RECOGNISING ACHIEVEMENT

GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres

November 2012

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

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

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

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General Certificate of Secondary Education

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OCR REPORT TO CENTRES

Overview

General Comments

This is the first year and the second session of the J567 linear specification. The specification can be taught as a traditional linear one or it can be taught using the graduated stages as described in the full specification. The entry for this specification was very different to that in June 2012. At the Foundation tier the entry performed far better than in June and suggested that it was not just candidates re-sitting from June, but possibly some were higher level candidates who were taking this examination earlier, either for practice or as a confidence boost. The rise in the grade thresholds was due to the papers being more accessible in this session. At Higher tier the performance was lower than in June and suggested that the entry was mainly candidates re-sitting from the summer session and some who were taking an early entry. This was indicated by the greater than expected number of omissions in the latter questions, implying that certain topics had yet to be learned. The two papers at this tier were considered to be roughly the same accessibility as in the summer. Centres need to consider carefully their entry policy as it is likely that most candidates will get their best result from a June entry in their final GCSE year. Alternatively, a result in November could improve by at least one grade in June the next year. Centres may be aware that March 2013 will be the first and last time that this specification is available in a March session and it has the advantage that preparation for the examination can be carried out while the candidates are still in school.

In this session the candidates again responded well on the normal type of questions, which are categorised as AO1, recall and use of knowledge, and AO2, select and apply mathematical methods. The questions labelled as problem solving, AO3, did continue to cause some difficulty to the candidates. These questions involve selecting information and choosing appropriate methods to solve a problem. Some problems have more than one step and then the order of the steps has to be considered. It has been suggested that centres give their candidates thorough practice on this type of question. In addition at least one question on each paper is designated as a QWC question, where the way the candidate sets out and communicates their solution is considered as well. In this session candidates were still not setting out their solutions in a logical way and frequently did not explain how their answers or part answers relate to the problem or to their solution. It would have been helpful to see some ‘headings’, for example on the J567/02 and J567/04 QWC question such as “weight/mass of one sheet” or “weight/mass of one packet” and so on.

The method to work out percentages without a calculator is universally well known, but there is a problem with percentages using a calculator. There are two common errors when finding a percentage. The first one is that they try to use the ‘non-calculator’ method and usually make an error in finding 10% or 1%. This method is not suitable when a calculator is available and was seldom used successfully. Alternatively they attempt to find the percentage by dividing by the number, so for example they would divide by 62 to find 62% of something. There is also a need to do much revision on fractions as these are not answered well.

The availability of equipment seems to vary considerably amongst centres and many candidates could not use the equipment when they had it. Calculators are still used poorly when the hierarchy of operations is required to be used. In trigonometry some calculators are in the wrong mode. The question on loci was answered quite poorly and specific equipment was required for that question.

At the Higher tier candidates need to learn the algebraic methods, such as solving linear equations with fractions, solving simultaneous linear equations and solving quadratic equations using the three methods (factorisation, completing the square and the quadratic formula). It is also important that candidates read carefully the questions as it is possible to demand slightly different responses from these topics.

Questions asking for ‘reasons’ to back up any answers are still answered poorly. These questions usually require an appropriate mathematical fact. A good example of this is in geometry where often the ‘reason’ was just a description of the calculation used. In statistics comparisons between two sets of figures usually require a comparison between the ‘average’ and another between the measure of spread.

There is also confusion in many candidates’ minds between area and perimeter and centres will do well to work on these two aspects of geometry. It is also a concern that candidates appear unable to find the area of standard shapes such as the triangle and the trapezium, the formula of which is stated on the formula page.

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 most were able to attempt a good range of questions. Many were able to attempt the later harder questions and often gained method marks even if they were unable to obtain the correct answer. There were a significant number of candidates who achieved very good marks.

Most candidates showed their method when undertaking their responses, but there is still a minority who show little or no working and consequently are unable to receive the method marks available when they have a partially correct solution with an incorrect answer.

Measuring equipment was generally used appropriately, but some candidates did not use a ruler, which led to their diagrams being inaccurate. Presentation of some candidate's solutions was difficult to follow.

The process for finding percentages of quantities without a calculator is well understood by many candidates. Conversely those questions which involved fractions were not answered well.

There was an improvement in the answers to the Quality of Written Communication (QWC) Question. Candidates are more aware that they need to give a detailed response when answering and look to give a solution in an appropriate form. More work still needs to be done in ordering their responses, so that their working is displayed in an orderly manner rather than having a confused jumble of working.

Comments on Individual Questions

1 Most candidates were able to understand and use a probability scale. A small number used the vocabulary of probability, giving answers such as unlikely and so on, while a few gave numerical answers.

2 Nearly all candidates could find 50% of the cost in part (a). Only candidates who misinterpreted the question, finding the difference between the cost of a box of pizzas and one single pizza (rather than two), tended to get part (b) wrong. Candidates could nearly all find 25% of the cost in part (c), but many gave the new price, rather than the reduction, as an answer and only received one mark. A significant number did not know the process of finding a third of a quantity. Some tried to convert it to a percentage, but were usually unsuccessful in this approach; again many gave the new price rather than the reduction as an answer.

3 Nearly all candidates reflected the shape successfully in part (a). With a few exceptions, many did not understand the concept of rotation symmetry and had little idea as how to approach the second part of this question.

4 Most candidates could extract and use information from a timetable and consequently nearly all obtained the correct answer in part (a). Most candidates recognised that they needed to find the time interval between 11:35 and 12:15 in part (b) and many obtained the correct answer, though a few gave an answer of 80 minutes. Part (c) involved a more complicated process; most candidates attempted this, with varying degrees of success.

5 In part (a), the majority measured the angles successfully. Some, including a few able candidates, could not use their angle measures correctly, so there were responses such as 43 or 143 in part (a)(i) and 114 or 74 in part (a)(ii). Most candidates identified acute and obtuse correctly in part (b).

6 This question was answered well. Nearly all candidates could continue the pattern in parts (a), (b) and (c)(i). For Pattern 10, in part(c)(ii), many again found the correct answer, although a few gave a response of 26, twice the number of squares for Pattern 5.

7 Although most candidates have a good feel for the concept of area there is a minority who are confused as to what it represents. Many found the correct area and perimeter in part (a), although a few confused the two and gave the reverse responses. Some tried to apply some sort of formula to find the area rather than simply count the squares. Candidates had mixed success with part (b); a few did not have a strategy to find the area accurately, which led to some scoring just one mark or none at all. Part (c) involved using some problem solving strategies. Many found the width of the rectangle successfully, but did not then always go on to find the area correctly.

8 Nearly all candidates could use simple proportion in the context of recipes in part (a) and use the simple function machine in part (b). Not all were aware that there are 1000 ml in a litre, so answers of 5 or 50 were common wrong answers in part (c).

9 Many weaker responses did not show that the sum of the angles in a triangle was 180°; better responses showed an awareness of this and some could go on to use this to explain why the sum of the angles in a quadrilateral was 360° in part (a) and find the missing angle in the quadrilateral in part (b).

10 Multiples were well understood by all candidates in part (a); better responses could generally find a common factor and some could identify the cube number, although 36 was a common incorrect answer. In part (b)(i) most had a good attempt with many giving a multiple of 6, such as 6 or 12, to obtain one mark. There were a significant number of correct answers, which was pleasing on this more complicated question. Part (ii) was found to be harder, but, again, there were correct answers.

11 This whole question was well answered with only a few errors seen. A few misread the scale in part (b) giving an answer of 30 rather than 20 minutes.

12 In part (a) most candidates struggled to add and subtract negative numbers.
A correct response to the subtraction in part (ii) was not often seen, a common error was to give an answer of $^{-}7$. Again in part (b) only the better responses showed they were confident working with fractions. Many did not have a strategy to compare and order the fractions and partially correct solutions were common.

13 Most candidates made a fair attempt at the pie chart and the better responses usually obtained full marks. Some did not have a strategy to find the correct angles and the only correct sector being the semicircle was quite common. It was pleasing to see very few pie charts with the angle the same as the frequency.

14 Nearly all candidates could interpret the stem and leaf table and could consequently identify the youngest member successfully in part (a)(i). Again, most understood the range of the data and gave a correct response in part (a)(ii); a small number did not compute the answer, giving a response of 17 – 67. Most understood the principal of finding the median and many obtained the correct answer; common incorrect answers were 36, 36.5 or 7, the latter presumably coming from an incorrect interpretation of the table. Only weaker responses failed to make a reasonable attempt at part (b); many obtained full marks, with some gaining marks for partially correct solutions.

15 Only the better responses managed a worthwhile attempt at this question.
In part (a) there were some correct answers, but many were confused by the algebra within the formula. Only the very best responses showed the skills necessary to rearrange the formula in part (b), most candidates failed to offer anything at all worthwhile.

16 The better responses usually had some idea as how to approach part (a) and many of these obtained the correct answers. The reasons given, however, were generally insufficient. In (i) the required reason was a corresponding angle and just stating that the two lines were parallel was not good enough. In (ii) the required reason was alternate with their answer to (i) + 70, or alternatively a sequence of correct reasons could be given. Less was required if correct angles were shown on the diagram. An encouraging number of candidates knew that the sum of the exterior angles in a polygon is 360° and consequently obtained the correct answer in part (b).

17 A fair number of candidates obtained at least one mark for completing the table in part (a) and then went on to plotting their points in part (b), although few obtained all the marks available by plotting a correct curve going through the correct points. Only the best responses showed an understanding of how to use the graph to find the solutions to the quadratic equation. A very small number solved the equation algebraically and were given credit for this if they gave their solutions as a decimal.

18 Part (b) proved to be easier to answer than part (a), with a large number of correct answers. A common incorrect answer in part (a) was vase B.

19 Part (a) had a mixture of responses, with some candidates finding it straightforward and others not knowing where to start. 60% was a fairly common incorrect response with candidates finding (300 -120) as a percentage of 300. Candidates often had a good idea of how to approach this problem, although their arithmetic was not always correct. Most average and above responses obtained at least one mark, with many achieving 3 or 4.

20 This was the QWC question. Some better responses gave a fully reasoned solution with a comprehensive method laid out in a manner that was easy to follow. Many showed working that was haphazardly set out and consequently difficult to mark, making it hard to give credit to the candidate's method. Some figures were presented without any supporting method; for instance 4 gallons, the amount of petrol needed, was often seen without any working that led to this result. Those who failed to carry out the instructions to estimate soon became embroiled with complex calculations and could not then proceed. Candidates need to further develop the skills needed to present their work in a reasoned way that follows logically from one step to another.

J567/02 Paper 2 (Foundation tier)

General Comments

Overall, most candidates attempted all the questions and time did not appear to be a problem. There were a few occasions when there was evidence that a calculator was not used or available, as a number of candidates used non calculator methods to attempt some questions. It was pleasing to see candidates showing some working, but there were still several occasions when the method was not communicated; it is evident that candidates need to be more prepared for the answers where the quality of written communication is assessed.

Candidates were particularly successful in topics such as identifying fractions, probability and interpreting bar charts. There was less success on measuring bearings, constructions and calculating the area of shapes.

Comments on Individual Questions

1 The first question of the paper was generally very well done.

2 In part (a), most candidates were able to give the correct answer, the common error being 'likely'. Part (b) was not particularly well answered; most candidates responded that the outcome of choosing a club was 'unlikely' or 'likely'. The majority of candidates gave the correct answer for part (c).

3 Nearly all candidates answered part (a) correctly. Only a few reversed the coordinates. In part (b) the vast majority gave the correct answer, although again some reversed the coordinates, more so than in (a). With part (c), most candidates plotted C in the correct position. A common error was to plot C at ($^-2$, 3). Most correctly described the triangle as right-angled, fewer gave the correct alternative answer scalene. The most common wrong answer was isosceles.

4 Many were able to give the correct name in part (a), however many were unable to correctly spell the word hexagon. The most common incorrect answer was pentagon. In part (b) again many gave the name cuboid with a variety of spellings. Common errors were cube and rectangle. Many correct answers were seen in part (c), indicating that candidates understood the meaning of the term radius. There were very few answers of 6, but 360 was seen occasionally.

5 The fairly straightforward part (a) was well answered by the majority of candidates who attempted the question, but there were surprisingly a number of candidates who did not attempt this part of the question. Part (b) was usually answered correctly. In part (c) many correct answers were seen; often those who had omitted part (a) scored 1 mark for an answer of 41. Some had added up incorrectly, even though a calculator was available to them. Many did not show any method.

6 Part (a) was generally well answered, although answers of 84 300, 84 000 or 85 000 were also given. Responses for part (b) were mostly correct, with common errors being 85 000 and 84 300. Part (c) was least well done, with 8 being the most common incorrect answer.

7 Virtually all candidates seemed to understand what they needed to do, however many were unable to give the correct order. It was difficult to see what caused some of the errors that were made. A few candidates seemed to be influenced by the number of decimal places rather than their value, ranking 4.7 as less than 4.17 and both of these less than the numbers with three decimal places.

8 Part (a) was generally well answered. Some drew tallies and left the frequency column blank, while others only wrote the frequencies in the tally column. Most answered part (b) correctly; some wrote down the frequency.

9 In part (a)(i), some included brackets around the 8 and 13, which changed the outcome. A significant number of candidates did not attempt part (a)(ii) of the question; of those who did, many were incorrect. Common errors included responses such as $(5 + 3^2)$... or $5 + (3^2 \times 2) \div 8$. Part (b)(i) was well answered, it was rare to see an incorrect answer. Again, part (b)(ii) was well answered, it also being rare to see an incorrect answer here. Many candidates in part (b)(iii) were able to give the correct answer, others gained credit for 0.59. When the answer was incorrect it was frequently for $^-5.495$, from $4.2 \times 1.8 \div 18.7 - 5.9$. It was obvious that some did not understand the hierarchy of operations.

10 Part (a)(i) was generally answered correctly. In part (a)(ii), understanding of the meaning of 'compass direction' was generally good and most gave the correct answer; occasional East-West muddles, or answers of simply North or East, were also given. Although many candidates gained the mark for part (a)(iii) it appears the term anti-clockwise is not well understood. Some candidates had not read the question and had simply drawn an arrow from the lighthouse to the village. Part (a)(iv) was attempted by the majority of candidates, but few managed to give the correct answer. Not all measurements seemed to be based on North, and quite a few were probably the bearing of the shop from the café rather than the café from the shop, as required. Others measured from North, but in the wrong direction. Accuracy seemed quite reasonable; almost every response in the correct quadrant fell within the specified range. Many responses in part (a)(v) gave an answer in the acceptable range and scored both marks. Some had answers just outside of the range, but in many cases had not stated their numbers of squares or shown multiplication by four. Explanations of candidates' methods were seldom present. Evidence of squares counted on the diagram was usually anything but clear. A noticeable number of candidates used 49 squares in their answer to this part, so either did not understand the question they were asked, or thought that a very rough-and-ready estimate was acceptable.

In part (b)(i) many correct answers were seen; almost everyone was able to score a method mark, even if they could not complete the calculation correctly, but overall there were a number of very basic errors. The majority of errors involved the decimal point, for example 10.5 instead of 1.05, or zeros getting into the wrong place, for example 9.03 seen instead of 9.30. Many candidates could not form a complete strategy in part (b)(ii) and quite a few of those that could went wrong in the details, e.g. forgetting that the bottle contained 2 litres not 1 litre, or thinking that there were 100 millilitres in a litre instead of 1000 millilitres. Many candidates also made rather heavy weather of the 'percentages' aspect of the question. The calculation involving ¾ (or 75%) of a bottle was mostly attempted directly, but the one involving 62% often led to long methods involving breaking down 62%, for example into 50% + 10% + 2% , which frequently went wrong at some point. Candidates seemed surprisingly unaware that percentage calculations can be done directly by calculator. Candidates who attempted to calculate how much each person drank usually saw, in theory, how to complete the question; those who began by subtracting 62% from 75% often got correctly to 13% quite quickly, but many of these attempts then petered out at that point. Part (c) was generally answered correctly, the main problem being the $^-2$ preceding the $^-4$.

11 Part (a)(i) was generally correct, when a calculator was used. In part (a)(ii) many correct responses were seen. Many of the candidates who did not have the correct answer failed to show any method. The common errors included following the flowchart as they had done in the first part, thus failing to reverse the order in which the operations were carried out, or reversing the order of the operations but not using the inverse of the operations, thus 104 + 32 was calculated and so on. Generally part (b)(i) was answered correctly; some did not use a calculator even for this part. Part (b)(ii) was also usually correct, however it was not uncommon to see 19+7 as a first step, or 19 – 7 attempted and then the wrong answer written down, throwing considerable doubt over whether some candidates had the use of a calculator. In part (b)(iii) many correct responses were seen, but ½ $x = 4$ was a common error, as was ½ $x = 6$ leading to $x = 3$.

12 Usually the correct answer was given to part (a), though some candidates wrote 'unlikely' for the probability and then continued to use word descriptors for each part. It was rare to see the answer in an incorrect form such as ratio and when it was, they carried on throughout the question so they were only penalised once, but the answers should be given as fractions. Part (b) consistently saw candidates carrying on their errors from part (a). Part (c) was not quite so well answered; some candidates did not cancel their answer and 4/20 was a common error.

13 Many correct responses were seen to part (a), the common error was to divide by 1.65 rather than multiply. Although in part (b) there were again many correct responses, it was apparent here that several candidates did not have, or did not know how to use a calculator. Too many tried to use a non–calculator method, such as finding 1% and then 5%, and so on; in finding 5% they usually got 4.1, but for 1% often put 0.41 and some added incorrectly. Many correct responses were given in part (c)(i), with the most common error being to read the scales incorrectly to give an answer of 124. In part (c)(ii) some suggested using a number not on the graph, for example 125, and others suggested that the graph should be extended. Many had the correct idea, but did not always refer to the graph and give a clear explanation.

14 Part (a)(i) was generally well answered. Incorrect responses were often not fully simplified, such as leaving the answer as $11r – 4r$. Few candidates scored full marks in part (a)(ii). The partial credit was more frequently for $13s$ rather than $-2t$, due to problems in dealing with the $–10t$. Many lost the second mark by leaving the double '+-' sign in the middle. Several were unable to collect like and unlike terms correctly, or deal with negative numbers with any confidence. Common errors seen were $13s – 18t$ or $13s + - 2t$. Part (b)(i) was very well answered; the most frequent incorrect response was giving the power as 6. Part (b)(ii) was less well answered than part (i), with 6^7 being a common error, as was dealing with the powers incorrectly, giving an answer of 12 from 3 x 4. Many evaluated instead of leaving in index form, working out the values of 6^3 and 6^4 then carrying out a wide variety of further calculations e.g.1296 + 216 ..., 1296 x 216..., 24 x 18....

15 Most candidates gained at least 2 marks for this question. There was a fairly even split between those who scored full marks and those who scored 2 marks for one set of correct angles. It was also fairly common to award the B1. Of those who scored zero, a common error was to write any three numbers that added to 180, often 38, 100 and 42 or 38, 70 and 72. Sometimes the same three angles for both triangles were given, just listed in a different order. Several answers included two obtuse angles showing little understanding of the sum of the angles in a triangle. A very small number of candidates wrote 38 38 38.

16 Part (a) was very poorly answered. Few candidates were aware that their answer needed to be halved and gave the area of a rectangle 164 × 87 = 14268, whilst others divided both numbers by 2 before multiplying or just added the 2 measurements given. Many showed no working at all. There were very few correct answers also for part (b), with candidates trying several operations on the given numbers. Common errors that arose were 14.8 × 20.4 × 16, (14.8 + 20.4) +/× 16 and 16 × 20.4. As very few wrote out the formula, it seems clear that candidates are unaware that the formula is given to them on the inside of the front cover. Most candidates who attempted to split the diagram into rectangle and triangles failed due to not halving when finding the area for the triangles.

17 Part (a) was usually answered correctly; the idea of the probabilities summing to 1 seems generally well known and there were not any commonly occurring misconceptions here. Many responses to part (b) were based just on the figures given in the table, as the value obtained from $\sum f \div 5$ was seen more frequently than any other, certainly being given more often than the correct answer. Many of the answers that appeared from candidates' calculations make no sense in the context of the question, i.e. not giving a possible mean value for a data set consisting of numbers between 1 and 5. Many of those candidates who knew they should calculate values of p × f unfortunately then didn't really know what to do with them; quite a few didn't even seem to make any attempt to add them up and some of those that did add them up just divided by 5 (or 15). Those carrying out the correct method usually accomplished this correctly, as far as the calculations were concerned. The blank column in the table supplied was often used for the wrong sort of calculation, for example cumulative frequencies sometimes appeared, as did the 'frequency density' type of calculation, along with other less readily identifiable numbers and even tally marks.

18 This question was not well answered at all with only a handful scoring full marks. Some candidates did not attempt the question at all and many of those who did provided responses that scored zero marks. Very few made any attempt to bisect the angle either with or without compasses and many of the runways were not horizontal in the East-West direction. The marks gained were usually for the line parallel to the canal. Scales were often correct, with 2cm distance lines and 5cm runways.

19 This question was assessing the quality of written communication, but there was a lack of clarity and organisation. In general, the presentation was poor, often showing many calculations with no apparent logic scattered about the workspace. It was not obvious what was being calculated. A significant number of candidates stated 210 by 297 rather than 210 × 297 and gave values such as 62370 and 40000 without showing the calculation that got them to these figures. Most realised that there was a lot of multiplying, but some divided the area by 80 or 500 and some divided a quantity by 60 rather than the other way round. Conversion of g to kg was usually correct, but the conversion of the area was almost always wrong, frequently dividing by 1000, unless the units were converted first before multiplying.

20 Part (a) was answered correctly by most candidates. In part (b) many scored full marks, however there were many wrong answers, such as $n + 6$, $6n + 4$, $4n + 6$, $2n – 6$ or just an integer. Many candidates answered part (c) correctly, often by continuing their sequence until they got to the 20th number rather than using their *n*th term formula. Frequent seen incorrect responses were from finding the 10th number and then doubling it or using the 5th number and multiplying that value by 4.

21 Many candidates were able to score some marks, often for 6 divided by 4, but they did not have the organisation to gain all the marks. There were some who misread the question and assumed that the antifreeze had to be 6 litres, so gave an answer of 18.

22 It was pleasing to see the majority of candidates attempting the final question, with many scoring full marks. Some produced two ratios, but then spoilt their solution by opting for 'yes', thus showing they had no real understanding of the problem. A common error was to use Pythagoras' theorem on both triangles and then just state one hypotenuse was longer or to calculate the area of the triangles. Some candidates just multiplied the two given lengths together and compared them.

J567/03 Paper 3 (Higher tier)

General Comments

Most candidates made a good start to the paper and many good answers to the earlier questions in the paper were seen. Well-prepared candidates entered at the appropriate time and level performed well on the paper overall.

Candidates appeared to have the time to complete the paper; it was however evident that a large number of candidates were underprepared, with a number of questions being omitted. They performed very well on many questions, but topics such as sampling, similar solids, vectors, algebraic fractions and congruence seemed unfamiliar.

Many candidates presented their work neatly and showed clear steps in their working. Candidates should be encouraged to set out their work in a logical format with sufficient annotation to enable examiners to follow their method. Presentation on the Quality of Written Communication question had improved on the whole, however there were still a large number of candidates whose work was very difficult to follow.

In general, questions requiring explanations were not answered well with many answers lacking the required clarity. It would be beneficial to candidates to practise answering this type of question and to look at mark schemes so that they are aware of the type of answers that examiners are looking for.

Comments on Individual Questions

1 Many candidates reflected the triangle correctly in part (a). Common errors were reflecting the triangle in the line $y = 1$ or reflecting in a line $x = k$, both of which gained partial credit. In part (b) many candidates failed to use the word translation; move, shift, vector and transformation were all offered as alternatives. The correct vector was often seen, although some candidates have difficulty with vector notation and included fraction lines or gave coordinates. Stating 6 right and 4 down was condoned, but correct notation should be encouraged.

2 Nearly all candidates answered ‘positive’ in part (a), often with a qualifier such as ‘weak’, which was not required. In part (b) most candidates drew a correct, ruled line of best fit of acceptable length. A number of responses however had the line of best fit as passing through the origin and these lines were outside the acceptable tolerance. Most candidates read off correctly from their line, although a number of candidates got the axes confused.

3 In part (a)(i) most candidates correctly found the value of p, however the reason was not always stated clearly. ‘Corresponding angles’ was required, however it was common to see vague descriptions involving parallel lines with no mention of corresponding. In part (a)(ii) fewer candidates correctly found the value of q, with answers of 70 not uncommon. The straightforward reason of ‘alternate angles’ was seen less often than would have been expected, with most candidates using reasoning involving several steps such as ‘vertically opposite angles’, ‘angles in a triangle’ and ‘angles on a line’. These reasons involving several steps often gained credit, particularly for those candidates who had written the sizes of the angles on the diagram, which should be encouraged. It should be noted that ‘angles in a circle’ is not an acceptable alternative for ‘angles at a point’. Little working was seen in part (b) and it appeared that many candidates guessed the answer, with answers such as 4, 6 and 8 common. Those who knew the method usually reached the correct answer.

4 Most candidates correctly calculated the required values of *y* in (a), although some candidates made errors with the negative values of *x*, having failed to identify the symmetry of the table. Many were then able to go on to plot a reasonable curve for part (b), although some candidates were still failing to then join the points in the graph after plotting them correctly. In part (c) some good use of the graph with answers in the correct range were seen, however a number of candidates omitted this part after having drawn a correct graph. Some misreading of the negative scale was seen with answers of $^-2.6$ rather than $^-1.4$. It was not uncommon to see answers such as 1, $^-1$ or 2, $^-2$ from candidates who had tried to solve the equation rather than use their graph.

5 Part (a) was very well answered, with most errors coming from the candidates trying to find 300 ÷ 120. In part (b) many candidates identified the correct processes required to solve the problem and showed a complete method, although there were many cases of incorrect arithmetic seen, in particular problems in subtracting £6.90 from £34.50 or in multiplying £27.60 by 6. Some candidates did not read the question clearly and only calculated the cost of one month's membership. Part (c) was found to be much more difficult with a minority of candidates identifying this as a reverse percentage question. By far the most common approach was to find 80% of £48, leading to £38.40. When a reverse percentage approach was used, most candidates reached the correct answer.

6 Most candidates made a good attempt at this QWC question, often showing lots of working, although candidates would benefit from deciding on a strategy before starting their calculations in order to show their method clearer and gain more marks. Many gained 4 marks from showing rounding and a full method to reach a conclusion, often finding the cost of driving as £28, but few candidates set out their rounding and method clearly and succinctly enough to gain the full 5 marks. Candidates should be encouraged to briefly annotate each calculation to indicate what they are doing. Candidates who rounded the cost of petrol from 138.9p to £1 per litre could not get full marks due to the inaccuracy of the answer reached. Some candidates showed some correct calculations, often correctly estimating the number of gallons per week as 4, but then became confused by the conversions required. Poor arithmetic was again seen. Some candidates ignored the requirement to estimate and attempted to calculate with the exact values.

7 Responses to part (a) were very varied. Many candidates concentrated on the fairness of the trials and how the results were used rather than the large number of repeats of the experiment. Explanations also required clarity and simply stating that it was reasonable because there were 200 trials was insufficient; stating that this was a large number of trials was required. Many candidates attempted to use relative frequency in part (b), but they were often let down by poor arithmetic skills; many would have improved their score if they had checked that their numbers of counters totalled 24. Some candidates scored for recognising that the number of yellow and blue counters would be the same even if they did not know how to proceed further.

8 Some candidates correctly identified that the question in part (a) was leading or biased or gave an explanation that implied this. Some gained the mark for stating that there was no box for 'don't know', identifying a minor flaw, but missing the major failing of the question. It was not uncommon for candidates to state that it was a good question because it was closed or easy to answer. There were very many good answers to part (b) with clear questions posed and sufficient answer boxes provided, including an 'other' option. Few candidates gave overlapping categories, such as both 'ball games' and 'team games', and very few posed irrelevant questions. The majority of candidates appeared to be unfamiliar with stratified sampling in part (c) and merely divided 120 by 6. Many of those who knew the technique struggled with the arithmetic and were confused about which numbers to divide. Some started correctly with $\frac{150}{900}$ but could not evaluate it; starting with $\frac{150}{900} \times 120$ and cancelling first would have eased the arithmetic.

9 In part (a) most candidates aimed to collect like terms first, although sign errors were common. The majority could collect the terms in *x* to 4*x*, but less were able to collect the constants to $^-6$. Many candidates were able to score a mark for correctly solving their equation $ax = b$. Trial and improvement methods were generally unsuccessful. Those candidates who attempted factorisation in part (b) usually answered with a full factorisation of the expression. Many candidates found rearranging the formula involving a square root difficult in part (c) and did not know how to begin. Common errors included subtracting 4π rather than dividing by it, squaring rather than square rooting their expression and not applying a square root to the whole expression.

10 In part (a)(i) the majority of candidates were able to plot an accurate cumulative frequency curve. Common errors included drawing a bar chart, plotting at mid-interval points or not joining the plots. A few candidates misread the vertical scale and plotted the points at the wrong height, although the point (40, 45) was also occasionally misplaced. Medians were often within the acceptable range for part (a)(ii), although some readings of the cumulative frequency from the time of 60 minutes were seen. Fewer candidates could find the interquartile range for part (a)(iii) than the median, with some confusion again seen about where readings should be taken.

In part (b) many candidates struggled to express themselves clearly, usually because they were trying to give too much detail rather than give a simple summary statement. When asked to find a median and an interquartile range and then to compare two distributions there should be one comment about the average and one about the spread of data and there should always be some reference to the context. Many tried to compare just lower or upper quartiles or talked about 'more staff' or 'less students'; grouped data gives no idea about the actual numbers of students. In this question, where the range of staff times is higher, but the interquartile range of staff times was lower, it is also important to make it clear which is being compared. It would help if candidates were encouraged to use the phrase 'on average' to preface the comparison of median times.

11 It was clear that the majority of candidates were unfamiliar with the topic of similar solids. The majority did not interpret 'similar' as meaning 'geometrically similar' and their comments related to the height having nothing to do with the base area. Some identified that the area factor rather than the scale factor was required, but struggled to give a clear explanation. In part (b) the majority of the candidates failed to use the hint from (a) and halved the given volume to reach 240cm^3. Very few correct answers were seen.

12 In part (a) many candidates started with a factor tree, although a number failed to reach the correct factors, often due to losing or gaining a factor of 10 at some point. Following a correct factor tree, most candidates then managed to give their answers in the correct form. Some attempts at trial and improvement with different values of p, q and r were seen, but these were usually unsuccessful. In part (b), many of the candidates who got the correct answer showed no working; other candidates gave 24 or 36 with some other multiple of 12. Some lists of multiples of 12 were seen, but fewer factorisations of 12 and 72. It was clear that some candidates did not know what lowest common multiple or highest common factor meant.

13 Many candidates reached an answer of 140 – a multiple of π. Common errors were to subtract the area of a circle rather than a semicircle, to find the circumference of a circle or semicircle, or to fail to fully simplify '$\pi \times 6^2 \div 2$'. Very few candidates tried to substitute a value for π.

14 Candidates did not perform as well as might have been expected on this question. Some candidates correctly stated all six pairs of coordinates, some having indicated the correct region or points on the grid. Others made the expected error of including one of the boundary lines in their region. Candidates who started off by drawing the lines on the grid generally did better than those who just identified points, but significant numbers were unable to draw the line $x + y = 7$ and instead drew $x = 7$ and $y = 7$ and then listed large numbers of incorrect pairs of coordinates.

15 Many candidates appeared unfamiliar with vectors. In part (a) those that had some understanding were usually correct in part (i), but had more difficulty in part (ii), often because they added NC, rather than CN, to AC. In part (b), candidates could guess that the quadrilateral was a trapezium and gain some credit; those who showed some working often were credited for attempting to find vector MN. Very few completely justified their answer by stating that MN was parallel to AC to gain full credit.

16 In part (a) some candidates gained credit for partial simplification, usually reaching $\left(9^6\right)^{\frac{1}{3}}$, however they often did not know how to continue. Some candidates left their final answer as 9^2; when the question asks for an evaluation, a final answer of 81 is required. It was clear in part (b) that many candidates had met recurring decimals and had some idea of the required method. Some clearly misunderstood the notation and used 0.343434… Many assumed that the answer would be $\frac{34}{99}$ with no further work.

17 In part (a) many candidates had no idea how to solve an equation involving fractions and tried to collect terms in the numerators and denominators or to solve using trial and improvement. Those who did try to eliminate the fractions first often only multiplied one side of the equation by 12. When expanding the brackets, the + 6 often became – 6 because candidates failed to multiply negative by negative correctly. Once the equation was simplified, many did solve their $ax = b$ correctly. Part (b) was reasonably well answered by candidates who had experience with algebraic fractions, although the unsimplified answer of $\frac{14}{6a}$ was common. The few candidates who knew how to approach part (c) generally factorised both expressions correctly and reached the correct final answer. Other candidates either made no attempt or cancelled individual terms, such as x^2, to try to simplify the expression and gained no credit.

18 In part (a) many candidates identified the right angle at A and calculated the angle correctly. A common error was 71° from the assumption that AOT was an isosceles triangle. Of the candidates that attempted part (b), few had any idea of the rigid proof that was required to establish that AT and BT were equal. Many started from the statement that tangents from the same point are equal in length that was required to be proved. Although many knew that the tangent was perpendicular to the radius so $\angle$TAO and $\angle$TBO = 90° they struggled to express this clearly. Candidates should also be made aware of the need to state obvious facts, such as that the radii AO and BO are equal and that OT is a common side. Very few stated RHS; those who used congruency conditions often used SAS.

19 In many cases those candidates who knew what was required reached a fully correct solution. Some candidates reached $x^2 - 6x - 16 = 0$, but attempted to solve it using the formula without success, rather than by using factorisation. Some correctly evaluated the y values by substituting their incorrect x values into $y = 2x + 5$. Candidates who had not met simultaneous equations of this form often tried to eliminate the x term as they would in a pair of linear simultaneous equations, but could make no progress.

J567/04 Paper 4 (Higher tier)

General Comments

It quickly became apparent from marking this paper that a good number of students were not completely prepared for this exam. The proportion failing to attempt some questions was very high, indicating that it was unlikely candidates had completed the full course.

Many candidates failed to show enough working; when it was evident, it was often untidy and disorganised and this was frequently the case in question 9, this paper's QWC question, where the clarity of how the method is communicated was assessed. Generally the organisation of candidates' answers needs improvement; it is good practice to get candidates to mark each other's class work so they can see the problems this can cause first hand.

Many candidates acted on their expectations rather than taking time to consider what was being asked in each question. Too many tried to use Pythagoras' theorem when it was inappropriate and in question 12, when it was expected to be used, most failed to use it.

Calculators were used carelessly and too many errors in straightforward calculations were seen; few use an estimate or try to do a calculation twice. The hierarchy of operations is ignored and complex calculations were entered into calculators as they were written, or even without the necessary brackets. It was a surprise also that many could not convert percentages to decimals and back (Q14a and Q17b).

Comments on Individual Questions

1 The stem and leaf diagrams were usually well completed. There were some unordered diagrams and also some where there were a few omissions, usually the repeated digits. In part (b) few were able to find the median height correctly.

2 It was surprising that many were not able to find the area of a triangle correctly. The errors included forgetting to divide 87 x 164 by 2 or dividing by 2 twice. A few simply added 87 and 164 and some used Pythagoras' theorem. Some tried to use ½*ab* sin*C*, which is given to them on the examination paper, but were often unsuccessful. In part (b) most used the formula for the trapezium, often with success. Some worked out ½(14.8 + 20.4), but then forgot to multiply the result by 16, while a few forgot to divide (14.8 + 20.4) by 2 and multiplied the sum by 16, giving double the correct answer. Another method used was to split the shape into a rectangle and two triangles, either using a large rectangle (20.4 x 16) and subtracting the triangles, or a smaller rectangle (14.8 x16) and adding on the two triangles. This was occasionally done correctly, but candidates did divide (20.4 - 14.8) x 16 by 2 and the wrong answers 326.4 or 236.8 were obtained. Weak use of calculators was seen, with ½ x 14.8 + 20.4 = 27.8 caused by incorrectly writing down the formula.

3 Part (a) was well answered by candidates; 6 or n + 6 were the most common wrong answers. Part (b) was usually correct; candidates who had not obtained the correct nth term expression in (a) were able to work out the 20^{th} term of the sequence by continuing the pattern.

4 This was correctly answered by roughly half of the candidates, usually with working that led satisfactorily to the answer 3. The most common error was to misread the question and assume that the mixture contained 6 litres of antifreeze, which led to the frequent wrong answer of 12 from 6 : 18 and then 18 – 6. Some started off correctly with 6/4 = 1.5, but then did not know the next stage and gave the answer as 1.5.

5 Few candidates completed this question, although only a small number made no attempt at all. The scale of 1cm represents 400m was used accurately in drawing a line 800m parallel to each side of the canal. Most of the lines parallel to the canal were drawn full length; some candidates drew an inaccurate partial line that did not remain parallel when extended. The length of the line for the 2000m long runway was calculated accurately. Some candidates realised that there were two regions, either side of the canal and near to the line AB. In the lower region some candidates seemed to realise that if they drew a line East-West (90° to the page) and then manoeuvred their ruler to touch side AB and their canal line, they had a position for the runway. The upper region was not used as frequently by candidates, but it gave more choice for the runway position.

The construction for the bisector of angle BAD was rarely attempted, but those who did were largely successful. A small number of candidates attempted this line without a pair of compasses, with varying success. Some candidates chose to bisect a side AB or AD, suggesting that they did not understand this part of the question.

6 This question on the rules of indices was well answered by the majority of candidates. Some misread the instructions and worked out the numerical value of the expression for part (a) instead of the index x. A small number of candidates throughout the question wrote down the number or letter to the power of x, even though the answer lines each stated 'x ='. Frequently given incorrect answers were a^4 for part (b) and p^7 in part (c).

7 This question was answered very well by the majority of candidates, using a variety of methods. Some gave the correct answer, but with no working and so risked not gaining method marks; interim answers should be given even though many candidates do all the work on their calculator. Candidates must avoid attempting the calculation as it is written and they should use the hierarchy of operations where appropriate. Rounding answers to 2 decimal places was carried out successfully by most candidates.

8 Many answered part (a) correctly, although there were a number of calculation errors when a calculator was not used. In part (b) many tried to find the midpoint of the 'classes', or added up the frequency and divided that sum by 5. Almost all answered part (c)(i) correctly. In part (c)(ii) some answered CD rather than EF. Few answered part (d) correctly, the usual approach being to calculate 880 – 840 to get 40 and then to apply an interval on 40, giving answers of 40.5 or 45.

9 This was the QWC question and there is a demand that candidates show clearly how they reached their solution, but many did not show important steps in their calculations. Most candidates were able to find the area of one sheet, although there was a significant number who did not write down the calculation. Some candidates chose to write the results of their calculations at each step, but were not explicit in writing down the calculation itself, rather using words to state which quantity they were evaluating. Some candidates clearly laid out working or descriptions so that their intentions were clear, but in many cases there were workings scattered across the space with little indication of an ordered approach. Many candidates got in a muddle and re-used values (commonly 80 or 500).

The conversion of mm^2 to m^2 was poorly attempted. Those who were successful managed it by using metres for the lengths, 0.210 and 0.297, or by converting first to centimetres, calculating the area and then converting to m^2. Few made the correct use of division by 1 000 000 to convert mm^2 to m^2.

The conversion from g to kg was done well, usually as the final or penultimate step. The mass was seen fairly frequently as 60 000g; 0.08kg per m^2 was used infrequently and was used mainly by higher scoring candidates. In many cases the units were unclear or absent.

The most frequent errors were wrong unit conversion in an otherwise sensible approach, or failing to make use of the 500. The use of density seemed to pose a problem for a lot of candidates; some seemed to know that there was a division involved, but could only guess as to what went in that division.

10 The best answers usually used trigonometry, commonly tan to find the angles of elevation or to find the scale factors 5.2 and 5.5. Some attempted to find the equivalent sides to 66 or 12 and these were usually successful; those who tried to calculate the equivalents for 100 or 520 were confronted with a more difficult analysis of their results. Some candidates attempted to use Pythagoras' theorem, which was of little use in this question.

11 Part (a) was well answered. Little working was seen, with most candidates giving the answers directly. Part (b) was answered extremely well and there were very few attempts failing to score both marks. Some single points were seen now and again, but usually only where candidates had made errors in (a) and were unable to connect points with a straight line. Almost all lines were ruled and points accurately plotted. The point most frequently plotted in the wrong place was (3, 12), which was plotted at (2.5, 12) in some cases. In part (c) a surprising number used algebraic or other methods to reach the answer of 2, despite being told to use the graph. Few made any marks on the graph, as the reading was simple. There seemed to be no errors in reading the scale of the graph, but some gave the value of *y*, 10, or, very rarely, both values in a coordinate form.

12 In this question candidates were expected to use the rules for calculating the midpoint and length of a line, however few seemed to have learned how to do this. The common answer for part (a) was (5, 8), with no working shown, or from subtraction. Many drew a triangle, with or without gridlines and attempted to manually find the mid-point. In part (b) many reached 5 and 8, but did not show it on a triangle. There were some attempts at Pythagoras' theorem using the wrong numbers for their sides. Very few answers showed clear enough working to enable their method to be followed.

13 Part (a)(i) was answered well. Frequent incorrect answers were 18, or 6 from 12 – 6. In part (a)(ii) most candidates gave either $^{-}45$ or 225, in both cases applying the hierarchy of operations incorrectly. The main problem in part (b) was that many added 11 and 3, or if they attempted to subtract 3 from 11 often gave the wrong result. In part (c) a common error was to add the 5 before multiplying by 2.

14 Many candidates used a long method for the calculation in part (a) and some premature rounding was seen leading to slightly inaccurate answers. Far too many candidates calculated simple interest. Other incorrect methods seen included those who used a multiplier of $(1{\cdot}24)^4$ and not $(1{\cdot}024)^4$ or just multiplied 16800 by $(2{\cdot}4)^2$, along with methods adding 16800 ÷ 2·4 to 16800 and also 16800 + 4(16800 ÷ 2·4). Working was often difficult to follow. In part (b) many candidates did not use a calculator to answer this question as intended and struggled with the calculation.

15 Part (a) was attempted well, (x – 10)(x + 3) being the most common incorrect factorisation. Part (b)(i) was answered better than part (a) and many gave the correct answer, however in part (b)(ii) they did not add the 2x first and those they did often did not use the hint in part (b)(i) to factorise. In part (c) many candidates appeared unaware of how to solve the simultaneous equations, a topic usually answered well. The common method was elimination, but many tried to guess the answer.

16 In part (a) most candidates gave the $\frac{4}{10}$ on the first branch, but then treated the problem as one involving replacement and wrote the same probabilities on the second branches. In (b) they could recover to score all three marks and many were able to do so. Incorrect responses here usually only considered one branch, or involved adding the probabilities instead of multiplying them.

17 Part (a) was answered well, but part (b) was not answered well by most, seemingly through a problem in converting the decimal into a percentage due to the fact that the percentage was a small value. Part (c) was answered well, though some were out by 1 year, giving the answer of 2016. There was a lack of method and many showed only one trial.

18 This question was answered very poorly, suggesting many candidates had not been prepared for this topic. There were many blank responses and those that responded showed very little method and little understanding of how to calculate a moving average.

19 Some candidates answered this very well, but most did not know how to find the values of a and b. Part (b) followed on from part (a) and few could answer correctly, as they had not complete part (a) successfully. The most common incorrect answer was 2.

20 Few candidates appeared to be prepared for this topic. The most common answers were 5 for part (a) and $^-1$ for part (b), gaining one mark. Many candidates left this question blank.

21 Few candidates were able to answer part (a), suggesting that they had not studied this topic, even though one answer could be been obtained by using the inverse sine key on a calculator. Some knew that the two solutions were supplementary. There were a number of ways of solving part (b) and the easiest was to take the large right-angled triangle and use tan to find angle BAC, then to subtract 12 to find the required angle. Another correct approach was to find AB using Pythagoras' theorem, then to use tan in the smaller right-angled triangle. Those who used the sine rule in triangle ACD to find angle ADC however ran into the problem that the answer had to be an obtuse angle and they usually gave the acute answer; had they filled in the angles on the diagram they would have seen that the angle AD could not be acute.

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