and then add on 12.8 multiplied by 0.6. Some however appeared to think that estimation was required, so simply multiplied 12.8 by 7 or 12.8 by 8, or even 13 by 8. Candidates should be encouraged however to estimate the correct answer to calculations as well as doing the full calculation, to check that their answer is of the correct order of magnitude; some marks were lost here by candidates who had answers that were clearly well out of range. Those candidates who rounded their final answer to the nearest penny were not penalised after the correct answer had been seen.

Almost all candidates drew a correct stem and leaf diagram in part (b)(i).
In part (b)(ii), it was pleasing to see that many candidates realised that they needed to find some representative value for Felix's electricity consumption to compare with the national average. In a question of this type, it is important for candidates to clearly express what they are doing; there were too many candidates who attempted to make a comparison, but did not clearly state what they had done to reach their representative value or what time period they were using. Successful responses usually resulted from use of the median value, although it was commonly given incorrectly as 68 rather than the correct value of 69. Some candidates did find the mean correctly and compared using that, although there were frequent errors in adding all 16 values together. Many candidates chose either the middle four values, the lowest four values or the highest four values as their representative amount, although it was often not clear why these values had been chosen. Some candidates failed to be awarded the final mark as they did not compare the consumption or they did not compare like with like values, for example comparing a monthly value with a weekly value.

4 Many candidates correctly reached a value of $x = 45°$, with some working shown. Some candidates had clearly been drilled in solving problems of this type and used correct three-letter notation to refer to the angles, attempted to give reasons for the angles that they had found and laid their work out in a clear step-by-step manner. It was common to omit at least one reason though, most often 'alternate angles' as a reason for x being equal to angle BAC. Some reasons were not expressed clearly enough, for example 'supplementary angles' is not sufficient reason alone without the addition of 'between parallel lines' and 'angles on a line' is not sufficient without the addition of '= 180°'. Candidates who did not reach $x = 45$ had often made conceptual errors, such as assuming that angle BCE = 125°, or that triangle ABC or ADE was isosceles. Some candidates failed to give any reasons at all, despite the demand in the question to give a reason for each step of working.

5 Most candidates answered both parts (a)(i) and (a)(ii) correctly. Any errors in part (ii) were usually from an inability to cancel or multiply correctly rather than from an incorrect calculation.

More incorrect answers were seen in part (b), but these usually came from an incorrect method rather than from arithmetic errors. Some candidates assumed that there would be 40 males and 40 females; others reached a number greater than 80 from an incorrect method involving multiplying or dividing a combination of 2400, 1500 and 80. Those who tried to use a ratio method, starting with
1500 : 900 and attempting to simplify, seldom reached the answer 50.

6 Most candidates reached the correct inequality answer. Far fewer candidates than in previous sessions gave the answer in an incorrect form such as $x = 4$. Again, most candidates could represent the inequality correctly on the number line, although a few terminated their line with a circle rather than an arrow, or they went in the wrong direction.

7 Some candidates showed clear and complete reasoning to reach the correct answer of octagon. Unfortunately many candidates just appeared to guess the name of a polygon and gave an answer such as hexagon or pentagon with no calculations or reasoning at all. Some candidates tried to justify an answer using a sketch, which often led to an incorrect answer such as triangle or trapezium, and even those that did lead to the correct answer of octagon seldom showed anything on their sketch that could be rewarded with any more than minimum credit.
Those candidates who decided to work with angles usually subtracted the 90° angle in the square from 360° and reached 270° which was then divided by two to reach 135°. Having reached this interior angle of the polygon though, many did not then know how to find the number of sides and a number of trial and error methods were seen, which sometimes led to the correct answer.

8 Many candidates performed the two transformations correctly and drew triangle B in the correct position. Those that didn't reach the correct answer had usually performed the rotation correctly, but made an error in one or both of the directions of the translation. Only very few candidates started by doing an anticlockwise rotation.

The most common error in part (b) was to give the scale factor as 2 rather than $^-2$, although some gave the correct centre with this incorrect scale factor. Some failed to give a centre of enlargement with the scale factor; candidates should be aware that if a description is given 2 marks then it is likely that two things are required from them. Some candidates introduced a second transformation into their description, most commonly a 180° rotation.

9 Most candidates realised that they needed to start by forming expressions for the perimeters of the two shapes. Reaching the correct perimeter for the triangle of $4x + 18$ was more common than the correct perimeter for the rectangle, where $8x – 2$ was a common error resulting from failing to deal with the negatives correctly. Many did try to equate the two expressions and solve the resulting equation with a reasonable amount of success. Candidates who reached a negative value for x did not identify that they must have made an error and try to correct it.
The correct answer of 7 for the shortest side was sometimes seen in the working, but the expression $11 – x$ given on the answer line, although this was not penalised if the working was clear.
Some candidates used a trial and error approach for the question, which was credited if the correct answer was reached, but marks were not given for answers that did not reach the correct value; these were generally very haphazardly laid out and could not be followed by examiners.
Some candidates reached $8x + 2$ or $4x + 18$ for each of the perimeters, but then turned these into equations by equating them to 0.

10 Most candidates could complete the cumulative frequency table correctly and many went on to draw a correct cumulative frequency graph. Some confusion was seen with frequency polygons when candidates plotted their points at the middle rather than the end of the interval. A number of bar charts were seen and some candidates, having plotted the points correctly, drew a line of best fit rather than joining with line segments or a curve.

In part (c) many candidates read their graph correctly at $s = 75$, though a significant proportion failed to realise that the difference between this value and 60 was required because the number of students scoring more than 75 was required. Some candidates misread the scale and read the cumulative frequency at 70 rather than 75.

11 Candidates showed a good grasp of standard form notation, with most answering part (a) correctly.

In part (b), most candidates identified the correct calculation and converted the standard form values correctly to ordinary form in order to subtract and a reasonable number of correct answers were seen, usually in ordinary form. It was disappointing at this level to see so many errors in the subtraction, with candidates being unable to subtract 976 from 1010 correctly, either from misaligning digits or from calculation errors.

Candidates had more difficulty with part (c); many correct multiplications were seen, but candidates did not always give the answer in standard form as was required for full credit. Although an estimated calculation was expected here, full credit was available for a correct answer to the unrounded calculation, however candidates who attempted this often made calculation errors or truncated their answer. Some candidates multiplied by 5 rather than 50 so reached the wrong power; others divided or attempted to multiply by 365.

12 At Higher tier, candidates are expected to have a good understanding of metric units, to know conversion factors and be able to convert between units without any difficulty. However, only a very few candidates performed well on this question.
Most candidates identified that they needed to multiply the surface area by the depth in part (a)(i), but many failed to identify the need to convert 60cm to metres before multiplying, so 180 was the most common answer, other answers such as 1800, 18000, etc, resulting from an incorrect conversion of units were also seen. Some candidates squared the 3 before multiplying so gained no credit. In part (a)(ii) it was apparent that few candidates knew the conversion factor between cubic metres and litres, with a number of candidates giving the same answer as in the previous part.

In part (b)(i) many candidates identified the scale factor of the enlargement was 10 but few then appreciated that, since they were finding the area of the model, they would need to divide by the scale factor squared rather than just the scale factor. A similar problem occurred in part (b)(ii) where the volume scale factor was not used, and again the volume was divided by 10 rather than 1000. In some cases the volume calculation was begun again rather than using the volume already calculated in part (a)(ii).

13 In most cases it was clear which region the candidate intended as their answer. Some candidates did not show clear shading along with the label R, thus making it difficult to identify their selected region. Candidates should be advised to either shade in and label the region they intend, or to shade 'out' and clearly label the unshaded part to indicate that is what they have selected.
Many candidates scored 2 out of the 3 available marks for a region with two correct boundaries, with the $y \geq x + 2$ boundary most commonly incorrect. Some candidates clearly intended one of the axes to be a boundary, while others drew extra lines for the boundaries despite the grid showing all of the required boundary lines and this having been stated in the question.

14 Understanding of the sign of the gradient of a straight line was good and the majority of candidates sketched a correct pair of lines for this statement.
Candidates were less successful in identifying the quadratic graphs correctly, however a good proportion of them could sketch a parabola for this part and so gained some credit. Common misconceptions about the signs of the roots appeared to be that they were related to the *y*-intercept being positive or negative or to the orientation of the parabola rather than where the curve crossed the *x*-axis. It was apparent that, as the graphs for the first two statements were linear, some candidates assumed that the third must also be linear.

15 This was a challenging probability question that required a clear and accurate thought process or a good tree diagram. Most candidates could identify the three starting probabilities P(D), P(M) and P(W), but very few identified the easier option of starting with P(D) and P(not D). Tree diagrams, when drawn, were usually quite good with the first branches showing the correct probabilities, and often the second branches also showing correct probabilities. Some candidates failed to appreciate that there was no replacement, so used denominators of 16 throughout.
Having drawn a tree diagram, work on identifying and calculating the required probabilities was often poor. All five required outcomes were seldom seen, usually at least P(DD) was omitted and sometimes it was not recognised that both P(MD) and P(DM), say, were required. When candidates attempted to calculate the probabilities, those that attempted to multiply often made calculation errors due to the large numbers being multiplied as few attempted simplifying by cancelling first.

16 In part (a) those candidates who attempted to eliminate the denominator first were usually able to make some progress with the solution and gain some credit, even if they made errors in their working. After an incorrect multiplication, the further manipulation of collecting terms and solving $ax = b$ was carried out well, although mistakes in handling negative numbers were seen. Those candidates who attempted to collect terms before removing the fraction usually failed to show anything that was worthy of credit.

Candidates who understood the laws of indices could reach a correct answer in part (b), usually showing a correct intermediate step of either $\left(a^{-4}\right)^{-2}$ or $\frac{a^{-10}}{a^{-18}}$. Candidates again failed to gain full credit because of inability to deal with negative numbers, with $^{-}2 \times {}^{-}4$ seen evaluated as $^{-}8$ or $^{-}6$ and $^{-}10 - {}^{-}18$ seen evaluated incorrectly. Common misconceptions were that 2 should be subtracted from each of the powers or that a power of $^{-}2$ was equivalent to the square root.

Many candidates had no idea how to approach part (c) and tried to incorrectly subtract or cancel the numerators and denominators. However, a reasonable proportion of the candidates identified the correct process of using a common denominator and showed some partially correct working. Problems with negatives caused many errors in this part as well, with simplification of $4(x + 1) - 5(x - 2)$ to $4x + 4 - 5x - 10$ being very common. Some candidates who had reached answers of the correct form then went on to incorrectly 'cancel' terms, for example going from $\frac{-x-6}{x^2 - x - 2}$ to $\frac{-6}{x^2 - 2}$.

17 The basic processes of adding or subtracting two vectors seemed to be reasonably well understood and many candidates gave the correct answers in parts (a) and (b).

Candidates found more difficulty with parts (c) and (d), where more interpretation of the diagram was required. Many candidates identified that part (c) required a fraction of the answer to part (a), but $\frac{1}{3}$ was not always correctly identified and $\frac{1}{2}$ was not uncommon. Some careless notation was seen, with answers such as $\frac{1}{3}\mathbf{a} + \mathbf{b}$ instead of $\frac{1}{3}(\mathbf{a} + \mathbf{b})$.

Few correct, fully simplified answers were seen in part (d), although some candidates were given credit for identifying that the required vector was
b – their answer to part (c), or twice their answer to part (c) – **a**.

18 Only a few candidates could identify a suitable strategy to begin to solve this problem. The candidates who identified that the sides of the square had lengths $\sqrt{5}$ and $\sqrt{15}$ often gained at least the first two marks for calculating the area of a triangle, although having found the two sides some then did not know how to work with the surds to progress any further. Candidates often did not lay their work out clearly enough and it was difficult to identify whether they were attempting to work out the area of one or two triangles or something else and then whether they were adding the triangle areas to the area of the squares. Few candidates could correctly simplify $\sqrt{75}$ to $5\sqrt{3}$. Some candidates did no work at all with surds, either attempting to use Pythagoras' theorem to find the hypotenuse of the triangle, or assuming that the given values should be halved to find the lengths, then performing calculations with the resulting decimals.

19 Some excellent solutions to this question were seen, clearly and economically set out, with accurate work throughout. It was pleasing to see many candidates correctly factorising their quadratic equation rather than attempting to use the formula to solve it on this non-calculator paper.
Those candidates who made good attempts at the question knew that the initial two equations should be equated and rearranged to reach a quadratic equation and this was often done correctly. Some then could not solve this, or made errors, particularly with the signs of the solutions, however they could recover a mark for correctly substituting these solutions to find the values of y.
Some candidates however were misled by the word 'simultaneous' and tried to eliminate x by multiplying the first equation by 4 and the second by 9, failing to realise that they would be left with terms in y as well as x^2. Alternatively they tried to square the linear equation to give them two equations involving x^2. Any trial and error methods usually failed to reach any correct solution.

J567/04 Paper 4 (Higher tier)

General Comments

The candidates were well prepared for this paper and they had sufficient time to complete it. The questions on number and geometry were usually answered very well. The algebra had a mixed response, the equations were solved correctly but most cannot do 'complete the square' and even fewer are able to use this method to solve quadratic equations. In statistics many could not interpret a frequency polygon, nor draw a two-way table. In calculating the mean of grouped data, only a few used the midpoint of each group and it is disappointing that this standard question is still not well answered.

The problem solving questions were answered better in this paper than in previous papers, however answers still lack communication and structure. Candidates need to set out their work logically, so that it flows from one stage to the next stage and that each step is explained and numbers are labelled such as "Volume =" or "Mean =". The other problem for candidates was to find the most appropriate method and some were not able to do this. In question 16(a)(i) it was sufficient to use Pythagoras' theorem, yet many tried to use either the sine rule or the cosine rule.

Calculators were available for the vast majority, although there was evidence that some of these were in the incorrect angle mode such as 'radians' or 'grads'. We advise all centres to get their candidates to check that all calculators are approved for the examination and that they are in the correct mode.

Comments on Individual Questions

1 These were done well. Candidates need to decide whether to input the entire calculation into their calculators using the calculator functions and brackets, or to break the calculations down to stages. In (a) the numerator should be evaluated first and in (b) the entire calculation inside the square root should be evaluated first. The evidence suggests that errors were more likely to be made when the first method is used as candidates probably do not use the brackets on their calculators and rely on the calculator to 'do it for them'.

2 The common problem in (a) was still 1 – 0.95 = 0.5, despite candidates having a calculator available for them to use.

In (b), most added the three probabilities together; some subtracted the answer from 1.

3 Most candidates attempted to extend the graph and to calculate the average speed as well and yet either method is sufficient on its own. The key points are that the gradient of the line extension should be the same as the given line. The average speed needs a correct reading from the graph and 14 km in 10 minutes was the expected one to give. Some candidates read this as 12 km in 10 minutes and so they calculate the average speed incorrectly.

4 Almost all the candidates worked out the term to term rule of +5 but some did not know what to do with it and writing $5n$ was the big step to take. There were some answers of $n + 5$ seen from those who did not know what to do with the 5.

In part (b) some started the sequence from $n = 0$ so giving 100, 92 and 84 as their answer, whilst others gave 92, 192 and 292 by adding on the 100.

5 This was answered well. The errors were to incorrectly multiply the brackets out, getting $12x - 3$, or incorrectly manipulating the equation, usually subtracting the 18 from 24 instead of adding it.

6 In part (a) they needed to determine the class interval before answering the question. In (a)(i) many used 9 and 24, but then added on more readings such as 10.5 or 12. In (a)(ii) the common answer was 5, showing that they had not worked out the group intervals.

In part (b) some candidates did not use the midpoint values and some calculated 5×0 as 5. There was a tendency to divide by numbers other than 25, the most common being 6 for the number of groups, or the sum of the lengths of calls and these were 150,180 and 210. It was disappointing that this standard question is still not answered well at all.

In (c) many correctly chose the month, but they failed to provide a justification and we were looking for the standard reasons. Some used the mean and range to justify both choices.

7 This question was answered well and it was pleasing to see most candidates had the use of the necessary equipment. The most common loss of marks was from having the diagonals missing from the square (on the plan) or no baseline for the triangle (on the elevation). Nearly all candidates knew the difference between a plan and an elevation and there were only a few extra lines in either diagram.

8 Part (a) was an unusual question and many candidates did not seem to know what a two-way table is. The most common approach was to create a simple table with four headings and to fill in the frequencies under each heading and this was accepted as a two-way table. The problem was that in many tables the cells were not unique to one category.

Part (b) was answered well though the common error was to use 31 rather than 25 as the original amount.

9 The perpendicular bisector of AB was usually drawn correctly, but rarely constructed correctly. The turn to the west was not always due west; some turned north-west, others south-west, whilst others turned east. Many kept the correct distance. Some drew the boundaries, but failed to draw a route. Most candidates understood the scale and most had the use of all the necessary equipment.

10 This question was not answered well because candidates continue to attempt to do the calculation in full and then to round the answer. They must learn to round the original figures to 1 significant figure so that they can do the calculation "in their heads". We would also allow the number of pupils (28) to be rounded to 25 as this was a sensible approximation to use.

11 Most candidates did not gain full marks here and one confusion was over which number indicated the gradient; those who decided it was the last number gave B as the steepest, A and E as parallel and A and F meeting on the y-axis. Others thought that B and D were parallel, probably because they have the same number as coefficient of x without taking regard of the sign.

12 Most answered part (a) correctly; errors came from the two stage approach or those who used 1.6 instead of 1.06.

In part (b) the common error was to find 6% of 371 000 and subtract that from it. The key to this was to write down 106% or 1.06 and then the solution was accessible.

13 In (a), the four parts were usually given, but some struggled with the negative number and it was common to see $7 \times {}^{-}3$ given as 4.

In part (b) many failed to take out the full common factor of $6x$, leaving it only partly factorised.

The first step of a rearrangement is important and in (c) many started with $A - 4y$ instead of $A + 4y$. In converting x^2 to x, some divided by x instead of using square root.

In (d), many used direct proportionality rather than inverse proportionality. There is still a problem with writing the equation, even when the constant has been correctly found.

14 The alternate segment theorem was not well known and therefore part (a) was answered poorly. Many thought that the answer was 48 because of alternate angles, yet the two lines are not drawn parallel, nor is there any indication that they are parallel.

In (b) there was a lack of correct reasons, particularly "the opposite angles of a cyclic quadrilateral add up to 180". There was no need to use the four angles of the quadrilateral, as the easiest method would have been to work out angle CBE first using the triangle, then use the property of the opposite angles.

15 Many candidates struggled on this question. In (a), a number to an inappropriate accuracy was given, such as 120 005 or 120 000.5 or similar.

In (b) it was common to use the wrong bound for both numbers, but the correct division of population divided by area was usually attempted.

16 In (a)(i) it was intended that Pythagoras' theorem should be used, however in using trigonometry the question was made more difficult. There were some good calculations, but they need to show either AC has to be shorter or that angle B is not 90°. Other approaches rarely resulted in success.

In (a)(ii) the only method was the cosine rule, but many used incorrect results from part (a)(i) with the sine rule. Some tried to use trigonometry, applicable only to right-angled triangles and they should know that these methods are not valid for this type of triangle.

In part (b) the formula is given on the Formulae Sheet, yet it was incorrectly copied and cos C was often used instead of sin C. Some candidates failed to divide the product by 2.

17 Most candidates drew the correct bar widths and most drew the first two bars correctly. They calculated the frequency density by usually dividing the frequency by 10; many did not check that the class widths varied in the last two classes. Plotting of the histogram was usually very accurate, the scale providing few problems.

18 Many gained credit on part (a) because the method is clearly well known, however there were errors in working them out, particularly if the coefficients of *x* were made equal as then the subtraction involved negative numbers. The easier way was to equate the coefficients of *y* and then add, as fewer errors were made using this method. Few candidates checked their solution and that would have highlighted errors. Candidates who make errors also seem unable to find them and rectify them, there was evidence of multiple attempts all making the same error.

Part (b) posed problems and although some were able to halve the $^{-}6$ and obtain $(x - 3)^2$, they could not find a way to work out $^{-}5$. A common answer was 13 or $^{-}13$ from 9 + 4. Some wrote $(x + 3)^2$ although the question was set out in the usual way. Many of them did go on to work out the $^{-}5$ correctly. In (b)(ii) few used the answer to (i) and so it was common to see the quadratic formula used, in some cases very successfully.

19 The layout and presentation of this question was not always logical and clear. Calculations were seen all over the page and few attached a year to their figures. Surprisingly, there were very few candidates who drew a table. The common errors were to divide rather than multiply, so for example, 6700 ÷ 1.03 (or 0.97) was seen. There were a few who thought that the increase would be the same each year, so they subtracted 201 from the bullfinches and added 192 to the chaffinches for each further year.

20 There were two common approaches to this problem. In the first they would use $S = 4\pi r^2$ to find the surface area and hence the area of water and then attempt to show that the land and water areas are approximately in the correct ratio. In the second method, after obtaining the surface area, they would then divide this in the ratio 3 : 7 and then compare the results to the land area given and sometimes to the water area as well. This second method proved to be an easier route to completing the problem and showed the importance of choosing the best method for these problem solving questions. Some correctly calculated the water area from the given land area by dividing by 3 and then multiplying by 7, but they usually did not calculate the total surface area and this method often petered out quickly.

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