GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres

June 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 entry pattern from centres has been difficult to determine because there has been larger than expected entries for all three series in this academic year. There was a strong indication that some candidates were not appropriately entered because a number of candidates had a very low score in the Higher tier and there were others who had a very high score in the Foundation tier. The expectation is that a candidate entering the Foundation tier has grade C as their highest possible grade. A candidate entering Higher tier should expect to achieve at least a grade C. It is recommended that candidates who are considered to be borderline grade D/C should always be entered for Foundation tier.

There has been an improvement in the standard of work, however the confidence and application that candidates are showing towards the problem solving and QWC questions has shown little improvement over the year. Another concern is that some candidates are not reading questions clearly and fail to understand what information is being given to them and what is required from them.

The common strengths in the previous series were the AO1 questions, which test the recall of knowledge and again they were answered well; the solutions of linear equations and the numerical operations on fractions are still exceptions however. In linear equations there is a demand for algebraic structure and too many candidates rely on trial and improvement methods. Clearly laid out stages of working in these algebra questions would allow candidates to gain more method marks and for linear equations it is important that each step results in another equation. In adding or subtracting fractions common denominators are necessary, whereas in multiplication or division they are not necessary. Candidates need to learn these methods thoroughly.

In the non-calculator papers it is important to have sound arithmetic skills and confidence in manipulating decimals and negative numbers. This is not evident in most candidates, even at the Higher tier. Candidates had problems in subtracting negative numbers and this often happens in the Higher tier when solving linear simultaneous equations.

In the calculator papers it is important to use the calculator with an appropriate method. The most common example where this consistently does not happen is in calculating percentages, where many candidates try to use a non-calculator method with a calculator; there is still a belief that, since you find 10% by dividing by 10, that this rule can be applied similarly to all other percentages. There are still too many errors when using a calculator and errors regularly occur when finding a power or root of a sum, calculating a fraction where the denominator has also to be calculated and, at the Higher tier, use of the ‘formula’ to solve quadratic equations. When using a calculator, few candidates use an estimate to check their calculations.

The questions where methods are applied in context need careful reading and more thought. It is evident that many are rushing into a solution without considering all the information given to them. Candidates are still struggling to answer questions requiring a comment; such comments should refer to the information in the question, which is often a diagram, and they should always state clearly the information they are comparing.

There is some evidence in the Foundation tier that candidates are answering the AO3 and QWC questions slightly better in this series. At the Higher tier there is no evidence of an improvement in these questions. The working is still often haphazard rather than ordered and there are still few candidates who explain what they are doing. In complex questions it is important to state what each stage is trying to do. Whether finding a length, an angle or any other piece of information, each stage should be prefaced by a statement giving the aim of that stage and the working should then follow in an orderly fashion. Another statement should then introduce the next stage and then the working should again follow similarly, until the completion of the question.

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; few appeared not to finish due to lack of time.

It was pleasing to see that most candidates made an attempt to show the working that led to their answers; consequently we were able to frequently award method marks in questions, even though a numerical mistake had been made in their calculations leading to an incorrect answer.

There was a marked improvement in the standard of responses to the QWC (Quality of Written Communication) question. Generally candidates made a clear attempt to lay out their working in a methodical manner which was much easier to follow.

The questions involving fractions were often poorly done. Question 14 was straightforward, but many candidates could not demonstrate the skills needed to solve the problem. There are several statements that pertain to fractions in the specification and these are regularly tested.

Comments on Individual Questions

1 Many candidates multiplied by 10 successfully in part (a). Some moved the figures by more than one place. Answers of 3.710 and 30.71 were also seen occasionally.

Most candidates could work backward from dividing by 3 in part (b) and could work through the two stages of the flow chart in part (c).

In part (d), many successfully reversed the flow chart to obtain a correct answer. Only a few tried a trial and improvement approach.

2 There were many good attempts at this question. There were plenty of numerical errors in the addition, subtraction or multiplication, but those who showed a full method were rewarded with appropriate method marks.

3 In part (a) the majority of candidates gave an answer of miles for the metric unit used to measure the distance from London to Manchester, clearly not understanding what was required for 'metric'. Most correctly gave the answer of grams for the weight of a ten pence coin.

Many candidates correctly changed centimetres to millimetres in part (b), but were less successful converting kilograms to grams. There were numerous answers of 250g, where candidates had presumably thought that there were 100g in a kilogram.

4 Nearly all candidates completed the tally chart and bar chart in parts (a) and (b).

Most carried out the calculation needed for part (c) correctly.

5 This was the QWC question and there was a wide distribution of marks here. There were lots of correct answers, well laid out and showing appropriate calculations. Some failed to get full marks because they had not annotated their solution. The cost of the taxi proved to be testing for some and working out 160 × 30 for the cost of the car journey was also difficult, but most scored at least some marks for showing some working. It would benefit candidates if they thought of how reasonable their answer was, so, for instance, those who gave an answer of £480 for the cost of the car journey might then realise that they had made an error in their calculation.

6 In part (a) some could only see one line of symmetry, vertically, in the equilateral triangle and thought that there were lines of symmetry in a parallelogram. Most obtained one of the two marks for getting the lines of symmetry correct for at least one shape. There was less awareness of rotation symmetry with some candidates having little idea of the concept. The majority found the correct perimeter of Shape C.

Many candidates made a fair attempt at finding shapes that satisfied the parameters given in part (b), though they were more successful with the shape in part (i) than part (ii). There was some success with finding the minimum and maximum perimeters, although some candidates were confused as to what was required.

7 Many candidates failed to make much progress here. Some found the missing side length of the small square correctly, but then went on to find perimeters rather than areas. A small number demonstrated good mathematical technique when finding a correct solution.

8 Nearly all candidates found the next term in the sequence correctly in part (a) and most could find the hundredth term.

In part (b) most candidates found the next term in the decreasing sequence and gave a valid reason. In (ii) and (iii) the required term was usually found correctly, although some candidates went the wrong way and gave an answer of $^-159$ in (ii) and $^-173$ in (iii).

9 The scale drawing of the kitchen was generally understood and most candidates correctly found the length of the kitchen to be 4 metres. Many did not find the width accurately enough, either because they did not measure accurately from the scale drawing or through using the scale incorrectly.

Part (b) was poorly done, often because candidates did not refer to actual measurements in their reasoning for their decision.

10 Most candidates found the median correctly in part (a)(i); a small number failed to order the data and gave an answer of 2.3. The method for finding the range in (ii) was understood by most and many gave a correct answer, however some did not perform the subtraction of 1.7 from 2.5 correctly. Nearly all found the mode correctly in (iii).

Problem solving skills were demonstrated by the majority of candidates in part (b) and many obtained at least one mark.

11 There were many correct tables in part (a). Typical errors were to think that there were 4 numbers on the yellow spinner or not to count, for example, a 2 on the yellow with a 3 on the red and a 3 on the yellow with a 2 on the red as two separate distinct outcomes.

In parts (b) and (c) a significant number of candidates gave words such as unlikely, impossible, etc, when some form of fraction was required for an answer. In part (b) some candidates combined the probability of a 2 on the yellow (1/3) with a 3 on the red (1/4) in some way and gave answers such as 1/7 or 2/7, rather than looking at the outcomes in their table.

Part (c) was answered a little better, with candidates frequently looking at the outcomes in their table to work out their response.

12 Nearly all candidates were able to find the change in temperature in part (a).

Few were able to apply some form of algorithm to carry out the calculations in part (b); common incorrect answers were $^{-}8$ in (i) and $^{-}28$ in (ii).

13 Only a small number could round to two decimal places in part (a)(i); some rounded incorrectly, but others became confused with place value and gave answers such as 5137.6, moving the figures two places to the right. Rounding to one significant figure was beyond nearly all candidates in (ii), a common incorrect answer was 51.

About a quarter of the entry successfully estimated the calculation in part (b), often showing a clear method. Many failed to try to estimate the calculation and some, often correctly, proceeded to work out the multiplication fully and they were awarded one of the two marks if they were reasonably accurate in this.

14 Few candidates had the skills necessary to subtract and add fractions in parts (a) and (b). Common incorrect answers were 1/3 in part (a) and 5/9 in part (b) (from subtracting/adding the numerators and denominators). Of the small number of candidates who found 23/20 in part (b), most went on to give the answer as a mixed number.

15 Few candidates could find an algebraic expression in part (a), many gave numeric answers.

A correct algebraic expression for the perimeter of the rectangle in part (b) was rarely seen.

16 Some indication of the correct movement was often shown in part (a) and many candidates obtained one mark here, but few stated a translation with a precise description such as a vector, which was needed to receive two marks.

Using the wrong centre or turning clockwise was common in part (b), however most candidates managed to rotate the trapezium through 90 degrees and were consequently able to received part marks.

17 There were many reasonable attempts at plotting the four points on the scatter graph in part (a). The two points with games won as a multiple of 5 were easier to plot.

Lines of best fit in part (b) were rarely within the parameters required and many went through the origin, however the majority of candidates could use their line of best fit successfully in part (ii).

18 Candidates found the algebra in this question taxing. There were some correct answers in part (a)(i); common errors were evaluating 5^2 as 10 or seeing $3x$ as 35 rather than 3 × 5. In part (ii) some candidates correctly evaluated $(^{-}4)^2$ as 16 or 3 × $^{-}4$ as $^{-}12$, but few obtained the correct answer.

Multiplying out brackets was a skill that many lacked in part (b), but there were a reasonable number of correct answers.

A few managed to partially factorise the expression in part (c), but a fully correct answer was rarely seen.

19 For this locus question some managed to draw the arc of 7cm from B, but few were able to construct a perpendicular bisector.

20 Half of the candidates obtained marks in part (a) of this question involving more difficult percentages. Of those who had a good idea of how to manipulate the percentages, some failed to account for all aspects of the question and gave answers such £8.45, which was the hire cost for one hour not two and consequently could only receive part marks. There were a reasonable number of fully correct solutions.

Part (b) involved ratios and there were a good proportion of correct answers here, with candidates demonstrating a sound knowledge of this topic. The common error was to find 40 ÷ 5 and 40 ÷ 3 rather than 40 ÷ (5 + 3).

21 Most candidates could not find a strategy that would solve this problem. They often started dividing up the hours in a week and made little progress. The small number of candidates who adopted a sensible approach using fractions often found the correct solution.

J567/02 Paper 2 (Foundation tier)

General Comments

There was good differentiation in the paper, allowing the weakest candidates to achieve some success along with stretching the stronger candidates and there was a good range of marks. Candidates appeared to have enough time to complete the paper.

Candidates lost marks for a variety of reasons and errors frequently came through not reading the question carefully, poor presentation, confusing writing of digits (for example 6 and 0 or 4 and 9 could not be distinguished) and failing to use a ruler where required.

A lack of showing working is still common with many candidates. Working should be shown for all questions and is essential for the QWC question.

Although this was a calculator paper, it was difficult to tell in some cases whether candidates did not have access to a calculator or if they just did not know how to use one correctly. Many cases were seen of the use of non-calculator methods, especially in questions involving percentages.

Comments on Individual Questions

1 This question was generally well answered; common errors were 87530 and 40 in part (a)(i) and 87000, 87500 and 90000 in part (a)(ii).

Part (b) was disappointing; fewer candidates than expected scored both marks although many were able to score one mark, usually for the first number correct. Several confused 6.93 with 6.3 and 6.903 with 6.309.

2 This was generally well answered, although some candidates gave E as the answer for part (c). A small number of candidates did not follow the instructions to write down the letter of the arrow and gave a fraction. Only a small number gave terms such as likely, certain or impossible.

3 In part (a) the majority of candidates were able to draw an obtuse angle, however not all labelled it, or they labelled it incorrectly. Some acute and reflex angles were drawn.

Many candidates gave the correct answer in part (b); 45 was a common incorrect answer, along with 145 from incorrectly reading the protractor and not recognising that the angle was less than 90˚.

In part (c) many candidates were able to calculate 142 and of those who did not, several scored one mark for the method. The explanation was less well answered, with many failing to refer to a quadrilateral; some incorrectly stated it was a trapezium, others simply stated the shape adds to 360˚ or the angles add to 360˚. Some candidates are still unclear about giving reasons and just showed the sum used to reach the answer, rather than using words to justify their method.

4 Many correct responses were seen, although some candidates hedged their bets by writing the letters in ambiguous places. Quite a large number of candidates appeared to have no idea about basic geometry and several candidates did not even attempt the question. In part (a)(iii), several failed to draw a radius as the question asked.

Part (b) was in the main well answered; there were some poor spellings of the word equilateral, but these were condoned. Isosceles (also frequently spelt incorrectly) was the most common incorrect response.

5 The majority of candidates answered this correctly. Of those who did not, most were able to score one mark, usually for the reflection 1 square left of the correct position.

6 Generally this was not well answered, with candidates being unclear about their reasons. The key words were width and scale; some stated 'Maths is Fun' is 4 wide, but then did not compare it with the other bar. Other reasons were "*x* axis not labelled", "bars are different", "scale not in thousands" and "scale not even". A small number made the comment "maths is not fun or exciting".

7 Part (a) was generally well answered, with candidates showing working breaking the question down into minutes before 10:00 and minutes after 10:00. Common errors were 10:5 or 10:15.

Part (b) was also correctly answered by the majority, although there was evidence of some candidates not having a calculator. A small number of candidates gave the answer of £9.09.

8 The majority of candidates showed a good understanding of BIDMAS and obtained the correct answer. The most common error was to ignore the brackets and give the answer 13.

Part (b) was also well answered. Common incorrect answers were 10, 14 and 49.

9 Part (a) was not answered well. Many candidates confused multiple and factor, many thought 49 to be a prime number or a square root and 27 was thought to be prime.

The majority gave the correct answer in part (b), although 30 and 7776 were seen as incorrect answers.

10 The majority of candidates were able to answer this question. The most common error was to reverse the coordinates, but this was in a minority of cases.

11 The majority of candidates appeared to be listing in a logical way and many scored both marks in part (a).

In part (b), fewer candidates gave the correct answer and few showed full method. Some added the numbers to get 0.81, but then did not know what to do. A common incorrect answer was 1/5 or 0.2, presumably due to the fact there were 5 choices.

In part (c) a significant number divided by 2.3 rather than 2.5. Some divided 150 by 150, but failed to then give the units as miles per minute.

12 Parts (a) and (b) were generally answered correctly, although a small number wrote "West North" in part (b).

In part (c)(i) many scored at least 1 mark, the common error was to give the first response as 'right'. In part (c)(ii) a common error was 72 from a subtraction, but failing to realise there are 60 minutes in one hour.

Many gave the correct answer for part (d)(i), but there is a misconception of how to write a time interval, with 2.3 being a common answer. Parts (d)(ii) and (d)(iii) were generally well answered, the common errors in part (iii) were to take one hour to return home, continuing in a horizontal direction or drawing a vertical line to zero.

13 There were many correct answers, but disappointingly also a large number of responses that revealed a lack of understanding of fractions, decimal and percentages. Common incorrect answers were 50% and 0.5 in part (a)(i), 6.3, 19.3 and 3/19 in part (a)(ii) and 6 and 0.6 in part (a)(iii). In part (a)(iv) many scored 1 mark for 92/100, but had failed to fully simplify.

In part (b) many candidates failed to show working despite the question stating "Show how you decide".

In part (c), a significant number of candidates had not correctly read the question and had given the new price rather than the increase. There were many non-calculator methods seen, with varying degrees of success.

14 Many candidates scored a mark in part (a) for either $2p$ or $10r$. A few candidates had written $-10r$, while other common incorrect answers were $10p - 4r$, $10p + 10r$ and $10p - 10r$.

Part (b)(i) was generally well answered. Part (b)(ii) was less well answered, with $4x = 26$ or $x/4 = 10$ often being given as the first step. It is pleasing to see fewer candidates giving embedded answers.

15 Several candidates did not attempt this question. Of those who did, some failed to realise that the angles needed to add up to 360˚. Few candidates showed that one person was 3˚.

In part (b) the general standard of drawing a pie chart was good, with ruled lines and clear correct labels. Those with a correctly completed table usually went on to correctly complete the pie chart. A small number had missing or incorrect labels.

16 Many fully correct cuboids were seen in part (a), some candidates however appear to be unfamiliar with isometric grids. Common errors were to have incorrect dimensions or to just draw a 2D shape.

In part (b) many correct answers of 48 were seen, however many of these omitted the units or gave them as cm^2.

17 Despite the instructions in part (a) to leave in all construction lines, many candidates did not use compasses; those who did almost always managed to score two marks. The vast majority relied on using a ruler and as a consequence one line was often of an incorrect length.

In part (b), several candidates did not appear to understand the word "regular" and few calculated the angle to be 72˚. Hexagons and octagons were also seen.

18 Although several candidates scored all the marks, this question proved difficult for the majority, who were unable to show understanding in concepts of equivalence in weight or cost. The most common incorrect answer was “A, as it has an extra 150g for only 90p more”. Some candidates did correct comparisons, but then incorrectly interpreted their result and chose B as better value.

19 Many candidates were able to calculate either 48˚ or 58˚, but then failed to indicate which angle it related to. Few candidates went on to score the full three marks. Several candidates merely stated that parallel lines do not meet and that DE and BC are parallel since they don’t meet.

20 Few candidates realised what was required for this question. Many failed to work out that the total mark for twenty candidates must be 66. Some, however, did work out that the total for nineteen students in the table was 62 and thus scored a mark. A common incorrect method was 19/5 = 3.8, then rounded to 4. Some candidates obtained the correct answer from a trial and improvement approach.

21 In part (a), few were able to get 10 when $x = {}^{-}2$, but many earned a mark for ${}^{-}2$ when $x = 2$. A common answer was 2 and ${}^{-}2$.

In part (b) many were able to correctly plot the points from their table and scored at least one mark. Some candidates who had the correct points then failed to join them, or joined them with straight lines, showing unfamiliarity with the shape of a quadratic graph. Some who had attempted a curve had a straight line between $x = 1$ and $x = 2$.

A significant number of candidates did not attempt part (c).

22 Most candidates made an attempt at this QWC question and it was pleasing to see candidates of all abilities scoring marks. The majority of candidates were able to correctly extract 980 from the table and the majority knew to multiply by 2 since there were two people. Common errors were to add on the incorrect flight supplement and not to calculate 8% of the total; again errors were made in calculating 8%, often from using non-calculator methods.

23 Few candidates scored all three marks. Some did score a mark for collecting either the x terms or the numbers, although errors with signs were seen here. Those who reached an equation in the form $ax = b$ usually gained a follow through mark for solving this, although some divided a by b instead.

J567/03 Paper 3 (Higher tier)

General Comments

The paper was accessible to candidates of all ability levels. Most candidates attempted the majority of the questions and were well prepared for the lower demand questions at the start of the paper. More difficulty was seen with the questions in the second half of the paper, where candidates were clearly insecure in some areas such as standard form, histograms, congruence, algebra and proportionality.

Presentation was generally good and most candidates had access to geometrical instruments where required. Working was often shown, although candidates would have gained more credit in the sequences question, Question 10, if their methods had been more clearly explained. Clearly laid out stages of working in algebra questions would allow candidates to gain more method marks.

In statistics questions requiring comments, many candidates found it difficult to express themselves clearly; if a comparison is required, they should ensure that they make it clear what they are comparing; if an explanation is required, they should ensure that their explanation relates directly to the question. Geometrical reasoning was again poor and candidates would benefit from more practice at structured setting out of geometrical proofs.

On a non-calculator paper, it is important that candidates have a good grasp of basic arithmetic. Some problems were seen in calculations involving negative numbers and decimals. Work on both arithmetic and algebraic fractions was generally poor. Some fluent use of algebra was seen, particularly on the lower demand questions, although the final question combining volume and algebra was inaccessible for all but the very best candidates.

Comments on Individual Questions

1 Many candidates correctly plotted the points on the scatter graph. Some misread one or both of the scales, most frequently the horizontal scale with the consequence that the points (17,55) and (26,82) were positioned wrongly.

Nearly all candidates used a ruler to draw the line of best fit. Many lines were within the acceptable boundaries, although some were too short. A common error was to assume that the line had to go through the origin, which given the context was not the case; these lines did not score. Most candidates could follow through correctly from their line of best fit to make an estimate in part (b)(ii).

2 In part (a) most candidates could correctly substitute $x = 5$. Problems in calculating with negative numbers were evident in the substitution of $x = {}^-4$. The term $({}^-4)^2$ was commonly evaluated as $^-16$, or less commonly as $^-8$. The product of 3 and $^-4$ was usually correct, but often errors were seen in subtracting $^-12$.

Part (b) was usually correct, although some candidates omitted to multiply the second term by y, leading to an answer of $y^2 + 5$. Poor notation of $y5$ instead of $5y$ was sometimes seen.

In part (c), the majority of candidates demonstrated that they understood factorisation, although partial factorisations of $2p(2p – 4)$ and $p(4p – 8)$ were common. A very small minority tried to factorise into two brackets.

3 Few completely correct answers were seen to this question, although most candidates attempted a construction and gained partial credit. A correct arc of radius 7cm, centre B, was often drawn but few candidates recognised that the perpendicular bisector of AB was also required. Those candidates who correctly constructed the perpendicular bisector usually gave a completely correct response. It was more common however to see two intersecting arcs drawn and the area between these arcs shaded; usually these arcs had different radii, so credit for arcs for the perpendicular bisector could not be awarded. Some attempts at the perpendicular bisector were seen without arcs, from measuring to find the midpoint of AB and then attempting to draw a perpendicular line. When shading was seen, it was usually on the correct side of the 7cm radius arc.

4 In part (a) most candidates made good attempts to find 30% of £6.50, although common errors were to find the cost for just one hour or to double the £6.50 but add on only £1.95 rather than £3.90. Arithmetic errors were too common, with errors such as $6.50 + 1.95 = 7.45$ or $2 \times 1.95 = 2.90$ being seen regularly.

Part (b) was very rarely incorrect. The values were occasionally reversed or division of 40 by 3 and by 5 seen.

Most candidates wrote a suitable question in part (c)(i) although a few referred to a week or gave no time period at all. Most candidates gave fairly clear response boxes though some boxes overlapped end values and some failed to include 'zero' or 'other'. It was common to have an overlap in the final two options, for example by using 8 to 10 and then 10+, thus overlapping at 10. In part (c)(ii) most candidates identified that the survey would not be random because it was done at a particular day/time. Reference was often made to members being unable to attend because of work, school etc, thus implying that the selection was not random. Very few candidates gained the mark in part (c)(iii). The expectation was to explain the mechanics of taking a random sample (drawing names out of a hat or using a random number generator to pick names from a membership list), but most suggestions involved sampling on different days of the week, leaving questionnaires at reception or asking, for example, every fifth visitor, which would never reach the non-attenders.

5 Candidates who understood the problem usually had little difficulty in reaching the correct answer. Those who could handle fractions well easily found that accounts took 1/8 of the time, leading to a 48 hour working week, although a calculation of $7 \times 6 = 42$ sometimes followed. The few candidates who attempted to work with percentages made little progress with the question. Poor fraction arithmetic sometimes led to $1/4 + 5/8 = 6/12$, which could lead to a correct follow through argument of a 12 hour working week. Some candidates misunderstood the whole concept and tried to find fractions of 168 hours (from 7×24 hours) or fractions of 6 hours.

6 In part (a) candidates found it difficult to draw a line from an implicit equation. Very few realised that the most straightforward method was to substitute $y = 0$ and $x = 0$ into the equation to find where the line would cross the x- and y-axes respectively. Many attempted to complete tables of values, but these often contained errors. Some correct short lines were seen and some candidates gained a mark for a line that passed through one correct point, usually (3, 0), but sometimes (0, 4.5) or (1, 3).

In part (b), very few completely correct answers were seen and few candidates even attempted to draw the reflection of their line. Some candidates demonstrated that they had some idea about how to find a gradient and triangles were drawn on their graph or attempts at rise/run were seen. Candidates were not always clear which way they needed to divide to find gradient and run/rise was calculated. There was some confusion between gradient and the equation of a line, as it was not uncommon to see an equation in the form $y = mx + c$ rather than simply the value of the gradient.

7 Part (a) was answered well with most candidates drawing both views correctly. The most common error was to draw a side view rather than a front view.

Part (b) was very poorly answered, with 60 being by far the most common answer. Candidates clearly could not distinguish between the linear conversion 10mm = 1cm and the conversion between units of volume. Other incorrect answers included 600 and 216.

In part (c) candidates dealt very well with the three-dimensional coordinates. Most answered part (i) correctly, with a common incorrect answer of E. Part (ii) was also often correct, with incorrect answers commonly having problems with the x-coordinate, giving (1, 2, 2) rather than (0, 2, 2). Most candidates however could follow through from their coordinates correctly to gain a mark in part (iii).

8 In part (a) most candidates could expand the bracket correctly and rearrange the resulting equation to reach $12x = 8$ or $3x = 2$. It was common to have problems from this point and an answer of 1.5 instead of 2/3 was frequently seen. Some decimal answers were seen, but these were often not sufficiently accurate. Where candidates showed clear working, they were able to gain follow through marks for correct methods when the initial expansion had been incorrect. Trial and improvement and reverse flow diagram methods were generally unsuccessful and did not score method marks.

Part (b) was very well answered with the common errors being to include 2 or omitting $^{-}3$.

In part (c), candidates who understood that the inequality could be solved in the same way as an equation usually reached a correct answer of $x < 8$, but sometimes answers of $x = 8$ or simply 8 were given, which did not gain full credit. Sometimes the – 7 was not transposed correctly, leading to $2x < 2$, however correct rearrangement of this to $x < 1$ could gain a method mark. Some candidates did not know how to solve an inequality and attempted trial and improvement methods, which commonly led to answers such as $x < 7$.

Part (d) was found much more difficult, although a significant number of correct answers were seen. Candidates need to be aware that they need to take care with the square root sign to avoid ambiguity in their answer; it is good practice to put brackets around the fraction to make it clear that they are taking the square root of the whole expression, rather than just the numerator. Where clear algebraic steps were seen, a method mark could be gained for one correct step of rearrangement shown.

9 In part (a), many candidates knew that the first step was to convert the mixed numbers to improper fractions, but following on from this step there was a lot of confusion. It was common to then use a common denominator of 20, leading to harder numbers to multiply and arithmetic errors appearing. Having found a common denominator it was not uncommon to then add, rather than multiply, the fractions. Some candidates did then go on to correctly convert their improper fraction to a mixed number in its lowest terms. In some cases, candidates multiplied the integers and fractions separately and then combined these answers.

Part (b) was very badly done. Some answers were spoiled by poor notation for a recurring decimal, by placing a dot above both the 1 and 6 and having divided 1 by 6, others gave the answer to an unacceptable degree of accuracy, 0.16 or 0.166. The most common incorrect answer was 0.6.

Part (c) was generally wholly correct or completely wrong. The most common incorrect answer was 58/100, often cancelled down to 29/50, but 5/8 and 1/58 were also seen.

10 Many candidates gained 3 marks in this question for arriving at the correct expression of $3n + 2$, however they often failed to show clearly how they had arrived at this. Those scoring full marks usually showed several substitutions into the expression or sometimes made the link between a difference of 3 and $3n$. It was common to write 5, 8, 11 with or without the differences of +3 seen, but these were often not linked clearly to the $3n$. Common wrong answers were $3n + 5$, $5n + 3$ and $n + 3$; the first usually scoring two marks and the others usually scoring only one mark for a difference of 3 or values 5, 8 and 11 seen.

11 Part (a) was very poorly done for a relatively simple question. The most common failing was not rounding correctly to 3 significant figures, with 8.45 seen more often than 8.46. Incorrect powers of 10 were also seen, usually 4 or 5 instead of 6.

Part (b) was better answered, with most candidates getting at least one of the answers correct. The second answer, India, was more commonly correct than the first answer, Mongolia. The most commonly seen incorrect answers were China and Tunisia.

It was rare to see a correct answer in part (c), because few candidates realised that the word 'estimate' in the question meant that they were intended to round the values given. Some candidates did show correctly rounded values, but then divided area by population or failed to deal with the powers of 10 correctly. Those candidates who did not round sometimes showed a clear attempt at population/area although it was common to see haphazard working and it was unclear what the candidate was attempting to do. Attempts at subtraction were common as were attempts to use the population figure alone.

12 Almost all candidates completed the tree diagram correctly in part (a). A few candidates converted the decimals to fractions on the branches, but the conversion was generally correct. Where errors were made, the 0.4 and 0.6 were the wrong way round, often on the bottom set of branches or 0.2 and 0.4 were used on all pairs of branches, these candidates not appreciating that the probability on each pair should add up to 1.

Part (b) was not as well answered and candidates who knew the correct method were often let down by poor arithmetic and the lack of appreciation that a probability should be less than 1; answers of $0.2 \times 0.6 + 0.8 \times 0.4 = 1.2 + 3.2 = 4.4$ were not uncommon. Where fractions were used, the calculations were often more successful, leading to correct answers of 44/100 or 11/25. Confusion was common about when to add and when to multiply probabilities and, having identified the correct outcomes from the tree diagram, some candidates used an incorrect method and started by calculating 0.2 + 0.6 and 0.8 + 0.4. On very few occasions were ‘not late, not late’ or ‘late, late’ included in calculations.

13 Many correct answers were seen in part (a), particularly by those candidates who included the rays from the centre of enlargement, (${}^-4$, 6). Where the answer was not completely correct, it was common to see a triangle of the correct size and orientation positioned incorrectly, often with one vertex on the centre (${}^-4$, 6) or using rays coming from an incorrect centre, often (6, ${}^-4$). Some candidates drew the rays correctly, but did not draw triangle B. Some candidates misinterpreted the scale factor and used a factor of 1.5 rather than 0.5.

In part (b) many candidates did not use the grid to help, as was suggested in the question; this led to many incorrect answers. Those candidates who did use the grid sometimes confused the lines $x = {}^-1$ with $y = {}^-1$ and the x- with y- axis. Most candidates did follow the instruction and tried to identify a single transformation. Rotation was often stated, along with 180°, but the centre was often omitted or incorrect. It should be noted that ‘turn’ is not acceptable as a description of a rotation. Very few candidates used the alternative description of an enlargement with scale factor ${}^-1$ and centre of enlargement (0, ${}^-1$). Some candidates scored the special case mark for correctly describing the translation that would result from using an incorrect reflection in either $x = {}^-1$ or the x- axis.

14 In part (a) candidates who showed calculations for the frequency densities usually went on to draw a completely correct histogram. A common error was for candidates to divide each frequency by 10 rather than the correct class width each time, usually with no working shown; another common error was to use the midpoints. Candidates who had some understanding of histograms usually gained one mark for bars of correct width in the correct position, however many candidates clearly seemed underprepared on this area of the specification.

The requirement in part (b) was for a comparison between the afternoon and evening sessions and many candidates failed to score because they did not make their comparisons clear through making no mention of ‘afternoon’ or ‘evening’. Descriptions using ‘older’, ‘younger’ or ‘middle aged’ were ambiguous unless qualified by some figures. Comparisons of frequency density rather than frequency showed no interpretation of the data. Some candidates wrongly identified 15 – 20 as the modal class in the afternoon because it was the tallest bar, forgetting that they needed to compare bar area rather than bar height. Comments on skewness were very rare. The most successful attempts usually involved comments and comparisons of single classes between afternoon and evening.

15 As the question in part (a) asked candidates to show that angle CDX was 22°, the key requirement was to give correct angle reasons rather than to show calculations and many candidates failed to appreciate this. Many stated that angle ACD was 48°, but seldom stated reasons and, of those that did, few were acceptable. Common incorrect or unacceptable reasons were 'angles in a sector', 'alternate segments', 'angles at the circumference' and 'bow tie theorem'. Some did gain a mark for stating 'angles in a triangle' for the second reason and showing the subtraction to reach 22°.

In part (b), working and explanations were generally unclear. Candidates would benefit from being trained in how to set out a clear geometric proof using correctly defined angles. Confusion between congruent and similar triangles was also evident and some candidates attempted to prove that the incorrect triangles, ABX and DCX, were congruent. Some correct pairs of angles were identified, although two correct pairs were seldom seen. The common side, AD, was rarely identified. Some candidates gained a mark for stating two correct angle reasons. Few candidates attempted a conclusion to the proof with the correct congruence condition, AAS. Vague statements about the triangles having all of the angles equal, or being the same size, or being symmetrical were often seen. In an angles question, it is good practice to identify known angles and mark them on the diagram and a number of candidates scored a mark for having done this correctly.

16 Some candidates identified that $(x + 5)^2$ was required and attempted to find the adjustment value. Working out was rarely set out in the conventional way so, if – 16 was not reached, a further method mark was hard to credit. Trials were often used to find the value or a separate calculation was attempted, for example 25 – 9 = 16, with a variety of signs used. Common wrong answers involved $(x + 3)^2$ or $(x + 10)^2$ and a number of candidates produced expressions involving $(x + 10x)^2$.

17 Many candidates did not read the question carefully and attempted to set up a formula of the form $C = kd$ rather than $C = kd^2$. This working led to the common wrong answer of $C = 26d$, which scored no marks. Candidates who used the fact that the cost was proportional to the square of the diameter often reached the correct formula, although some stopped at an intermediate point such as $k = 13$ and did not substitute the value into $C = kd^2$ to complete their answer. A number of candidates thought that the question related to circle formulae and worked with a formula using π, which were sometimes able to gain a method mark for a formula involving C, π and d^2.

18 In part (a), candidates who were confident in dealing with surds could often gain a method mark by writing the expression as $\frac{\sqrt{2}}{\sqrt{2}\sqrt{9}}$, however this was often only simplified to $\frac{1}{\sqrt{9}}$ or, incorrectly, to $\sqrt{9}$. Candidates did not always realise that they could simplify $\sqrt{9}$ to 3. Those who attempted to multiply top and bottom by $\sqrt{18}$ often did not know how to make further progress.

In part (b), few candidates realised that the first step in simplification should be to factorise the numerator and denominator and those that did were seldom successful with both expressions. Many fundamental errors were seen, with many versions of incorrect cancelling of $4x^2$ with $2x^2$, or the 9 with the 3, leaving depleted fractions as their answer.

19 Many candidates completely omitted this question. Of those who attempted it, few appeared to realise it was testing their quality of written communication as few words of explanation were seen in any responses. Few candidates appeared confident with having to find an algebraic solution to a geometric problem. Candidates would benefit from being trained in how to present working in a clear and logical manner in a question like this. The formula for the volume of a sphere was often copied correctly from the formula page and an attempt made to substitute for the radius, but unfortunately many candidates could not quote the formula for the volume of a cylinder correctly. The substitutions of the radii $3r$ and $2r$ into the formulae often led to sightings of $4/3\pi 3r^3$ and $\pi 2r^2h$ rather than $4/3\pi(3r)^3$ and $\pi(2r)^2h$. Some candidates excluded r altogether, substituting in just 3 and 2 and many got no further than this substitution. Candidates who equated their versions of the two volumes usually tried to rearrange to find h but errors in rearrangement were common, with some subtracting instead of dividing. Very few candidates arrived at a correct final answer of $h = 9r$ and few of those showed clear correct working leading to their answer. Some candidates felt that they needed to substitute 3.14 for π and reach a numerical answer.

J567/04 Paper 4 (Higher tier)

General Comments

There was sufficient evidence to show that the candidates had plenty of time to complete this paper. Most of them had the equipment to answer Question 1 and few did not have a calculator, however many failed to use it correctly to answer some of these questions. There are still too many candidates at this level who use a non-calculator type method to work out percentages and few of them complete it correctly. In this session there was also a problem over the recognition of certain digits, such as 4 and 9, and candidates are advised to write all numbers clearly.

It appeared that many candidates had not learned all the topics, with many essentially restricting themselves to the first half of the paper and not attempting some of the later questions, which were often more straightforward despite being set on more challenging topics.

The word 'estimate' is still a confusing term for some candidates. In Question 8(d) it was the intention that the candidates rounded their answers at the end only. The word is also used when calculating a mean from a grouped frequency table, although no such question was set in this paper this session. Candidates still do not check their answers to see if they are reasonable, for example in Question 4 we had many trains averaging about 1mph. For Question 9(b), candidates should know the shape of a quadratic curve and then realised that ($^{-}$2, 2) was therefore an incorrect point.

The QWC question, 10(a), was well answered this time, but the organisation is still poor; few responses flowed logically and even fewer indicated what their numbers represented. Trial and improvement is becoming an over-used method, especially where it is not appropriate. In Question 17(c) it is appropriate and would gain full credit providing the results of the trials are given, however it is not appropriate to use to solve linear or quadratic equations, or percentage problems, where there are far better methods available.

Comments on Individual Questions

1 In part (a) the triangle was drawn correctly by the majority of candidates. Some used the preferred method of construction arcs, although many obtained sufficient accuracy by trial and improvement. Very few candidates left this question blank or drew the triangle freehand.

In part (b), most candidates showed that they knew what a pentagon was, but not many drew an accurate regular pentagon. Some attempted to draw a regular figure, but incurred cumulative errors that resulted in their figure being just outside of tolerance. Many showed no evidence of using a protractor and very few indicated they needed to use 72°. Some used their compasses, but this drew a hexagon instead of a pentagon.

2 This question was answered quite well. Many correctly found the difference, but then misused it, many divided by 100 to give an answer of 8.84 or divided by 11284. A few left their answer as 1.085 or 108.5%. Some divided the two numbers straightaway and, of those, a large number divided them the wrong way round.

3 In part (a), most candidates struggled in dealing with the negatives involved with the number terms, but many were able to score some credit for dealing correctly with the x terms. It was pleasing to see most candidates attempting an algebraic solution, although some did unsuccessfully attempt trial and improvement methods.

In part (b), errors were regularly made in the order of operations; some candidates wanted to divide by 5 before adding 8, others subtracted 8 rather than adding it. There was pleasingly very little evidence of candidates having to resort to using a flow chart method to aid rearrangement.

4 There was generally good understanding that the distance needed dividing by time, with many going on to a correct answer. Misunderstandings frequently came about in the units used; many took the time as 270 minutes, but used this to give an answer of about 1mph; others misinterpreted 4 hours 30 minutes as 4.3 hours.

5 Candidates must remember that when working is asked for and adequate space provided, their work should be set out in a neat structured manner. There were many different approaches taken, but most tried to compare similar quantities, such as cost per gram, grams per penny, cost for 3000g and so on, or how much 750g at Offer B's price would cost. Pleasingly many candidates were able to score full marks. A few, especially those using grams per penny, made the wrong choice of cheapest. A few misread the Offer B and took one box to cost £3.90. The fact that Offer A included 150 grams more cereal for only 90p extra is, of itself, not enough to base a decision upon here.

6 The correct value for either angle ADE or ECB was frequently found, but often there was no reference to the reason, usually just the angle sum of a triangle or a calculation was shown. Many candidates were unable to express an adequate reason for the lines being parallel and a number of those that did refer to corresponding angles were actually working backwards to find the angles.

7 Candidate's working was again often unstructured and difficult to follow here. Many worked out that the total mark for the nineteen pupils was 62 and stronger candidates recognised that the total for twenty pupils must be 66, in order for the average to be 3.3. Others approached the solution by carrying out trials with different test scores used. Some candidates made the error of dividing the number of pupils (19) by the number of marks (5).

8 Nearly all candidates were able to answer part (a) correctly, giving their answer as a decimal.

Part (b) was also answered well; the most common wrong answer was 0.5, from using Rest of World instead of Rest of Europe.

Part (c) was also answered well by most candidates. Having calculated answers to parts (a) and (b) in decimals, a significant number then unnecessarily gave their answer in percentages or fractions here, often with a denominator of 1.

In part (d), most of those who used the correct method for calculating 42% also rounded their answer to a whole number. Some were confused about whether to multiply or divide by 0.42 and a few misunderstood the meaning of 'estimate' in the question, treating this as if it was an estimation question and rounding the figures before using them.

9 In part (a) most candidates correctly found the value of y when $x = 2$, however many were unable to evaluate correctly for the negative value of x and common wrong answers were 2 or $^{-}2$ instead of 10.

The points were generally plotted accurately in part (b), however it was surprising how few recognised errors in their part (a) y-ordinates once plotting these gave graphs with non-quadratic curves. Most candidates attempted to draw a curve dipping below the line $y = {}^{-}2$, however some still use straight line segments and a significant number did not attempt to join their points at all.

Part (c) was not as well answered with many not attempting it at all. Errors commonly came about through attempts to answer this using algebra, which was rarely successful, or to give the values where their curve intersected the x-axis.

10 Part (a) required candidates to work through a multi-step task and, since this was the QWC question, to show their working clearly. Nearly all candidates were able to select the correct cost of the holiday from the table, double this and then make the right decision based on their final costing. A common error was to forget to double the supplement for not flying from London Heathrow airport. Many did not carry out the steps in the order they were listed in the question, which often meant that the 8% discount was not applied to the total cost of the holiday; frequently the discount was calculated and then the supplement added. While the working was often mainly correct, it was too often poorly set out and difficult to follow, however many candidates wrote clear conclusions on the answer line, which frequently included their deficit or surplus.

Candidates found part (b) difficult, with few getting full marks. The most common error was to calculate 94% of £1643, or for those who started with 106%, to multiply by 1.06 instead of dividing.

11 Most candidates showed a good understanding of the elimination method and were able to multiply both equations by an appropriate number, before going on to attempt the correct addition or subtraction. A common error was to subtract when they had equated the coefficients of y, usually to 12; the different signs indicated that addition was the correct operation. Many had difficulties dealing with the negative numbers correctly and did not get the final answer correct, however, as in previous years, the correct method was well rewarded.

12 Those candidates realising the need to use Pythagoras' theorem generally earned all five marks and loss of marks in these here was usually due to calculator errors in working out the appropriate lengths to use. Some stopped after calculating 237 and 264, forgetting to add on the extra distance along the side. However, this question proved a challenge for many others. By far the majority here simply added various lengths around the edge. A small minority tried to use a form of trigonometry and some found the area of the sections identified.

13 In part (a) most candidates wrote down the correct product; some were unable to perform this correctly on their calculator, whilst others were unable to change from cm^3 to litres, dividing by 10 or 100 instead of 1000.

The correct answer of 960 was not seen that often in part (b). Very few used 2^3 as a scale factor and successful candidates generally found three measurements with a product of 120 (000), doubled them and then found the new volume. 2 × 120 = 240 was the most common wrong answer. A few diagrams were seen showing ×2 on each of their dimensions and then treating this as equivalent to ×6.

In part (c) only the very highest scoring candidates used $\sqrt[3]{3}$ as a scale factor of length; others tried trial and improvement with little success. It was most common to see 3 × 60 = 180, along with many who trebled the original dimensions to find the new volume.

14 This topic was not well understood. In part (a)(i) a minority of candidates were able to obtain the correct average. Some then continued to round their answers to 336 or 337. Candidates achieved a higher success rate in part (a)(ii), since they were able to earn follow through marks from their answer in part (a)(i). However, the general quality of the plotting was disappointing, with some plotting at the correct height but displaced horizontally.

In part (b) there was a lot of confusion between the seasonal variation and the general trend and as a result many statements were repeated in the two parts. However, responses were better here than for either (a) or (c). The most commonly used approach was to describe which season had the most rainfall and which season had the least rainfall; others attempted to describe the change from season to season.

Part (c) was found to be challenging**;** many of the answers were between 375 and 380 and often normally accompanied either by no working or by a variety of largely incorrect calculations.

15 The majority of correct approaches labelled the correct ‘o’, ‘a’ and ‘h’ on the triangle, with the sine ratio then correctly identified and used. However, a number of candidates also used a correct sine rule with 90º as their angle opposite to 5.8 metres; in these cases there was frequently evidence of poor calculator skills and candidates were unable to gain the correct final answer. Most candidates rounded their calculations at the end of the process, however this was not required. A number of candidates used the incorrect trigonometrical ratios; both cos and tan were seen. There was also a number of candidates who tried to find the missing angle in the triangle and then used trigonometry to find the required side, but these were largely unsuccessful.

16 Few candidates seemed to understand the concept of upper and lower bounds and therefore this question was not well answered. In parts (b) and (c) it was a common approach to use the given numbers in the calculation and then find the upper or lower bound of the number obtained.

In part (a), most answers were found using one decimal place rather than two as a starting point, so 4.75 was a common wrong answer, but 4.704 was also seen.

In part (b) most candidates failed to identify the two separate upper bounds before the addition, leading to a common incorrect answer of 11.48, which was sometimes then raised to 11.485 to give the upper bound.

In part (c) a common wrong answer was 2.08, from 6.78 – 4.70, which was sometimes then given as 2.075 on the answer line, again their attempt at finding the lower bound. However credit was often given for seeing 6.775, which was a step in the right direction and shows the value of candidates writing down all working.

17 Part (a) had some clear explanations that involved or implied subtraction from 1 or 100%. Some candidates lost the mark by merely repeating the values given in the question and others used a mixture of percentage and decimals, such as 1 – 5 = 95(%).

Part (b) was well answered providing a calculator was used correctly; it was surprising how often we saw the correct expression with the incorrect answer.

In part (c) it was intended that the given formula was used and the results of trials shown. Some showed very little working. A very few went through the long process of working out 5% of the current population and subtracting it from the previous year.

18 The majority of candidates using the ‘quadratic formula’ gained credit for correct substitution into the formula, but many of these failed to produce the correct answers from their calculator. Common mistakes were not dividing the entire numerator by ‘2a’ and failing to recognise that $25 - {}^{-}12$ is equal to 37, not 13. Although the question asked for “answers”, many only gave one solution.

19 This proved to be a challenging question, although some did get part (a) correct. A common answer was $y – 1 = x^2$.

Part (b) was only answered correctly by a very few; common responses were $y = 4x^2$ or $y = x^2 + 4$.

20 This was another challenging question; many did get ‘B’ for the first one, but ‘E’ was a popular choice for the second one. As this was essentially a multiple choice question, it was surprising that more did not have a guess at the answers and many candidates gave no response.

21 This question was targeted at A or A* candidates and was therefore inaccessible to a lot of candidates. Many had an attempt at starting the question, but had little idea how to proceed. The main fault was not dealing with the fractions as fractions; many separated them and then tried to bring them together in some fashion. Others did not involve the 5 from the right hand side until very late in their solution. The most successful attempts were either to multiply each term by $(x + 2)(4x – 1)$ or to write the left hand side as a single fraction as $\frac{5(4x-1)+3(x+2)}{(x+2)(4x-1)}$. Common errors were simplifying to $\frac{8}{5x+1}=5$, dealing separately with $\frac{5}{x+2}=5$ or $\frac{3}{4x-1}=5$, or removing the denominator and writing $5(4x-1)+3(x+2)=5$ or $5(x+2)+3(4x-1)=5$. The final quadratic did factorise, which is why the question demand does not say “to 2 decimal places” or similar. Pleasingly, there were a significant number who correctly answered this question.

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