OCR
Oxford Cambridge and RSA

GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education **J926**

OCR Report to Centres June 2015

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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

B391/01 Foundation Tier

General Comments:

A good spread of marks was seen for this paper and the paper differentiated quite well, with marks across almost the whole range, excluding the very top end of the range.

Questions 5, 8 and 14 required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Performance was reasonably good for Q8, which was the QWC question, as indicated by the asterisk on the question number. Candidates generally gave a good explanation. However in question 5 many candidates did not give evidence of comparing the probabilities and in Q14 some candidates may have found this question to be daunting due to its unstructured investigative nature. Many candidates wrote down little working for this question, even though it had four marks.

It was encouraging that there were good attempts at the algebra questions 7 and 10 (b)(i). Q13 involved using a Venn diagram and many candidates did not score well on this, particularly when interpreting the written descriptions of the sets and knowing what was needed for the number of members of the intersection of the two sets.

The omission rate for this paper was higher than for some previous papers but this did not appear to be because of a lack of time.

Comments on Individual Questions:

1 This was a well answered question, with almost all candidates getting the correct answer in part (a) and a large majority having the correct answer in part (b), with the most common error being to reverse the values in part (b). Part (c) was not answered as well as the other two parts, but it was answered correctly by the majority of candidates.

2 Candidates demonstrated a good understanding of words associated with probability, with the majority of candidates gaining all 4 marks. The second statement caused the most problems: “likely” and “evens” were quite common wrong answers. Candidates also gave the answer “certain” quite frequently for the last statement, possibly reading it as “greater than or equal to 1”.

3 Part (a) was usually correct, but there were some simple addition errors within the sum. Incorrect answers were often out by just 1 digit, with 2414 being a fairly common wrong answer, where the ‘carry’ figure had not been added.

Part (b) was well answered by the majority of the candidates. Common wrong answers were 228 and 233.

Part (c) was the least successfully answered part of the question, with only a minority of candidates giving a correct answer. A number of candidates omitted this question part, and some did not provide working out. Many candidates attempted a division, but they often ended up with a remainder.

Part (d) was well answered by the majority of the candidates, with the most common wrong answer being 20.12.

4 A large majority of candidates understood the concept of reflection symmetry in part (a) giving a correct answer, and most gained at least 1 mark. Some candidates shaded extra squares and may not have fully read the question.

Rotation symmetry was not as well understood and ‘clockwise’ and ‘anticlockwise’ were often seen as an answer to part (b)(i). Many candidates appeared to be measuring the angle in part (b)(ii) as 118°/119°/121°/122° were quite often seen. Another common answer was 60°, this may have come from using the incorrect scale on the angle measurer or from 180/3 which was often seen in the working. 180° and 90° were also seen fairly frequently.

5 A high minority of candidates stated 1/5, 2/8 and 3/10 as the probabilities of each spinner, but few of these then put them in a comparable form to show that 3/10 was the biggest. When the probabilities were compared, converting them to percentages was often successful, but there were candidates who successfully converted to fractions with denominators of 20 or 40. A high minority of candidates failed to score because they often just gave how many sectors were 6 on each spinner, with the argument that C had more 6s, so more chance of getting a 6. Some of those that gave probabilities went on to say that it was C, because it had more 6s.

6 Candidates clearly understood the use of brackets in part (a), with a very large majority getting the correct answer in part (a)(i). The brackets were well understood in part (ii), but it was the calculation of 11×11 which caused many candidates to lose the mark, with 110 and 122 commonly following the correct working. The answer of 22 was also seen quite frequently from 11×2 or after the correct working of 11^2, and 81 was a fairly common wrong answer.

A large majority of candidates scored at least one mark in part (b) for saying that the calculator worked using BIDMAS, or equivalent, or for showing the specific calculation, either what the calculator had done or what Samir should have done. A minority of these earned both marks for showing the two requirements. It was a small minority of candidates who did not score any marks in this question part.

7 A small majority of candidates has the correct answer in part (a), with 2 being a common wrong answer.

Part (b) was usually correct, and the majority of candidates scored two marks in part (c), some of whom gave a correct answer with very little working. In part (c) it was rare for candidates to earn just the method mark, with some candidates seeming to start on a correct strategy, such as giving 35+10=45, but without the full line of algebra, and then giving a wrong final answer, earning 0 marks.

8 This was a well attempted problem with many candidates scoring at least 3 marks. Much competent working was seen. Where the solution was not quite complete, it was usually because the number of cans of paint had not been justified, either by showing a division or showing multiples of 7 up to the amount required. Some numerical errors were quite often made within a complete solution – usually in finding the answer to 7×1.5 or 27-10.5 was 17.5 rather than 16.5. Candidates showed good strategies in multiplying by £14.99 which usually only became a problem when they had come to an incorrect large number of tins.

Some candidates were finding the perimeter rather than the area, some did not take away the window area and others added it on again to the area of the wall. Those who tried to split the area of the wall into different sections were usually unsuccessful as they were not consistent in their measurements on the diagram. From an incorrect area, many candidates still gained 2 marks by deducing the correct number of tins of paint required for their area and multiplying this correctly by £14.99.

9 In part (a) a small majority gave the correct answer, but 20 and 9 were common wrong answers. Some tried to use Pythagoras' Theorem for the hypotenuse.

In part (b) a good majority of the candidates earned the two marks and there were others who showed the correct method but then made a numerical mistake. A common error was to find the area of the faces and then add them. A few were adding all or some of the lengths of the sides together.

10 Just over half of the candidates scored 0 marks in the parts of part (a), but some candidates clearly understood the concept of partitioning numbers and scored well throughout part (a). In part (a)(i) 0 was often placed in the bracket and it is possible that these candidates were only looking at the 40 after the equal sign ($5\times8+0=40$). 32 was the other common value placed in the bracket as $8+32=40$. Candidates who understood that 2 numbers adding to 17 were required in part (a)(ii) usually multiplied them correctly to gain the second mark, although there were some errors in multiplying the numbers. There was a large variety of incorrect numbers being placed inside the brackets. In part (a)(iii) those candidates who placed the 3 inside the bracket usually went on to gain the second mark, but there were some who correctly inserted 100 and 15 with an incorrect value inside the bracket, as the 5×20 was used for the 100 and then the 15 calculated to make 85.

In part (b)(i) a small majority of the candidates earned two marks, but 1 mark was gained for one correct term in the answer by other candidates, with the most common mistake being to omit to multiply $2y$ by 3. Many candidates appeared not to understand the term factorise in part (b)(ii) and a substantial number left this answer space blank. Only a minority had a correct answer, and $12xy$ and $x+5y$ were common incorrect answers.

A significant number of candidates omitted answers to the parts of this question.

11 Parts (a) and (b) were almost always correct, apart from the small minority who plotted (-1, -3) for D in part (b).

In part (c)(i) only a minority of candidates had the correct answer, with 'rhombus' or 'trapezium' as common errors. A majority of candidates had the correct answer in part (c)(ii), although in some cases just the answer was given without working out. There was some evidence of counting squares, with answers close to the correct one.

12 In part (a) candidates demonstrated a good understanding of cubes and square roots with most giving correct answers. There were some who gave the answer of 6 for 2^3. The most frequent incorrect values for $\sqrt{36}$ were 9 and 18.

Simplifying indices was also well understood in parts (b) and (c). Occasionally 5^5 was given in part (b) and in part (c) common incorrect answers were a^{12}, $12a$, and $7a$. A small number changed the lower case a to capital A, but this was condoned.

The correct answer of 27 was rarely seen in part (d) although a good minority gave 3^3 to gain a mark, perhaps not evaluating this, as previous answers in this question required answers with indices. Many tried unsuccessfully to evaluate 3^9 and 3^6 in order to divide them. 27÷18 was commonly seen.

13 In part (a)(i) only a small minority had a correct answer and there were a variety of wrong answers, such as "diagonal", "not integers", "integers from 1-6", "(2.5, 1.5)", "square", "from 1-6" and "meeting". Parts (a)(ii) and (b) were omitted by a significant number of candidates, with only a minority with correct answers. Many of the candidates who had a correct answer for part (a)(ii) did not give the correct answer for part (b). In part (b) many candidates did not seem to know what the question was asking of them, and a number gave the number of members of the union of the two sets, if the answer to part (a)(ii) had been followed through.

14 This problem proved very difficult for a large majority of candidates, as they had difficulty breaking down the information they were given and scored 0 marks. A small number of candidates gained 2 marks for reaching the point where they showed the area of the triangle is $18m^2$ and a few then showed good reasoning to find the length of the triangle and hence the length of the shallow end by subtracting from 30. However most went down a different path once reaching $18m^2$ and the majority did not get as far as realising that the area of the triangle was a crucial piece of information to use. The most common answers were 10 and 20 from 30÷3 and 30-30÷3 and 16 and 14 from 48÷3 and 30-48÷3. Some seemed to be measuring the diagram and trying to use a scale factor.

B391/02 Higher Tier

General Comments

The paper differentiated quite well with marks across the whole range. It also proved accessible to most, since omission rates were very low with only questions 12 and 13b above 0.05. Very few candidates produced marks in single figures suggesting that there were few for whom entry at foundation level may have been a more rewarding experience. Questions 11b, 12 and 13 proved a very demanding end to the paper and were the reason for the fewer marks at the very top of the mark range.

Basic arithmetic continues to let many candidates down. The inability of candidates to do the basic four operations led to a fairly substantial loss of marks by some candidates.

Questions 6, 10, 12 and 13b required candidates to interpret and analyse problems and use mathematical reasoning (AO3). The response to questions 6 and 10 was quite pleasing although as was to be expected the facility was somewhat less than on other questions. With respect to Questions 12 and 13b it appeared that it was the difficulty of the topics rather than the mathematical reasoning that proved to be the problem.

Question 12 was also the QWC question as indicated by the asterisk on the question number. As such, it was expected that candidates would use the correct vector notation and also correct conventions in algebra such as use of brackets. As stated above vectors is a topic which candidates find difficulty anyway and this proved the greater problem.

Working was usually shown but sometimes was muddled and difficult to follow. This makes it difficult and sometimes impossible to award part marks.

Comments on Individual Questions

1 In both parts of (a), almost all candidates realised which digits were required but more were successful with the place value in part(i) than in part (ii) which provided a wide response of answers. In part (b), most candidates realised that rounding was required and successfully rounded most of the numbers. However a significant number rounded 0.032 to 0.05 which did not seem justified. Arithmetic proved a problem here as many could not multiply 500 by 0.03. Just a few attempted long calculations with the original numbers.

2 There has been a definite improvement in fraction work and part (a) was usually done well with very few subtracting each of the numerators and denominators. Part (b) was designed to test the syllabus statement "use efficient methods to calculate with fractions, including cancelling common factors before carrying out a calculation". The vast majority of candidates did not do any cancelling before carrying out the calculation and hence were faced with a difficult piece of arithmetic. Whilst a significant number correctly reached $\frac{28}{1764}$, very few of them could cancel fully to $\frac{1}{63}$. Most candidates, who reached the correct answer, did do their cancelling first.

3 Both parts were done well. In part (a) however a number were let down by their arithmetic and a number thought that the total angle in a quadrilateral was 380°. In part (b) a number who reached angle BEA = 70°, were unable to interpret the isosceles triangle.

4 Candidates adapted very well to this combination of possibility space and Venn diagram. All parts were well answered although a number wrote 'square numbers' for the first part and there was some confusion between intersection and union in parts (b) and (c).

5 In part (a), most candidates showed a basic knowledge of algebra and wrote correct expressions for Hattie and Lian's cards. Some forgot to add the original number of Wilson's cards and a few forgot to complete the equation by putting their expression equal to 310. Part (b) was marked independently. Many did solve their equation successfully but many started again and used a logical arithmetic approach to reach the answer.

6 The most successful approaches to this question were those who split the shape into a rectangle and a triangle with a horizontal line. Those trying a vertical line and a rectangle and trapezium were less successful. There were a number who used the trapezium with an area of 42 m^2 which completed the rectangle. A number, totally incorrectly, assumed that the line which continued the sloping bottom of the pool went through the top right corner. For many candidates their working was a jumble of figures which did not say what they represented and hence awarding part marks was difficult.

7 Part (a) was extremely well done with just a few plotting the point D elsewhere than at (2, –1). (2, –2) was the most common wrong point. In part (b) there were many correct answers and many more who used either the correct gradient or y-intercept in $y = mx + c$. A significant number thought the gradient was 2 instead of ½.

8 Both parts were done quite well. In part (a), the brackets were almost always multiplied out correctly with the exception being that almost half wrote $+6y$ instead of $-6y$. The collection of terms was usually correct but that error led to the answer $4x - 9y$ being seen as often as the correct answer of $4x - 21y$.

Part (b) was very well done with just a few only taking out one factor and a few thinking that two brackets were necessary.

9 The problems with part (a) were twofold. Firstly many candidates could not multiply 8.4 by 1.5. Others who correctly reached 12.6×10^{-5}, could not convert that to 1.26×10^{-4}. In part (b) the vast majority of candidates score at least part marks for rounding, or converting to standard form or knowing the division required. Arithmetic proved a problem for some here too and with a number multiplying instead of dividing. However better candidates did it very well and many gained the correct answer.

10 Although this proved a demanding question for weaker candidates, about a third were completely successful. Some candidates, however failed to state a direction with the 90° angle and hence it was impossible to know which of the centre and mirror line should follow that. A few were confused as to whether the lines required were $x =$ or $y =$.

11 Middle and high level ability candidates did part (a) well. Some did not multiply the surd part by 3 or 2 and others multiplied both parts of the surd, e.g. $3 \times 2\sqrt{3} = 6\sqrt{9}$. In part (b), it was hoped that candidates would spot the shorter and simpler method of factorising $P^2 - Q^2$ to $(P + Q)(P - Q)$. Unfortunately almost all the candidates chose the longer method of squaring each of P and Q and then subtracting. Even stronger candidates using this method often found difficulty with $(2\sqrt{3})^2$ and many made sign errors in subtracting Q^2. Weaker candidates often simply treated e.g. $(5 + 2\sqrt{3})^2$ as $5^2 + (2\sqrt{3})^2$.

12 Vectors continue to present problems for all but the best of candidates. Most of the better candidates recognised that it was necessary to find $\overrightarrow{BQ}$ in terms of a and b. Unfortunately the algebra and fraction work often defeated them even if the vector work was sound. Careless written work such as the omission of brackets was common. Many gained part marks through finding $\overrightarrow{AB}$ and sometimes $\overrightarrow{OP}$ or $\overrightarrow{BP}$ but very few made further correct progress. Weaker candidates often gave long vague descriptions with little or no reference to vectors. Having said all that, there were some excellent well laid out responses from some of the very best candidates.

13 This proved a challenging probability question. In part (a) common errors were thinking that the game went on after Amy or Bishan had won or not realising that there were two ways of the game ending and 4 ways of it continuing. In part (b) it was expected that candidates would set out work showing the probability that Amy won on throw 1, throw 2, throw 3 etc and then spot the pattern and generalise. Very few did this and very few were able to go straight to the answer.

B392/01 Foundation Tier

General Comments:

Entry for this paper was lower than last year but most candidates were appropriately entered with few very low or very high marks seen. It appeared that some Centres might have decided to enter their weaker Foundation tier candidates for a single GCSE rather than the linked pair.

Candidates performed well on questions involving basic sequences, percentages, money calculations and solving equations. Candidates appeared to be familiar with the topics assessed on this paper and there were fewer instances of ‘no response’ than in previous years. Whilst it was to be expected that candidates would find the higher demand questions such as the two Ao3 questions on volume and finding the radius more challenging, it was disappointing that many candidates underperformed on some of the easier problems at the start of the paper. Inequalities and writing an answer to a given degree of accuracy continue to be poorly answered. Candidates generally showed their working, but too often it was presented in a rather muddled manner.

Comments on Individual Questions:

Question No 1
Almost all candidates were able to continue the two sequences but very few recognised triangle numbers.

Question No. 2
About half the candidates gained full marks on this question. A small but significant number of candidates found the products of the dimensions and then some further meaningless calculation. Others approached the problem correctly but then made an error when interpreting the number of lengths *d* and lengths *e.*

Question No 3
Most candidates were able to find the perimeter and the area of the rectangle. However they found it more difficult to find the perimeter of the square with the same area as the rectangle. A common error was to give the side of the square as 9cm, from 36 divided by 4. Others found the length of the side as 6cm but then failed to find the perimeter.

Question No 4
Most candidates were able to use simple percentages. Marks were lost in part (b)(ii) by failing to include money units. Some gave an answer of 4.5, often clearly from having divided 45 by 10, and this did not score any marks.

Question No 5
Both parts of this question were answered very well. However when answers were incorrect it was unusual to be able to award part marks as methods were unclear.

Question No 6
This question assessing a range of number skills was answered very well. Part (b)(ii) was the least successful with the most common error being to insert ÷ and then +, not appreciating that this gave an answer of 23. In part (c) the most common error was to divide the number of books by the weight and then multiply by 12.

Question No 7
This question was not well answered and a significant number of candidates did not even attempt the question. Few candidates attempted to solve the inequalities and then to interpret their solution. Most adopted an informal approach but struggled to combine their results from both inequalities.

Question No 8
Most candidates were able to continue the tessellation pattern in part (a) but some failed to draw sufficient shapes for both marks to be awarded. The common error was to leave a gap. In part (b) about three –quarters of candidates gave angle *x* correctly as 90°, but a surprising number gave an answer of 60°. Fewer candidates were able to find the size of angle *y*. Methods were not clear but sometimes it was evident that a solution had been attempted from finding the sum of the angles of the hexagon. A few candidates had just measured the angle. In part (c) about half the candidates were able to find the missing length but about a third of these were unable to write their answer correct to one decimal place. Some candidates just divided by 6 or subtracted 2cm rather than 4cm. Unfortunately most candidates did not record their answer before rounding so the independent mark for rounding their solution could not be awarded. In part (c)(ii) only the abler candidates realised that they needed to use scale factor 3 and they then generally worked with the individual lengths, rather than the perimeter, of the original hexagon. The common error was to add on 4cm to their length DE and then find the sum of the six lengths.

Question No 9
The majority of candidates scored at least 2 marks in this question. Almost all candidates worked out that the remaining area was 5%. The successful candidates used a range of methods to find the total area of 560m² or an area of 532m² (95%). The common error, having reached 5%, was to work out 5% of 28 and then find other areas.

Question No. 10
Most candidates were able to write a ratio, although not all were able to write it in simplified form. Less than half the candidates scored in part (b), either the full marks for finding the number of counters removed or the method mark for finding the number needed to fit the ratio. Generally it was unclear how candidates were tackling the problem.

Question No. 11
Most candidates were able to solve the three equations. The common error in part (b) was an answer of 2 from 9 - 7 and in part (c) 6.5 from incorrect expansion of brackets.

Question No 12
The majority of candidates were able to tackle this question and just over a third of candidates scored full marks. A few candidates having found 75% in part (a), calculated 75% of 25 in part (b) but then their interpretation of the result was generally inadequate. Many weaker candidates just referred to the differences between games won and games played and so did not score.

Question No 13
Just over a third of the candidates were able to rearrange the formula in (a)(i). The common error was just to swop the *d* and the *C*. More candidates were successful in part (ii) as they used the original formula. The majority of candidates gained at least partial credit in part (b), although marks were lost through failing to find the square root or through premature rounding. Other errors included using 91.6^2 or finding $\sqrt{(91.6)}$ rather than $\sqrt{(91.6/\pi)}$.

Question No 14
Part (a) was well answered. In part (b) many candidates realised that finding 6 x 22.5 was an appropriate check. Others used a non calculator method to complete the division. About a quarter of candidates scored full marks in part (c). Marks were lost through ignoring the '1' or the recurring decimal notation.

Question No 15
In part (a) the correct line was selected by about a third of candidates. The most common error was to tick the third line.

Over half the candidates failed to score in part (b). A common error was to find *q* first as 65° (incorrectly from 180 – 115 = 65) and then make errors or incorrect assumptions in following through to *p*. Those candidates who did recognise *p* as 36° were generally unable to state alternate angles. Some did refer to z angles but this was not sufficient. Some abler candidates did proceed to *q* =101° but usually some reasons were missing and so full marks could not be awarded.

Question No 16
Almost all candidates answered part (a) correctly but only about a quarter were able to find an expression for the nth term. The common error was ‘n +2’. In part (c) the majority of candidates were able to score at least one mark but it was rare for 2 marks to be awarded. Candidates generally found one or two products and showed that the answers were in the sequence. For full marks candidates were required to justify the product of <u>any</u> two terms also being a term in the sequence.

Question No 17
Most candidates gained some marks in this question. In part (a) about half wrote the correct equation. In part (b) the majority plotted the correct points but some failed to join them. About a third of candidates found the correct values of x and y but few drew the line $y = 3x$. Other errors included reversing the values, drawing $y = x/3$ and giving values such as 1, 3 as the answer.

Question No 18
About half the candidates scored marks in this question, generally for finding the volume of the whole cube and possibly a small cube or the 2 by 2 by 6 cuboid. Few candidates reached the correct volume as they generally ignored the ‘overlap’. Some candidates were clearly only considering areas and others just recorded a figure with no indication of the calculation involved.

Question No 19
Very few correct solutions were seen to this question. About a quarter of the candidates realised that it would be helpful to find the length of the side of the square but few then recognised that they could use Pythagoras. Surprisingly some candidates attempted to solve the question using the formula from question 13b which involved the area of a circle!

B392/02 Higher Tier

General Comments

The number of candidates for this paper was similar to last summer and the majority were entered at an appropriate level with only an insignificant number failing to gain at least 20% of the marks available. The paper differentiated well while giving all students the opportunity to demonstrate higher level skills. Questions with no responses were quite rare and, when evident, did not appear to have resulted from any lack of time.

The AO3 questions (4b, 6, 7biii, 8 and 11) requiring students to interpret and analyse problems using mathematical reasoning to solve them were generally tackled effectively but many would benefit from setting out the work in a more logical manner.

Questions 2b and 4b were the two areas where QWC had to be considered. There were many good attempts at answering these questions and it was quite rare for no marks to be awarded in either case. Equally only the best candidates gave a complete enough explanation to consider full marks.

Calculators were used effectively throughout and it was encouraging to note a generally sound understanding of trigonometry in the five questions where it was either possible or appropriate. In many cases, however, accuracy was compromised by the use of premature rounding.

Comments on Individual Questions

1 A successful start to the paper with the majority demonstrating good calculator skills in part (a). Estimation was used to good effect in part (b) although those who used a complete method (long division) made occasional errors often arriving at 22.5 instead of 202.5. Most recognised the correct fraction required in part (c) without the need for working.

2 The large majority identified the error in part (a) correctly.

In part (b) a high proportion of candidates found both angles correctly although only a minority scored all four marks due to missing reasons. As this was a QWC question it was expected that a correct reason was clearly linked to the appropriate angle and alternate was required for angle p rather than Z angles. Use of information contained in part (a) was not usually evident and the most common error in the calculation was to give q as 79°.

3 Part (a) was a straightforward ratio that caused few problems for all but the weakest candidates who often attempted to divide by 7 and/or 2.

In part (b)(i) most were able to cope with the multiplication and understood the meaning of mixed numbers but occasional answers of 5.25 or 21/4 were seen.

Those who understood the concept of reciprocal or inverse were able to accurately give 1/7 as a correct response to part (b)(ii) while some using calculators were able to score by recognising the need to indicate that the decimal was recurring. The most frequent incorrect answers were 1 and -7.

Part (c) was well answered by better candidates but values of 11 and 10 were often seen in the wrong order. A small number failed to take on the requirement for whole numbers and gave 1.1 : 1 as their final response.

4 Part (a) was well answered by a large majority of candidates. Only a few failed to identify the need for '2n' with n+2 being the only significant misconception.

The most successful candidates in part (b) were those who made reference to the general idea that the product of odd numbers is odd with many gaining both marks by also stating that the sequence only contained odd numbers. Simply demonstrating specific examples was quite common. Those who attempted an algebraic explanation usually gained one mark for either (2n + 1)(2n + 1) or for (2a + 1)(2b + 1) without developing the expressions far enough to gain both marks.

5 Another well answered question with parts (a) and (b) invariably correct.
In part (c) the graph of y = 3x was required in order to score full marks and most candidates made a successful attempt at this. Generally, however, the correct values for x and y were found with or without the graph.

6 There were many correct answers here and those who failed to achieve full marks usually managed to gain credit for calculating volumes of appropriate sections of the shape. The five methods given in the mark scheme were supplemented by some quite ingenious alternatives. Successful calculations were often illustrated by annotations or additional diagrams. The most common approach was to find the volume of the whole cube before taking smaller sections away (small cubes, cuboids or a combination of both). Reasons for loss of marks included failure to process the centre cube (leading to an answer of 168), counting the centre cube more than once (144) and multiplying the cross sectional area by 6 (192). A very small minority were obvious in their attempt to find surface area.

7 Expansion of the bracket in part (a) caused few problems but re-arranging the equation was less successful with problems encountered when trying to bring together the x terms.

Part (b) had mixed results with the majority showing competence in the process of substitution in (i). The re-arrangement in (ii) proved to be more difficult as is often the case when square roots and fractions are involved. Many made a poor start by giving a first step as $A^2 = P \times R$.

The final part (iii) was handled quite well with many candidates astute enough to use A = 1. The most common error involved a failure to square the value for A when testing the calculation.

8 The majority obtained the side length of the square correctly although some weaker candidates divided the area of 36 by 4 to get 9. Most then went on to use Pythagoras successfully and found the diameter. Common errors at this stage were forgetting to halve in order to obtain radius and premature rounding of $\sqrt{72}$ to 8.5 giving an answer out of the required range. A small number tried to use a variety of circle methods involving π.

9 Most coped well with the basic trigonometry in part (a) and achieved full marks for method although many lost the accuracy mark due to premature rounding of 3.6 ÷ 8.6 to 0.4 or use of 7.8 for $\sqrt{61}$ (using Pythagoras). Part (b) was also affected by the use of 7.8 for the third side when using ½ x base x height. Some assumed that the missing side was the hypotenuse and used Pythagoras incorrectly. The candidates who used trigonometry to find the area of the triangle were usually successful and avoided the use of 7.8 leading to an answer of 14.04 which was outside the range.

10 In part (a) the most common approach to solving the equation was to use the quadratic formula. This was probably because the coefficient of x^2 made it more difficult to factorise and most attempts failed to gain any credit. Solutions from completing the square were virtually unseen. Inevitably the complex nature of the formula led to errors usually with signs or through failure to include -5 as part of the quotient. A significant minority still resort to trial and improvement with limited success and some attempted to re-arrange then 'solve' the equation.

The very best candidates correctly simplified the algebraic fraction in part (b) and a few more managed to use a correct common denominator without getting any further. Most simply failed to score at all.

In part (c)(i) the relatively small number that obtained correct answers for both u and v tended to use trial and improvement although a decent proportion gained a mark for expanding $(x + u)^2$ correctly. Part (ii) was the most successful part of the question with a large majority giving an appropriate value for x.

11 The first part of this question was quite challenging and very few managed to demonstrate how the equation given in the question was derived. Many scored a mark for giving the length of QS as 4 or ST as (3 - x) but it wasn't generally understood that use of Pythagoras was required to move on from this. The solution was less complex once it was realised that some basic re-arrangement gave a relatively simple linear equation leading to 4/3. Some lost accuracy marks for giving this value as 1.3 in their final response.

12 Better candidates who clearly understood the idea of inverse proportion wrote clear, succinct working leading to the correct answer in part (a). An equal number indulged in large amounts of algebra which included either $\sqrt{x}$ or x^2 or both often trying lots of values without success. Common wrong answers were 50 and 20 with the latter scoring SC mark(s) if obtained correctly.

Part (b) was less successful even allowing for a follow through from an incorrect value for k in (a). A common error, even among those who used a correct method, was to calculate $\sqrt{8}$ instead of 8^2. An incorrect answer of 1 was frequently seen (obtained from 50 in the first part).

13 It was encouraging to see that so many candidates either understood the general shape of a cosine curve or were able to calculate sufficient values to produce an adequate sketch. Only a minority failed to score at all in part (a). Marks were often lost for curves that crossed the x-axis too often between 0 and 360 and for those that more closely resembled straight lines.

In part (b) most seemed to realise that a translation was required but a large number moved the curve in the x direction. It was often possible to identify three correct points on their curve for 1 mark (usually maximum, minimum points and intersection with the y-axis). Common errors involved incomplete sketches and lines that crossed the original graph to the right of x = 2.

14 Only exceptional students scored marks in part (a) of this question despite the fact that the general idea of congruence seemed to be understood. Most managed to identify the relevant triangles and referred to the right angles and the sides of the parallelogram. However, this often led better candidates to look for RHS. Properly reasoned solutions were very rare with “parallel lines” or “sides of a parallelogram” deemed to be enough to show JM and KL were equal. Angles other than the right angle were not often considered. Another common misconception was that the diagonal of a parallelogram bisects the angles at the end of the line.

Part (b) was better answered but a large number failed to recognise the advantage of using the cosine rule. Some attempted the sine rule using an incorrect angle at H (usually 35°). Many weaker candidates treated FGH as a right angled triangle and used either inappropriate trigonometry or Pythagoras leading to a variety of incorrect answers. In common with several other questions, premature rounding caused a loss of accuracy in the final answer.

15 A large number of candidates obtained a correct solution to the final question allowing a very beneficial 5 marks to be awarded. For others, finding the arc length was generally more successful than calculating the length of the straight line joining A and B. A majority managed at least 3 marks sometimes failing on accuracy for the chord – once again premature rounding was responsible for inaccuracies in the final answer. Some made the mistake of working with the area formula.

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

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Facsimile: 01223 552553

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