Oxford Cambridge and RSA

GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres June 2014

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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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J567/01 Paper 1 (Foundation tier)

General Comments

The large majority of candidates had been entered at an appropriate level. The number of instances where no response was offered was at a reasonably low level and it was clear that students are being advised to attempt all questions.

It is also clear that centres are encouraging students to consider their responses carefully and ensure that answers are accompanied by appropriate working. Candidates should be encouraged to write clearly and legibly, care needs to be taken when plotting points and avoid using thick blunt pencils. Candidates should be encouraged to cross out incorrect answers rather than overwriting figures.

Several students appeared to struggle with basic numerical calculations, a simple check may help them. Candidates should take care to read the questions carefully, as for example some candidates did not always give the answer in its simplest form when the question clearly stated to do so. Several candidates are unable to correctly carry out division.

The question that required candidates to show good quality written communication was generally answered effectively, it was apparent that candidates were able to identify this question and most showed some understanding of the need to explain each step in the process leading to the final solution.

Centres appear to be addressing many of the issues relating to method of approach, working and presentation to good effect.

Comments on Individual Questions:

Question No. 1

Many candidates scored full marks on this question but it is apparent a significant number are not familiar with everyday contexts, in (a) the weight of an apple was often 19 kg and in (b) the length of a car 45 m or 4.5 km. It was pleasing that most candidates knew which measurements were length, and weight.

Question No. 2

The majority of candidates scored both marks. If anything was incorrect it was usually the bottom right vertex extending too far to the right.

Question No. 3

In part (a) most candidates scored a minimum of 1 mark. A significant number did not read the question correctly and showed no regard for the position of "E". Those candidates scoring both marks tended to list systematically, this method does need to be reinforced to candidates. The candidates who did not list systematically often repeated at least one line, (often the given one). Part (b)(i) was generally well answered, (b)(ii) was less well done as many candidates did not appear to understand significant figures. Common incorrect answers were 78 000, 78 or 79.

Question No. 4

Part (a)(i) was usually correct. (a)(ii) Often correct but 470 and 47 000 were common incorrect answers. Most candidates attempted part (a)(iii) with varying degrees of success, with many failing to put the carry figure in front of the 6, some thought 4 went into 9 once so carried over 5. It was disappointing to see some candidates giving answers with remainders. In (a)(iv) there often was a lack of strategy to handle the arithmetic, many tried to find 1% first, when finding 10% would have been better. Working was often incomplete with correct amounts shown for 10% and 5% but no attempt made to add them. Part (b) had several candidates not reading the question carefully and giving their answer in an incorrect form. In (b)(i) most candidates who gave a fraction scored the mark, 0.75 and 7/5 were frequently seen. (b)(ii) was less well answered, very few candidates attempted to divide 3 by 5. Some moved to 6/10 but were still unable to carry out the division. 3.5 and 0.35 were common incorrect responses.

Question No. 5

This question was generally well answered. In (a)(ii) a small number of candidates did not give a quantity and a direction stating for example " I found the difference" . Part (b) was equally well answered.

Question No. 6

Many candidates scored at least 1 mark. The errors were due to a lack of understanding of place value, e.g. 4.2 was often placed before 4.02. The most successful candidates were adding zeros to 4.2 and 4.02 to give all the values the same number of decimal places.

Question No. 7

This question was generally done well with few errors in parts (a) and (b). In part (c) most candidates appeared to understand what a linear scale was but some marked the spaces not the lines. The majority of candidates who scored 3 marks had used the linear scale best suited to the space provided, increments of 2, those who used increments of 3 or 5 found it difficult to accurately mark the heights of the bars. Candidates should be encouraged to use a ruler.

Question No. 8

Part (a)(i) and (ii) were generally well answered, a small minority reversed the coordinates. In (a)(ii) many were able to give the name of the triangle they had drawn, candidates need to learn to spell the word *isosceles*. (b) The majority of candidates were able to draw a radius, there were a few diameters and a smaller number of chords drawn.

Question No. 9

The parts of this algebra question were answered with varying degrees of success. In (a)(i) the answer was mainly correct, the most common error was incomplete processing and giving the answer as $5a - 2a$. (a)(ii) Most candidates scored 1 mark for $5c$, but could not correctly deal with "d", common incorrect answers were, $5c + 3d$, $5c - 3d$, $c + 3d$ and $5c + 7d$. In (iii) many correct answers were seen, with the common errors being $8b$ or b^{15}. (b)(i) was generally well answered, it was pleasing to see very few embedded answers. (b)(ii) was less well done, several candidates got as far as $9 = 6x$. Several candidates then went on to give the correct answer whilst others divided by 9, again division proved a problem for several candidates. Part (c) was less well done with many failing to state P = … A Common incorrect answers was h^6.

Question No.10

Part (a) was the QWC question which required candidates to show their working, which the majority did in a clear way. It is clear that candidates need more practice at these type of questions as many only compared 2 methods to buy tickets. Some candidates did not score as their combinations did not always include 8 tickets. The arithmetic was generally good, but errors did occur when carrying numbers. Part (b)(i) was generally well answered, common incorrect answers were 57 and 2 – 57, in (b)(ii) many candidates were correctly able to identify the median although some left the answer as 23, 31. A small number did not order the list and used 44 and 57 as the middle values, others wrote down the gap 8. Very few candidates attempted to calculate the mean. Place value again caused problems in (c) with 6.4 being a common answer. Several candidates confused area and perimeter in part (d), In (d)(i) many did give the correct answer of 36 but a surprising number wrote 11 + 11 + 7 + 7 and failed to add the numbers correctly, while others only added 2 sides. In (d)(ii) many had either omitted the units or used m or cm^2. Part (e) was generally well answered with 9 being the most common incorrect answer. Several candidates scored the mark in (f) although 4.45 and 1645 were common incorrect answers.

Question No.11

Some candidates were able to select a suitable method and gain all 4 marks. Others had selected a correct method but were let down by poor arithmetic and the conversion between metric units. Some candidates had found for example the number of boxes which could be fitted in each dimension as 10, 5 and 8 but then added them to give 23 rather than multiplying them.

Question No.12

Candidates who gave a numerical probability throughout the question usually gained all 3 marks. Some candidates still give probability in an incorrect form and some used words. In (b) some gave two separate probabilities rather than combining them, in (c) impossible was a common answer.

Question No.13

In (a) many candidates failed to read this question carefully, answers of 9/12 were common as cancelling the fraction was omitted. Many others gave the unshaded fraction. In (b) it was disappointing that many failed to show working leading towards a common denominator, but just added the 2 numbers giving an answer of 4/10. In (c) clearly several candidates did not understand the term mixed number, with 23.6 or 6/23 being common incorrect answers. In (d) there was again a lack of understanding with 15/8 often seen. Part (e) also caused problems for some candidates, many added rather than subtracted but scored 2 marks for the 13/30. Some realised that they needed a common denominator of 30. Problems were encountered by many candidates in achieving the correct numerator, often having difficulty multiplying 18 by 6.

Question No. 14

There were many correct answers and some gave 12 or even 12:48 as the final answer. The most common incorrect method was to divide 60 by 4 and giving 15 or 45 as the answer, although the division again caused problems for some candidates.

Question No. 15

Many candidates made a good attempt at this question, and several scored 1 mark. Common errors were not to have the vertices on the circumference of the circle, and not knowing that an octagon has 8 sides. Some marked the circumference, but failed to join up their points.

Question No. 16

The plotting of the points was, in most cases done accurately, the main problems were (2.20, 21) and (1.88, 40) where the scale did seem to confuse some. Some were difficult to judge given the thickness of the pencil. In (b) most did give the correct response, the most common incorrect responses were 'positive' and 'no correlation' while others described the relationship rather than the correlation. The line of best fit was usually ruled and within tolerance, although some did go outside the right-most limits. A small minority joined up the points. In part (d) most gave the correct answer and in (e) some misread the number sold from their line of best fit and a few gave that number rather than doubling their reading, in doing so some made further numerical errors.

Question No. 17

This question was not designed for trial and improvement so those who used that method were not usually successful. They also did not make clear what their input and output numbers were, generally the work was a mass of numbers. Many failed to use algebra and write the correct expressions in the two blank cells and then form and solve an equation.

Question No. 18

This question was poorly done, many did not draw a circle centred on C, several of those who did failed to draw the arc long enough, fewer understood that the constraint "nearer to AB than AD" meant they had to bisect the angle at A, several candidates did not attempt this question although some drew a random shed inside the shape.

Question No. 19

Most candidates did complete the table correctly in (a) and plotted the points accurately in (b). However several did not join the points. Some candidates did not score the mark in (a) but were able to correctly plot their points, again a small number made this difficult for the examiners due to using a blunt pencil.

Question No. 20

Some candidates realised what was required and scored 4 marks. Many did successfully work out the distance to be travelled on the motorway as 124 miles, (although some did get the subtraction wrong). The main problem was working out the time spent on the motorway, this meant dividing 60 by 40 and many wrote 1 (h) 20 (min) rather than 1.5 (h) so most did not get the time on the motorway as 2 hours. They were usually left with 124 divided by 2(h) 10 (min) which was more difficult than intended. Some then simply divided the 124 by 3.5.

J567/02 Paper 2 (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. There were few really low marks and few really high marks suggesting that candidates had generally been entered at an appropriate level of entry.

Most papers are well presented by the candidates. However there have been several cases where work is barely legible and difficult to mark. Candidates who write over previous responses are particularly problematic. If candidates make an error it is recommended that they clearly cross this out and rewrite their answer.

The majority of candidates are aware that it is in their interest to show their working and consequently, if their answer is incorrect, can still gain marks from showing a correct method or a solution that is partially correct. Inevitably there are candidates who could have gained further marks but failed to do so as there was no evidence of how they had obtained their result.

The perennial advice of reading the question carefully is still as pertinent today as it ever was. Some candidates had clearly not fully read the question or taken enough time to fully understand the problem and consequently did not offer a solution to the problem that was asked. Candidates must also consider the reasonableness of their answer, for instance in Question 20(c) candidates were asked to estimate the number of times a 3 would be scored if the spinner was spun 500 times and there were many answers that were greater than 500.

On the questions involving percentages many candidates used an approach that may be more suitable for use without a calculator. For instance when finding 15% of a quantity they found 10%, 5% and then added. This is a perfectly valid approach and candidates are given full credit for this with method marks, but it is more prone to error than simply multiplying by 0.15 or equivalent.

Generally candidates do not always use their calculators effectively.

Comments on Individual Questions:

Question No1(a)
Nearly all candidates were able to identify the coldest day.

Question No.1(b)
Nearly all candidates were able to put the directed numbers in order of size.

Question No.1(c)
Most candidates found the change in temperature correctly.
A few miscounted and gave an answer of 7° or 9°.

Question No.2(a)
Many candidates could not identify the quadrilateral containing a reflex angle.

Question No.2(b)
A majority of candidates identified the kite as the quadrilateral having one line of symmetry.

Question No.2(c)
The two parallelograms were identified by most candidates.

Question No.2(d)
Many candidates failed to find the trapezium that also contained a right angle.
Some gave quadrilateral G, the other quadrilateral containing a right angle, as an answer
This suggests that many candidates were unsure as to how to identify the trapezium.

Question No.2(e)
Congruency was not understood by most candidates. Some candidates gave the two parallelograms as an answer.

Question No.3(a)
Most candidates were able to extract information from a time table and found the correct number of trains.

Question No.3(b)(i)
Most candidates were able to specify the correct time at which the train should arrive.

Question No.3(b)(ii)
The principle of finding a time interval was generally well understood and many gave the correct answer of 64 minutes.

Some candidates just subtracted 1318 from 1422 and gave an answer of 104 minutes.
1.04 was another occasional incorrect answer.

Question No.3(c)
The arithmetic was more complex in this part of the question and, although there were many correct answers, more errors were made finding this time interval.
2 hours 57 minutes was a common incorrect answer.

Question No.3(d)
Most candidates were able to solve the straightforward problem of finding which train to catch.

Some gave an answer of 13 50, the time this train arrived in Tinborough, rather than 13 05 the time the train left Ellerbridge.

Question No.4(a)(i)
Multiples were well understood with nearly all candidates giving a correct answer.

Question No.4(a)(ii)
Candidates were aware of the definition of square numbers.

Some developed a pattern of finding 2 × 2, 3× 3 etc and most were able to give a correct answer.

A common error was to give an answer of 20 rather than 25.

Question No.4(a)(iii)
Cube numbers were less well understood although there were still many candidates who found the correct answer.

Question No.4(a)(iv)
Although there were quite a few correct answers, there were some candidates who did not understand the definition of prime numbers and gave an even number as an answer.

Others gave an answer of 21 or 27 rather than 23, suggesting that they did have some idea but were unable to find the appropriate factors of these numbers.

Question No.4(b)
Common factors were well understood with most candidates giving a correct answer.

Question No.5(a)(i)
Most candidates gave the correct answer.
A small number failed to answer this question.

Question No.5(a)(ii)
It was very pleasing to see that most candidates were able to compute this percentage problem correctly. A variety of methods were used successfully.

Those who used a 'non calculator' method of finding 10%, 60% and 5% and adding, or equivalent, were more likely to make errors in their calculations.

Those who calculated 0.65 × 420 inevitably found the correct answer.

Question No.5(b)
This proportion type question in the context of percentages was a little unusual, but many candidates had the problem solving skills needed to find a correct answer.

Of those who made errors in their approach many used the 420 parents from the other school in part (a), which was not relevant to this problem.

Question No.6(a)(i)
Many candidates correctly identified the solid as a sphere.

A significant number gave an answer of circle, presumably missing the word solid, which was highlighted in bold print.

Question No.6(a)(ii)
Nearly all candidates identified the cylinder correctly.

Question No.6(b)
Many candidates did not appreciate what was required to complete the net of the cuboid.
Some just drew a 1 by 4 rectangle to create the net of an open box, others just drew a reflection of the given diagram.

A small number just drew a 4 by 4 square without the 'fold' line, for which they were given some credit.

Question No.7, (QWC Question)
Most candidates attempted this question and nearly always scored some marks.

Some candidates are confused as to the difference between area and perimeter and this caused difficulties for many. They need to have a clear understanding of which process leads to each definition and the appropriate units that are associated with each.

Marks were usually obtained for drawing one or two rectangles of area 18 cm^2.

Some went on to find perimeters, but their methods were not always easy to follow.

As always in QWC questions, candidates need to present their work clearly and coherently, using units where appropriate.

Question No.8(a)
All candidates knew how to draw the next pattern in the sequence.

A small number were not careful enough in their drawing and put in extra circles.

Question No.8(b)
Completing the sequence in the table was correctly answered by nearly all candidates.

Question No.8(c)
Those who continued the sequence for another five terms up to ten squares nearly always found the correct answer of 26 circles.

A sizeable minority just doubled the number of circles for five squares and gave an answer of 32 circles, not understanding that this would be an incorrect method in this type of sequence.

Question No.8(d)(i)
A fair number of candidates saw how the rule related to the sequence and gave a correct answer of +6. A common incorrect answer was +2.

Question No.8(d)(ii)
There was a good number of correct answer for candidates successfully following through from their answer in part (d)(i).

Question No.9(a)
Most candidates used the formula correctly to find the gas mark.

Some candidates did not know how to use their calculator appropriately for this type of calculation and gave an incorrect answer of 196… for which they were given some credit.

Question No.9(b)
A majority of candidates successfully used a reverse process through the flow chart to convert the temperature to °Celsius.

Question No.9(c)
It was pleasing to see that many candidates could identify the correct algebraic formula to represent the rule.

Question No.10(a)
Most candidates could use the graph to convert pounds into dollars.

Some were not careful enough reading off a value and gave an answer of 46 for which they were not awarded the mark.

Question No.10(b)
This was a more straightforward conversion, which candidates found easier, with many correct answers given. There were a small number of incorrect answers of 41.

Question No.10(c)
There were many good attempts at this, with many candidates gaining both marks. Some were inaccurate reading off the graph which led to an answer outside the acceptable range.

Question No.11
Only a very small number of candidates gained two or three marks on this question.

Some realised what was required but failed to take into account that the length of two sides on the diagram were missing and they had to work out what these were, so an answer of $9x + y$ was quite common for which they gained one mark.

Others became confused as to how to proceed and xy instead of $x + y$ was sometimes seen.

Question No.12(a)(i)
Nearly all candidates identified the correct compass direction

Question No.12(a)(ii)
The majority of candidates could use the scale drawing to work out the real distance.

There were some answers of 30.5 with no other working. This has probably come from miscalculating 6.5 × 5; if this intermediate stage had been written down the candidate would have scored a method mark.

Question No.12(b)
Only a small number of candidates could give the correct answer.

A common incorrect answer was (0)20°.

Question No.12(c)
The lack of understanding of bearings was again prevalent here. Most were able to draw a course of the right length but few gave the correct direction.

Question No.13
This question was generally answered poorly.

A common erroneous approach was to find 3/8 of 96 and 1/8 of 96 and then add these to 96, or some equivalent process, giving an answer of 144.

Those candidates who did add the fractions, for which they were given some credit, often did not know what to do with the result and answers of 96.5 were seen.

There were some good full solutions showing a good understanding of how to solve this problem.

Question No.14
There were some good attempts at solving this problem, with a significant number of correct solutions. Many understood that there needed to be at least two eights and that the smallest number was 2, but failed to realise that the sum of the five numbers was 35.

Question No.15
Most candidates understand the principle of a pie chart and only a few used the raw data as angles giving a circle with only a quarter shaded in, for which no credit was given. Some of the angles were not accurate but most, of course, realised that there needed to be an angle of 180° for education. Labelling was generally good. There were lots of fully correct solutions appropriately presented.

Some sectors were drawn freehand, rather than with a ruler. Candidates must realise that appearance and accuracy are important when presenting data.

Question No.16(a)
Many candidates gave the correct answer.

A common error was to give an answer of 8/4, a few gave a ratio as an answer which is not appropriate for a probability. A small number did not realise that a numerical answer was required and gave an answer of likely.

Question No.16(b)
A majority of candidates realised that box C with 5 red and 2 yellow would have a probability of 5/7 of taking a red counter. A common error was to choose box D which had 5 red and 7 yellows, with candidates clearly not thinking this through.

Question No.16(c)(d)
Generally only candidates who scored well elsewhere on the paper found the correct boxes in these two parts of the question.

Question No.17(a)
Translations were not understood by most candidates. Many positioned their triangle with a vertex at (6,-1) rather than moving the triangle 6 across and 1 down.

Question No.17(b)
Few candidates gave a correct reflection.
Some reflected their triangle in the *y* axis rather than the line $y = 4$.
A small number reflected triangle **A** rather than triangle **T,** for which they were given some credit.

Question No.18(a)
Many candidates clearly did not know the formula for the area of a triangle, with some just multiplying the base by the height and a few adding them.

There were some correct answers with a full correct method shown.

Question No.18(b)
Again, although the formula for the area of a trapezium is given in the formulae sheet, many did not use this and just combined the three given lengths in a variety of ways.

A small number gained a method mark for substituting the lengths into the formula correctly, but were unable to compute this to gain the second mark.

Question No.19(a)
Many calculated the expression successfully, gaining 1 mark, but then failed to round to three significant figures correctly.

Question No.19(b)(i)
There were few correct answers, many explanations were not complete. For instance saying there are 60 minutes in an hour did not score as there was not enough to explain why that made the answer wrong. Other candidates stated 2.25 hours was 2 and a quarter hours which was again incomplete as they needed to go on to say that this is 2 hours 15 minutes, which would imply not 2 hours 25 minutes.

A small number of candidates thought that the two sentences were the same.

Question No.19(b)(ii)
Again there were few fully correct explanations. For instance just saying that the answer should be bigger does not give enough detail.

Some candidates worked out the correct answer and used this for comparison, which clearly did not gain the mark.

Question No.20(a)
Relative frequency was not understood by most candidates.

Nearly all gave an answer of a number greater than one, from either adding, multiplying or dividing the number of spins by the number of 3s.

Question No.20(b)
Most candidates did not appreciate that the most number of spins would give the best estimate.

Question No.20(c)
Although candidates rarely scored in part (a), some candidates were able to use the values in the table to come up with a sensible estimate within the acceptable range.

Question No.20(d)
Many candidates thought that the spinner was fair.

For those who correctly thought that the spinner was biased, explanations were either incorrect or incomplete. For instance many candidates thought it was not fair because there were different numbers of odd and even numbers on the spinner.

Question No.21(a)
Although this was a standard question for finding the mean from a group frequency table, few candidates obtained a correct answer.

Many just divided 30 by 6, the total frequency by the different number of times late.

Others attempted to find the total number of times late correctly but then divided by 6.

There were other confused solutions involving attempts to find mid intervals or by using cumulative frequency in some way.

Question No.21(b)
For those candidates who had some idea as how to proceed there were some good attempts at this question. Of these most found 15% of the number of sessions, usually correctly. Having found these values, some misinterpreted the question and gave an answer of Summer rather than Autumn or Spring.

There were a few fully correct solutions with appropriate working to support them.

Question No.22(a)(i)
There were a reasonable number of candidates who could substitute numbers into the expression to generate terms of the sequence correctly.

Question No.22(a)(ii)
Of those who generated a correct sequence in part (a) many gave a good reason as to why 96 could not be part of the sequence.

Question No.22(b)
Many candidates found the common difference of 7, but then did not know what to do with it; consequently $n - 7$ and $23n$ -7 were common incorrect answers.

Others realised that $7n$ would be part of the expression and scored 1 mark, but were then unable to go on to find a correct solution.

Question No.23
Hardly any candidates were able to gain full marks from a correct answer with a fully worked solution with appropriate reasons.

Some found some correct angles for which they gained some credit.

The notation ‘angle BCD’ was not understood by all and some gave an incorrect answer even though the angles they had found on the diagram were correct.

Treating triangle ABD as equilateral was a common error.

Most candidates who made a fair attempt at this gave some correct reasons, for which they gained some credit, but were unable to find the appropriate reasons to tie in with the steps of their solution correctly.

J567/03 Paper 3 (Higher tier)

General Comments:

This paper does test a candidate's ability to perform the four operations on decimals and fractions, including questions set in context. Their performance in this paper shows that many cannot do this with any degree of confidence. Two of these questions were designed to test the use of algebra to solve problems and most candidates chose to use trial and improvement instead. This method does have a correct structure and most of those who used it ignored this. The result was a mass of figures and it was difficult to see the values that were being tried out and the results of these trials. These are essential for credit to be awarded. However candidates should not be reluctant to use algebra because it usually delivers the correct result very easily. The equations which needed solving were considered to be quite simple at this level.

Some questions required answers to be given in a certain form, for example 'in its simplest form' in questions 16(a) and (c) and 19, 'in standard form, in question 12(b), 'in vector form' in question 18(a) and as coordinates in 18(b) as well as questions 9, 13, 14(d), 17(b) and 21 where the level of accuracy was determined by the absence of calculators. So in question 17 it was sensible to use fractions as the decimal equivalents were not exact and in questions 8, 9 and 21 it would have been unlikely to have more than one decimal place. Still many tried numbers which were prohibitive without a calculator. This is the major problem with a method such as trial and improvement where there is no limit to the values that could be trialled.

It was a surprise that more candidates did not know how to construct the angle bisector and how to apply it to a standard problem. Questions 3 and 10 tested the use of the order of operations and it was surprising that many did not know these. However ratio is clearly understood by most and so is linear graphs both questions being answered very well.

Comments on Individual Questions:

Question No. 1
In part (a) there were many correct answers and some gave 12 or even 12:48 as the final answer. The most common incorrect method was to divide 60 by 4 and giving 45 as the answer. However in part (b) many continued with this method and they attempted to divide 42 by 8 first and then multiply by 5. It was crucial to read the instructions for this part carefully.

Question No. 2
The plotting of the points was done accurately, the main problems were (2.20, 21) and (1.88, 40) where the scale did seem to confuse some. In (b) most did give the correct response, the most common incorrect responses were 'positive' and 'no correlation'. The line of best fit was usually ruled and within tolerance, although some did go outside the right-most limits. In part (d) most gave the correct answer and in (e) some misread the number sold from their line of best fit and a few gave that number rather than doubling their reading, in doing so some made further numerical errors.

Question No. 3
In (a) the most common error was to use the incorrect order of operations. It was common to see a candidate calculate 15^2 instead of 3×5^2. In (b) the main problem was dealing with – (–10) and many just subtracted from 18 to give an answer of 8.

Question No. 4
Most candidates preferred to convert to improper fractions rather than subtracting the integers first. The extra work involved gave scope for simple arithmetic errors. Most realised that they needed a common denominator of 30 with the rare higher multiple of 30 also occasionally seen. Problems were encountered by many candidates in achieving the correct numerator, often having difficulty multiplying 18 by 6, common wrong answers seen of 140, 166, 158 and even 48. Fewer problems were seen in multiplying 13 by 5, however 55 and 75 have been seen. The most successful method by far was when the integers were separated from the fractions and candidates had smaller numbers to deal with.

Question No. 5
In part (a) there were no correct solutions found when the dimensions were subtracted. The correct method was to multiply the dimensions and the order of multiplication was crucial. Many attempted 40×40×25 when 40×25×40 would have been easier to work out. Again in calculating the volume of one speaker the order 15×20×30 might have been easier than 20×30×15. Some forgot to double this value before subtracting it from the volume of the box. Some omitted the zeros which made the multiplication easier but they then replaced only one zero instead of three zeros. In part (b) a small sketch would have assisted the correct solution. Some calculated the volume which was surprising at this level. The most common error was to do 2 × (20 × 15) and 4 × (20 × 10). Multiplication was not found to be as difficult as in part (a).

Question No. 6
Many did draw a circle centred on C but very few could understand the constraint "nearer to AB than AD" and so they would bisect the sides AB or AD or angle B. When they did draw the angle bisector of angle A very few used the correct construction.

Question No. 7
Most candidates did complete the table correctly in (a) and they plotted the points accurately in (b). However some did not join the points with a ruled line. In (c) they were given the opportunity to use the graph if they did not know the rule about the gradient of a straight line. Most candidates did not know how to find the gradient of the line and $2x$ was often given as the answer.

Question No. 8
This question was not designed for trial and improvement so those who used that method were not usually successful. They also did not make clear what their input and output numbers were, generally the work was a mass of numbers. The best method was to write the correct expressions in the two blank cells and then form an equation from the sum of these two expressions and 43. The equation formed was found to quite easy to solve, though some did have problems dividing 30 by 4.

Question No. 9
Most candidates did successfully work out the distance to be travelled on the motorway as 124 miles, although some did get the subtraction wrong. The main problem was working out the time spent on the motorway. This meant dividing 60 by 40 and many wrote 1 (h) 20 (min) rather than 1.5 (h) so most did not get the time on the motorway as 2 hours. They were usually left with 124 divided by 2(h) 10 (min) which was more difficult than intended.

Question No. 10
Part (a) was usually answered correctly; some candidates did omit to multiply the 5 by $-y$. In (b) the x's should be combined by subtraction but some added them and in the same way they dealt with the numbers so the equation was simplified to $6x = 20$ instead of $4x = -14$. In (c) the rearrangement was done successfully provided that the operations were done in the correct order. The same was true in (d) where the square root should have been done last and should have covered the entire fraction.

Question No. 11
Clearly only answers were required in this question. The common incorrect answer to the first statement was P and S showing that the correct line had been selected but they had not understood the inequality. The second statement had more incorrect answers; S was the most common one.

Question No. 12
In part (a) too many counted the zeros so in (i) 5.4×10^5 was seen and in (ii) the answer was often 0.00463. In part (b) the most successful method was to write out both numbers in full, although the columns usually were not aligned well. Some did not write out the answer in standard form as the question had asked.

Question No. 13
It was a real surprise to see many calculate 5% with the correct method but making simple errors. First finding 10% which was 18 and then dividing by 2 to get 5% but they worked this out as 6. Those who used 1% as 1.8 and multiplied by 5 often made errors. Some tried to multiply 180 by 0.15 and they made this question much more difficult that had been intended. It was expected that they would choose the most efficient method.

Question No. 14
Many candidates could not complete the table correctly and many started with 0 in the first cell instead of 10. Many calculated the frequency density, thinking it was a histogram. In part (b) many drew bars probably continuing the idea of it being a histogram even when the frequencies were correctly worked out. In (c) many read from the frequency of 30 instead of 25 and of those who did read from the correct figure, many did not give the reading or they did not answer the question which asked for a ‘higher’ or ‘lower’ response, just ‘yes’ or ‘no’ was not sufficient. In (d) many read from 1.9 and not 1.8. The scales were more challenging but at this level it is expected that candidates can select the correct values. Having given a reading they then did not subtract it from 50 to find the number over 1.8. Conversion to a percentage by doubling was achieved by most candidates.

Question No. 15
Most of those who attempted this question had learned to halve the 12, although some halved the 24. Having obtained the $(x + 6)^2$ most could not work out the value of the constant, -12. In part (b) very few answered these two parts correctly and in many responses it was difficult to apply a follow through because they did not have a linear expression in (a).

Question No. 16
In part (a) many were able to expand the brackets and produce four terms, although they did struggle to simplify $2\sqrt{3} \times \sqrt{3}$ and $2\sqrt{6}$ was a common response. It was also surprising that having reached $4 + 6\sqrt{3} + 6$ many did not simplify this expression. In (b) many knew they had to multiply the numerator and denominator by $\sqrt{2}$ but they only multiplied the 3 by $\sqrt{2}$ and not the $\sqrt{2}$ as well. Some just cancelled the two $\sqrt{2}$ s and gave the answer as 3. In (c) most gave $3^2 \times \pi$ as the area of the circle but they could not simplify the 80/360 and often they worked out 360 divided by 80 as 4.5 and multiplied 9π by this 4.5. This demonstrated how uncomfortable many candidates are with fractions.

Question No. 17
Most candidates correctly completed the tree diagram in (a) although some drew a pair of branches after ‘success’ in the letter column. The most common approach in (b) was to add 1/10 and 1/3 together. Again there was plenty of evidence to show that many were uncomfortable with multiplying and adding fractions. However very few candidates attempted to change the fractions to decimals.

Question No. 18
Part (a) was usually answered correctly, although some fraction lines were seen and some left out the vector brackets. In (b) the correct method was to subtract the vector but some added them to give (10, −7) and others seem to guess as they had no perceivable method to solve this problem.

Question No. 19
Many wrote 72/99 and did not attempt to simplify this fraction whilst a very common approach was to write 72/100 and simplify to 18/25. Some attempted to get $100x$ and then to subtract but this method was not well understood. It will be interesting to see how they might cope with decimals where the recurring digits do not start straight after the decimal point.

Question No. 20
Vectors is clearly one topic which many candidates did not study as can be seen by the number who did not attempt this question in its entirety. These parts are all linked by the same theory so it was usual to see some candidates answer it all correctly whilst others answer it all wrongly. Part (a)(i) did offer the opportunity for some to get at least 1 mark, although some wrote **3*a***. In (a)(ii) the most common incorrect answer was **4*a*** + **4*b***. Part (a)(iii) was only correctly answered by a few and yet in (b) there were more correct answers presumably by interpreting the diagram.

Question No. 21
This question was also not designed for trial and improvement so those who used that method were not usually successful. They also did not make clear what values they were using for the two tickets and they rarely showed the total price they used to compare to the receipts. The intention was to use algebra to solve this puzzle, which many did, and usually they were successful. The middle receipt was intended to be ignored because it introduced an additional variable. An alternative approach was to see the difference between the left and right most receipts which would have given ‘adult + child = £20’ and this was used as a starting point for any trialling work.

J567/04 Paper 4 (Higher tier)

General Comments:

The paper was accessible to candidates of all ability levels and most candidates attempted the majority of the questions. In general candidates were well prepared for algebra questions but many showed little understanding of relative frequency, moving average, congruence and inverse proportion.

Many candidates showed their working out which enabled them to be awarded method marks even if their final answer was incorrect. Often this working was clearly laid out and legible, but some candidates still show a haphazard approach making it difficult for examiners to follow the method. The quality of written communication question was often well presented, however Centres should advise candidates that they are expected to use some words along with their calculations.

On this paper, candidates are expected to use their calculator appropriately. A significant number of candidates used inefficient non-calculator methods rather than multiplier methods in percentage questions. Errors in calculations with negative numbers were also common. In questions where several stages of calculation are required, candidates should be encouraged to retain all figures on their calculator rather than round intermediate answers as this leads to inaccuracy in final answers and the loss of accuracy marks. Candidates should also check each answer, particularly that the answer to a context question makes sense: it was not uncommon to see the amount of money in an account at the end of three years being less than the original amount invested.

Candidates' answers to comment questions are improving, but they would benefit from reading their answers to ensure that they have answered the question asked. If a comparison is required, it is essential that it is clear what has been compared with what. Where reasons are required in geometry questions, clearly expressed reasons are expected and Centres should encourage candidates to use the correct terminology. Where a proof is required, clear steps are expected rather than a paragraph of vague reasoning.

Comments on Individual Questions:

Question No. 1
Part (a) was generally well answered with many candidates giving an answer within the acceptable range. Some candidates did not understand how to find the height from the elevations but they could be awarded a method mark for showing correct use of the scale. Errors involved inaccurate measurement from the diagram or incorrect application of the scale: either multiplication by 2 or an incorrect attempt at 4.5 ÷ 2.

The plan view in part (b) was not so well done with candidates often using the wrong scale or omitting the central line but a rectangle divided in two halves or a correct sized rectangle with no central line gained part marks. Of the candidates who gained no credit, some attempted to draw a 3D representation of the shed, a net, an elevation with a roof or a rectangle with an inner X shape.

Question No. 2

In part (a) most candidates were able to use their calculators correctly to arrive at 2.917[…]. Some answers were truncated to 2.91 rather than being rounded to 2.92 and others were given to three decimal places rather than the three significant figures required. If candidates had used the incorrect order of operations they could gain a method mark for showing their answer correctly rounded to three significant figures.

Most candidates could identify the error in part (b)(i) and give an acceptable explanation, many stating that the correct answer should be 2 hours 15 minutes and some backing this up by stating that the error had been taking an hour as 100 minutes rather than 60 minutes. Those candidates who simply stated that 0.25 hours is not 25 minutes had not given sufficient explanation for the mark.

Candidates found the explanation in part (b)(ii) more challenging with more vague answers being seen. It was common to state that the answer should be larger without stating larger than what. Candidates either needed to identify that the answer should be larger than 3570 or that when dividing by a number between 0 and 1 the answer should be larger. Candidates often used the word decimal without realising that this does not necessarily mean less than 1. Some explanations involved the use the fact that the division would not result in an answer with one decimal place but these types of explanation were rarely convincing. Estimated answers involving division by 1 were generally too vague to be awarded the mark.

Question No. 3

Candidates of all ability levels did not know what was meant by relative frequency and it was common to see 'number of spins ÷ number of 3s' calculated or, in fewer cases, 'spins × 3s'. The majority of candidates who calculated the relative frequencies correctly gave them as decimals rather than fractions or percentages, all of which were acceptable. In answers given as percentages a percentage sign was essential.

A range of answers were seen in part (b) with a number of candidates being able to explain that more trials would give a better estimate of the probability. Some candidates identified that a higher number of trials was important but then spoilt their answer by stating either that this would give more chance of scoring a three or simply that it had a higher relative frequency. Other candidates selected 50 spins because it was the middle result, selected the answer closest to what they thought was the correct probability or selected 0.4 because it was easier to calculate with.

In part (c) many candidates gave an answer in the acceptable range, often because they had used the frequencies from the table to make a total of 500 spins rather than from the use of their chosen relative frequency multiplied by 500. A small number ignored the table and used equally likely outcomes, giving an answer of 100 which gained no credit.

A lot of confusion about what constituted a 'fair' spinner was seen in part (d). Candidates who scored here managed to convey the fact that the relative frequency was higher than the expected 0.2. A smaller number of correct answers involved the fact that there would have been 100 threes if the spinner were fair. Those candidates who failed to score often said 'no' because there were more odd than even numbers on the spinner or a vague comment about three occurring more than any other number. Some incorrectly answered 'yes' and gave a reason involving equally sized sections on the spinner or similar relative frequencies from the trials.

Question No. 4

In part (a) most candidates made an attempt to find the mean, but a large number failed to reach the correct answer. Many tried to find the sum of the products, but the inclusion of 0 both as number of times late and as a frequency caused problems: despite having the use of a calculator 0×11 and/or 3×0 were often incorrect, although when method was shown some credit could be awarded for the attempted calculation. Some candidates went on to divide their total by

30 which gained further credit, but it was equally common to see division by 15 (the sum of the numbers in the first column) or 6 (the number of groups). The correct answer of 1.4 was sometimes unnecessarily rounded to 1. Some candidates did not know what to do with the extra column in the table and it was common to see cumulative frequencies or 'mid-points' written here. Many candidates evaluated the mean as 30 ÷ 6 = 5.

Many good attempts were seen in part (b), with correct answers coming from either calculations showing the percentage of sessions late per term or finding 15% of the number of sessions. Some candidates showed correct, consistent calculations but then failed to compare correctly: this was more common from those candidates who had found 15% of the number of sessions and then selected 'summer'. Candidates who correctly calculated the percentage of sessions late usually selected 'autumn' and 'spring' correctly. Some candidates used inefficient non-calculator methods in this question but, as the numbers were designed for calculator use, errors often occurred and there was seldom enough evidence to award marks. Candidates who selected the correct terms but showed no working were given no marks as the question required working.

Question No. 5

Most candidates could find the first three terms of the sequence correctly in part (a)(i) although some started their sequence with $n = 0$ and were only awarded 1 mark. A small minority of candidates treated it as a term-to-term rule and having found the first term as 3 substituted this into the expression to find 19 as the second term.

In part (a)(ii) many candidates identified that 96 could not be a term in the sequence and a variety of correct explanations were seen. Common explanations involved all of the numbers in the sequence being odd, demonstrating that 101 ÷ 8 was not an integer, showing that the sequence went from 91 to 99 or commenting that 96 was a multiple of 8. Some gave incomplete explanations such as stating that 91 is in the sequence, or that 96 would not give an integer value. Only a very few candidates thought that 96 was in the sequence.

Part (b) was answered less well than the previous parts. Many candidates identified that the common difference was 7 and many of these knew that this meant that there would be a term involving $7n$. However the fact that it was a decreasing sequence made it harder than usual for candidates to identify the correct expression for the nth term. Common incorrect answers were $23n – 7$, $n – 7$, $7n – 16$ and $7n – 9$. There was little evidence that candidates had checked their expression against the numbers in the sequence.

Question No. 6

In part (a) many candidates gained at least 2 marks for finding angle BCD = 100°. Although the question asked for reasons to be stated, a number of candidates gave no reasons at all. To gain full credit, as well as stating the correct value for BCD candidates needed to link relevant reasons using correct key words with the correct angles and not use any incorrect reasons. Many candidates did state at least one correct reason, although reasons were not always clearly linked with the correct angle and many included incorrect reasons such as corresponding angles rather than alternate angles. Reasons such as 'all angles add to 180°' are not acceptable and 'alternate segment' is not acceptable when 'alternate angles' is required. A number of candidates thought that triangle ABD was equilateral which led to no correct angles being found.

In part (b) many candidates knew that the number of sides in a polygon could be found from dividing 360° by an angle. However it was more common to see a division by 156, the interior angle, rather than by the exterior angle of 24°. Some candidates attempted to find the exterior angle by subtracting from 360 rather than from 180. It was common to see candidates listing the sum of interior angles for various polygons and using this to reach an answer, often unsuccessfully.

Question No. 7
In part (a) most candidates took out the common factor of 2*y* and completed the factorisation correctly. Some candidates only partially factorised using a common factor of either *y* or 2. Only a very small number of candidates attempted to add the two terms or attempted to factorise into two pairs of brackets.

In part (b) it was evident that most candidates understood the process required to expand the brackets with a four-term expression being found followed by an attempt to simplify this to a three-term expression. Most candidates gained at least one mark with many giving a correct final answer. In general any errors occurred in use of the directed numbers, either from incorrect multiplication of –3 and –5 or from incorrect simplification of $-3x - 5x$.

Many candidates showed clearly laid out and correct algebra in part (c) reaching the correct final answer. Some candidates used an = sign in their working rather than the inequality: those who then gave their final answer as an inequality gained full credit, but those who gave a final answer of 10 or $x = 10$ only gained two of the available three marks. Some errors in rearrangement were seen, usually in subtracting 2 rather than adding it, but in these cases partial credit could be awarded if some correct steps were seen. A small number of candidates attempted to solve using trial and improvement methods, but these generally failed to reach a correct answer.

Part (d) was found to be more of a challenge. Candidates who attempted to eliminate the fraction first were generally more successful than those who collected the *x* terms first. In the elimination of the fraction it was common for candidates to multiply only one of the terms by 4, usually the 2 which often led to a final answer of $x = 4$. Again, if correct algebraic steps were seen at any stage in the solution, method marks could be awarded and many candidates gained at least one mark for the final step.

Question No. 8
Many candidates used the grid provided and carried out the two transformations correctly. They then often had difficulty in describing the equivalent single transformation. Some ignored the word single and used some combination of the two original transformations, usually clockwise rotation and reflection in the *x*-axis. Those who recognised that the single transformation was a reflection often had difficulty in describing the mirror line: even if they had drawn it on the diagram the equation was often given as $y = x$.

Question No. 9
Most candidates identified that part (a) required the application of Pythagoras' Theorem with many completely correct answers seen. Some candidates correctly found the length AC, but then lost the final mark because they did not add the sides to find the total length. A significant number of candidates used Pythagoras and added the squares rather than subtracting so could only gain a final method mark for finding the perimeter using their lengths: the diagram should have been a clue that AC should be shorter than AB. Very few candidates attempted to use trigonometry, usually unsuccessfully, as a route to finding AC.

Part (b) was very poorly done with few candidates identifying the need to use trigonometry. Many candidates measured an angle from the diagram to find the bearing, even though 'not to scale' was stated and the question asked for a calculation. Candidates should have noted the allocation of four marks to this question and realised that measuring an angle could not be the correct approach. Those candidates who did use a trigonometric ratio often reached the correct value for angle BAC and gained three marks, with some then correctly using that angle to find the bearing. It was sometimes unclear from working whether candidates were applying a trigonometric ratio incorrectly or whether they were finding an incorrect angle. Some candidates used the sine rule, often correctly, or the cosine rule, usually incorrectly.

Question No. 10
The response to the straightforward substitution in part (a)(i) was poor, with many candidates failing to deal with the –2 correctly. Answers of 2, –2 and 8 were almost as common as the correct answer of 10.

Candidates are expected to be able to identify the shape of a quadratic graph, so, in plotting the points in part (a)(ii), they should have realised that there had been an error in their calculation in part (i). Most candidates plotted their points correctly, and those who had found the correct value in part (i) often joined with a smooth correct curve with a minimum between $x = 1$ and $x = 2$. However there a significant proportion of curves were poor and could not be given full credit, including curves missing plotted points, feathering of lines, no attempt to show curve below $y = -2$ or, very occasionally, joining with straight lines.

In part (b) there were many excellent ruled straight lines of the correct length drawn gaining full credit. Very few freehand lines were seen but some lines were too short and were awarded only two marks. A number of incorrect lines gained one mark for passing through a correct point: often $y = x + 5$ or $y = 5$ passing through (0, 5).

There was a poor response to part (c) with many candidates not knowing that the solutions to the simultaneous equations were the points of intersection of their graphs. Many candidates either omitted to answer or gave integer solutions that bore no resemblance to the points of intersection. Those who attempted to find the coordinates often read them accurately, although some misread the vertical scale which was different from the horizontal. Some candidates did not read the question and solved the equations algebraically.

Question No. 11
Those candidates who understood the topic of moving averages generally gained full credit in part (a). A small number of candidates however found three-quarter rather than four-quarter moving averages which did not score. Many candidates did not know what a moving average was and treated this as a sequences question, giving the missing numbers as 6.75, 6.25 and 5.75, which gained no credit.

Many candidates described the seasonal changes in visitor numbers rather than the trend so did not score in part (b). ‘On average visitor numbers are increasing as time goes on’ would have been the perfect answer but ‘increasing’ alone was acceptable. Some confusion between trend and correlation was seen with a number of candidates describing the trend as ‘positive’.

Question No. 12
This question tested the candidates’ quality of written communication so they were expected to identify their calculations by more than numerical values and to present them in a logical form leading to a clear conclusion. On the whole presentation is improving in this type of question. Some candidates gained five marks with a minimum of effort producing complete, but concise, working with correct annotation.

Many candidates understood that compound interest calculations were required and multiplier methods generally led to correct answers, but in some cases marks were lost because these calculations were not linked with accounts. Candidates who used step-by-step methods to calculate the amounts in the accounts each year often lost marks due to arithmetic slips or miscopying of numbers. Candidates found it harder to deal with the changing interest rate of the Bonus Account than the constant rate in the Fixed Rate Account. Some incorrect application of the interest rates was seen, with, for example, 1.35 used in place of 1.035.

Some candidates worked with simple interest rather than compound interest which meant that a maximum of two marks would be awarded. Other candidates tried to use non-calculator methods to find the percentages which is inappropriate on a calculator paper and seldom led to more than one mark for finding the interest correctly for one year.

A number of candidates subtracted the interest from the investment or did not give answers to the nearest penny, demonstrating a lack of understanding of functional mathematics.

Question No. 13
This topic had clearly been covered as many candidates identified at least one graph correctly, often the reciprocal. Many candidates used the shape of the graphs to identify that the first graph must be a quadratic and the third a cubic, but then could not select the correct equation for each. If they had considered whether the terms should be positive or negative and then the effect of translations on the position of the curve they would have been able to reach the correct equation in each case.

Question No. 14
In part (a) many candidates failed to recognise that point A was not positioned at the origin and the incorrect answer (6, 0, 4) was seen as regularly as the correct answer of (8, 0, 4). If the candidates had used the diagram to record the lengths of the edges they may have been more successful.

Part (b) was very poorly attempted with only a very small minority realising the need to apply Pythagoras' Theorem. Few of those used the more efficient method of summing the squares of all three sides, with more applying it twice often with intermediate rounding of values leading to an inaccurate final answer. In order to gain full credit, candidates were required to give an answer correct to three significant figures. Some candidates found the length AF rather than AG and others just summed the lengths of the sides.

Question No. 15
Most candidates gave a correct answer in part (a)(i) usually referring to it being a leading question or the answer being impossible to predict.

Those candidates who had covered the topic of stratified sampling usually reached the correct answer in part (a)(ii), although some left the answer as 11.25 girls which was not given full credit. The most common misconception was assuming that an equal number from each group was required leading to the answer 10. Other errors were to divide 800 by 50 or to divide 800 by 180.

In part (b)(i) many candidates dealt very well with the difficulty of the real data and produced an accurate histogram within the acceptable tolerances. Common errors were in the width of the bar for 45 to 65 years, which often stopped at 55, 60 or 70. Where heights of bars were incorrect it was usually 40.4 plotted at 44 or 4.1 plotted at 41. Most candidates however gained at least one mark in this question.

In part (b)(ii) a comparison was required, so candidates needed to make two comments that clearly described similarities or differences between the two distributions and they did not perform as well as was expected on this question where any valid comparison would have been given credit. Many correct statements were seen, such as 'there were no births in 1980 by women over the age of 45' but although this was correct it could not be given credit because it did not involve any comparison. Comments needed to refer to specific age groups and referring to younger/older people was considered too open to interpretation.

Question No. 16
In part (a) many candidates identified the word 'proportional' and took this to be a question about direct, rather than inverse, proportion and so gained no credit. Those candidates who did use inverse proportion often left in the proportionality symbol, failed to evaluate their k or, having evaluated k correctly, failed to substitute this value to give the correct final answer. Common wrong answers were $10I = 1.2R$ or $R = 8.33I$.

Those candidates who had the correct equation in part (a) usually gave the correct answer in part (b), although there were some who were unable to divide 12 by 0.5 and reached the answer 6, clearly not having used their calculator. Candidates who had given an equation in part (a) were given credit for correctly substituting I = 0.5 into their equation, and some follow through marks were awarded, although often the answer was not sufficiently accurate to gain credit, as three significant accuracy was required.

Question No. 17

The majority of candidates correctly applied the laws of indices in parts (a)(i) and (ii). Only a small minority made the expected errors of multiplying or dividing the powers, but some candidates thought they were being asked for the powers and gave the answers as 8 and 6.

Most candidates did not understand what was required in part (b) and many omitted the question completely with others trying to cancel individual terms or to treat it as an equation to solve. Of those candidates who understood that factorisation was required, most successfully factorised the numerator as the difference of two squares and many went on to reach the correct final answer although a number had difficulty factorising the denominator. Some candidates gained one of the two available marks for factorising the denominator by finding 'factors' that would expand to give two terms correct, many from use of a trial and error approach. Following an incorrect factorisation of the denominator some candidates reached an expression that could be cancelled down and gained a further method mark for this.

Question No. 18

In part (a) the majority of candidates did not realise that the start of 2010 was when t = 0, and found the population when t = 1 which was 8832.

Many candidates however knew that they were required to substitute t = 3 into the equation in part (b) and gained at least partial credit here. To gain both marks, candidates were required to realise that a population had to be an integer but rounding or truncating to 8139 or 8140 were both acceptable.

In part (c) many candidates realised that they needed to use a trial and improvement approach to find when the population reached half of its original value. Problems occurred when they tried to relate their value of t to the actual year, so, after seeing correct trials, it was not uncommon to see answers such as 2017 or 2018. Method marks were often awarded for clear trials with the correct outcome shown. Although this was a question on a difficult topic, overall performance was good, with candidates demonstrating good calculator skills.

Question No. 19

Almost all candidates performed very badly on this question, with only a small proportion gaining any marks at all.

A proof requires clear statements giving equal sides and equal angles with correct geometrical reasons concluding with a correct congruence statement. Angles were often paired correctly, but reasons for these were often incorrect or omitted, in particular for the equal angles in the same segment. In some cases sector was used in place of segment, but, more commonly the 'bow tie theorem' was referred to, which is not an acceptable reason. It was often assumed that AB and DC were parallel and 'alternate angles' was used which was not accepted. If the radii were paired up, a reason for this was seldom adequate, with pairs of diameters often mentioned rather than radii. Those candidates who had correctly paired angles and sides did not often then go on to give a correct congruence statement.

A number of candidates confused congruence with similarity and attempted to prove that the angles in the two triangles were equal with no mention of equal sides.

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