OCR
RECOGNISING ACHIEVEMENT

GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education **J926**

OCR Report to Centres

November 2013

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General Certificate of Secondary Education

Methods in Mathematics (Pilot) (J926)

OCR REPORT TO CENTRES

Overview

This is the first November award for the pilot specification, previous winter awards having been in January. There was a significant change in entry pattern with almost all candidates being entered for both units. There was a substantially lower entry in this series than there has been in previous series. Most candidates appeared well prepared for the units and there were relatively few gaps in responses. Overall, Centres entered candidates for the appropriate tier and at a suitable time.

Candidates generally performed as expected on individual questions and it was pleasing that almost all Foundation candidates were able to tackle topics unique to this specification, Venn diagrams and tessellations.

All papers included questions which expected candidates to be able to interpret and analyse problems and to use mathematical reasoning to solve them. Examiners reported that candidates appeared to be increasingly prepared to tackle questions set in novel situations and thus achieved at least partial credit for their responses.

Examiners also reported an improvement in the quality of written communication. A weakness continues to be in providing adequate geometrical reasons when solving problems.

For all papers performance was reasonably close to the forecasts at most thresholds although there was a substantial reduction in the proportion of Centres submitting forecast grades. Centres are reminded that these are a useful guide in the awarding process.

To improve standards further Centres are encouraged to focus on the aspects raised in the detail of the reports. Centres are reminded that they are able to analyse the performance of individual candidates and of groups, comparing results to that achieved by all candidates, using the Active

Results service at www.ocr.org.uk/ocr-for/teachers/active-results.

B391/01 Foundation Tier

General Comments

Entry for this paper was lower for this sitting than for previous papers, but almost all candidates appeared to be appropriately entered. Few very low or very high marks were seen.

Time was not an issue, as most candidates answered all questions in the paper.

Candidates generally showed their working, but sometimes it was presented in a rather muddled manner. This was particularly evident in Q5, which was the question addressing QWC, where sometimes costs were written down without the multiplication for them indicated, and lists of values were given without thorough explanation.

The questions involving graphs (Q10 and Q13) were particularly well done.

Questions 4(c), 5, 11 and 12 required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Performance in these questions was generally good, apart from that in Q5.

The omission rates for this paper were low for all the questions, suggesting that there were no questions that were inaccessible to candidates, although the explanation in question 8 part (b) was omitted by a very small number of candidates.

Comments on Individual Questions

1 All three parts of this question were answered very well by a very large majority of candidates.

2 Part (a) was well answered with the majority giving an angle within the accepted range, often 45° or 50°. Even if an angle outside the range was given, it was very rarely over 90°.

A large majority of candidates selected "Acute" in part (b).

3 Many candidates had difficulty with all parts of this question.

Part (a) was answered correctly by a majority of candidates, with 0.15 and 0.5 being common wrong answers.

Parts (b) and (c) were correctly answered only by a minority of candidates, and there were a variety of wrong answers selected.

Part (d) was the answer part which had the highest success rate, although a number of candidates had the selected cards the wrong way round for parts (d) and (e).

Part (e) was the part the lowest success rate, with 10, 0.1 and 25 being common wrong answers.

4 Most candidates had correct answers to all parts in this question.

Part (a) was well answered with only a very small minority of candidates giving a wrong answer; by far the most common wrong answer was 2.

In part (b) correct answers were usually given for the probabilities, and it was pleasing that very few candidates presented their answers in incorrect forms, such as in words (eg 1 in 8) or as ratios. 3/8 was sometimes seen as an incorrect answer to part (b)(i).

The spinner problem in part (c) was well understood.

5 Many candidates scored 1 mark for multiplying *their* number of lengths by £7 and a reasonable number realised that 8 lengths were needed for one side. Many thought that you could buy a section of a length, this was condoned when awarding a mark for multiplying by £7. Few candidates calculated that 15 lengths were required, either by showing 8 were needed one side and 7 the other or by looking at total length of 22 m. Candidates often failed to set work out in a way which was easy to follow. Some did not show calculations, but just showed totals, and this lost them marks.

6 Most candidates scored some marks in this question. The centre was almost always identified, but the chord was often confused with sector or diameter, and diameter was sometimes given for the radius.

7 Part a) was well attempted, with a large majority of candidates earning the marks, although part (i) had a higher success rate than part (ii).

In part (b) most candidates earned the mark in part (i). The figures 384 were often seen in part (ii), with a large majority of candidates having the correct answer, but some had the wrong place value. In part (iii) candidates often understood that the reverse operation was necessary and gained a mark for showing figures 24, but far fewer got the place value correct. Part (iv) was the least well attempted part. It was quite common to see candidates ignore the information given and try and work out the answers from scratch. This approach was usually unsuccessful.

8 The indices in part (a) were generally well understood. Some miscounted the twos in part (iii), with 128 as a fairly common wrong answer. Some candidates made the error of multiplying the number with the index.

In part (b) there were many incorrect explanations, including the fact that 11 is not a whole number, or that 150 will not have a whole number square root so it can't be 11. There were a minority of candidates with a correct answer but these candidates often demonstrated a good understanding that 12×12 gives a closer answer to 150 than 11×11.

9 Part (a) was very well attempted with most candidates having the correct answer.

Part (b) was answered correctly by a majority of candidates, but common errors were to give 36 or 14.

In (c), parts (i) and (iii) were correctly answered by a majority of candidates, but 15 was quite often used as the numerator for the probability in part (ii). In part (iii) some candidates scored a mark for 8 on its own or given as a numerator with an incorrect denominator which did not follow through from the answer to part (b).

It was encouraging that only a small number of candidates gave answers in words, such as "unlikely" in this question.

10 In part (a) a very large majority of candidates had the correct answers.

In part (b) the points were usually plotted very well, although some candidates did not draw in the straight line, and these candidates often did not have the answer within the range for part (c) or they omitted this part.

11 It was rare to see full marks in this question but candidates were often gaining part marks in both parts of the question for giving some correct quadrilaterals. Rhombus was often incorrectly included in part (a) and square in part (b).

12 It was only a small minority who scored full marks in part (a) of this question, but there were some good attempts with quite often $3x$ correctly given but often accompanied by –5, as the minus sign outside the bracket was not understood. Although not as common, $-3x$ was also seen instead of $3x$.

Few scored full marks in part (b) but quite a number of candidates earned 1 mark for putting a minus sign in front of the bracket.

13 This was a well attempted question and a large majority of candidates scored full marks in part (a), usually for giving the acceptable answer of (–6, 2) rather than the expected answer of (6, 2). Common mistakes were to give (–5, 2) or to make the shape a symmetrical trapezium by plotting a point at (–2, 2).

When the correct shape was drawn, it was pleasing to see many candidates calculating the correct area in part (b), although the method was not always given.

B391/02 Higher Tier

General Comments

The paper differentiated quite well with marks across a wide range. It also proved accessible to almost all candidates as indicated by the extremely low omission rate. There were very candidates who made hardly any progress with almost all scoring at least 20%.

Basic arithmetic continues to let some candidates down although this particular paper held slightly fewer pitfalls in this respect.

Questions 3, 6, 9b and 12 required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Performance in these questions proved mixed, but facilities for the first of those three questions were nevertheless at least 0.5. It was particularly pleasing to note the very good attempts by many candidates at question 9b.

Question 12 was also the QWC question as indicated by the asterisk on the question number. As such it was expected that candidates should set out the solution with working and geometrical reasons for there statements. Due to this, the facility was somewhat lower as some gave no or only partial geometric reasons.

All candidates seemed to have sufficient time to complete the paper as evidenced by the very low omission rate for the later questions. Working sometimes appeared as jotted notes around the question rather than an integrated part of the response.

Comments on Individual Questions

1 In part (a) the vast majority of candidates were able to convert $\frac{3}{5}$ to a decimal. Fewer, but still a high proportion, coped with $\frac{5}{8}$ some giving 0.13 when the decimal was exact and others not managing to do the division. Many started off the final fraction the right way by reaching 0.4 but many could not complete it or round to the required three significant figures.

Most candidates were able to round the given numbers in part (b) although a few tried to do long multiplication. Some rounded 0.48 to 0 which showed a lack of real understanding of the effect this would have. Having rounded successfully many achieved one of the expected answers but a significant number divided by 2 instead of 0.5.

2 Part (a) proved a safe source of marks for the vast majority of candidates. There were, however, a few arithmetic errors.

Understanding of relative frequency is much improved and most were able to write down the initial answer in part (b). Some, though, were unable to write the fraction in its lowest terms.

Part (c) was well answered by most candidates who picked out the substantial discrepancies between the frequencies. A few however answered 'yes' or gave an unsatisfactory answer for 'no'.

3 All the special quadrilaterals were seen over both parts (a) and (b) but about three-quarters were able to score at least half marks on the question with part (a) scoring slightly higher than part (b).
A few less able candidates chose shapes that were either not the correct mathematical names like diamond or shapes that were not quadrilaterals.

4 In part (a), the vast majority gained the correct answer. By far the most common error was to evaluate $(5 \times 5)^2$.

Part (b) proved more of a problem but here too there were many correct answers. The most common source of error was dividing by 2 instead of $\frac{1}{2}$. Some others were unable to evaluate $a + 2b$ correctly with both +13 and –13 being seen.

5 The vast majority of candidates gave an acceptable answer to part(a)(i). Of course the correct answer was really (6, 2) as candidates should know the convention that diagrams are labelled round the figure, but (–6, 2) was accepted and this was the most common answer. The most common incorrect answer was (–2, 2) with an isosceles trapezium drawn.

In part (a)(ii) the vast majority obtained the correct answer. The most common error was to use AD (measured) instead of the perpendicular height, although a few used ½base ×height.

As was to be expected, part (b) proved more difficult but better candidates did it very well indeed and most candidates gained at least one mark.

6 Better candidates did part (a) well and most candidates gave an x term of $3x$. The number term proved more difficult with –5 occurring as often as the correct answer 5.

In part (b) a large proportion recognised that the sign immediately before the bracket was – but only the better candidates gave both the other signs as – also.

7 This question was meant to test that candidates knowledge of inverses and better candidates did it well with the majority of candidates getting at least one of the answers. Perhaps surprisingly part (b) was slightly better answered than part (a).

8 A very high proportion of candidates were successful with part (a).

In part (b) a large proportion of candidates lost at least on mark due to writing an equation with inconsistent units. Some were also unable to use brackets correctly in writing their equation. Those good enough to write the equation usually knew the correct techniques for solving it. Less able candidates were unable to write any form of correct equation although some of these gained the single mark available for the correct answer found by numerical methods.

9 It was very pleasing to note the good attempts by most candidates at least part (a) of this somewhat unusual question.
In part (a) most candidates followed the algorithm well and full marks were obtained by a large proportion of the candidates.

Less guidance was given in part (b), so it proved more difficult, but here too many good attempts were made and just over half the candidates gained 3 or more marks. The usual errors were made in finding the prime factors of 540 with some non prime factors such as 10 being given. A few errors were also made in using the rule having found prime factors.

10 Most candidates were able to pick out B and C as a pair of similar figures due to them being squares. Some spoilt this however by also saying that one of them was similar to one of the other shapes. Finding the other pair of shapes proved more difficult. Although some found A and D, many also thought other shapes were also similar. A common misconception was that, if the same amount was added to each side, then they were similar for example F and A.

11 Work on surds from the very best of candidates is good and the correct answers to these questions are seen more often than in the past. However, they remain a problem for middle and low ability candidates. The most common mistakes were made in multiplying $\sqrt{3}$ by $2\sqrt{3}$. A few who got all four terms were unable to collect terms correctly. Many did not appreciate the need to multiply out using brackets and algebraic techniques.

12 The question was designed to test candidates' ability to set out a calculation with geometrical reasons as required in a QWC question and also test their knowledge that "the perpendicular from the centre of a chord bisects that chord". Very few candidates included this last statement in their reasons and therefore most were unable to gain full marks. It could of course be done using the fact that equal chords are equidistant from the centre but this is not stated on the syllabus although a few candidates knew it. Some explanation of the use of angle properties of an isosceles triangle was also required and many more did that. The most common numerical mistakes were to make false assumptions such as PQ being an angle bisector of the right angle.

13 Part (a) was very well done with one of the highest facilities on the paper.

Part (b) proved the hardest question on the paper. Many candidates could not pick out the correct probabilities to use and often added instead of multiplied and vice versa. Most tried to use P(Win), P(Draw) and P(Lose) rather than the more efficient P(Win) and P(Not Win). Those using the latter were more successful. Candidates should be advised that when probabilities are given as decimals it is advisable to leave them as decimals. Many candidates turned the probabilities into fractions with only the very best then able to gain success. That said, there was some excellent work from the best of candidates with a small but significant number getting the right answer of 0.48.

B392/01 Foundation Tier

General Comments

Entry for this paper was significantly less than in January 2013. The overall candidature was stronger than for the June 2013 exam, possibly with most Centres choosing to only enter stronger Foundation candidates at this stage. There were a few candidates who were not able to make a reasonable attempt at the majority of the questions.

Overall candidates made a good attempt at all questions with very few questions having a high omit rate.

Candidates did well on money problems, basic number skills including fractions and percentages, calculator use, coordinates and basic sequences. It was pleasing to note an improvement in performance on questions involving tessellations and Pythagoras' theorem.

In several questions some candidates interpreted 'show that' as 'explain why'. Consequently they set themselves a far more demanding task which was rarely completed satisfactorily. In general 'show that' just requires a candidate to provide evidence.

Candidates continue to have difficult in using algebra to justify a statement and it appeared, in many cases, to be an unfamiliar skill.

Many candidates are showing working but a significant number continue to lose marks by failing to record intermediate steps. This was particularly evident in the angles in a triangle and quadrilateral, using a formula and volume questions.

Candidates used appropriate equipment, with no evidence of a lack of calculators or rulers.

Comments on Individual Questions

1 Most candidates made a good start to this paper by scoring at least half marks in this question. Some lost a mark in part (a) for including the cost of car parking and in part (b) a significant number of candidates only worked out the cost for one night.

2 Almost all candidates scored some marks in part (a). Whilst most were able to apply the sum of the angles of a triangle some made an error in finding the size of angle b, thinking that the three angles on the straight line summed to 180. Most candidates scored full marks in part (b). Some candidates who scored 0 would have gained a mark if they had applied the symmetry and marked the size of angle B.

3 Almost all candidates were able to use their calculator to score full marks in this question. A few squared or multiplied by three in part (c). A small number of candidates used their calculator in fraction mode.

4 Most candidates answered parts (a) and (b) correctly and the majority part (c). The only common error was to find 25% of 12.

5 Almost all candidates plotted the points correctly although a few lost a mark needlessly by failing to join the points. The majority correctly identified the triangle and found the midpoint of BC. About half the candidates gained full marks for the area of the triangle. Common errors were answers of 40 and 20 from 8 × 5, answers of 32 and 16 from 4 × 8, and an answer of 11 from counting squares.

6 In part (a) most candidates were able to solve the simple equations although an answer of 17 for the first equation and an answer of 4 for the second were not uncommon. A significant number of candidates failed to tackle part (b). Over half the candidates gave the correct answer for P but they found A more difficult with an answer of 16 being common. Some candidates failed to use the given formulas and introduced formulas involving π but generally ignoring that they were dealing with a quarter circle

7 Most candidates were able to complete all three statements in part (a). Finding the reciprocal of 2 was the least successful but was still answered correctly by over three quarters of the candidates. Most were able to write the fraction 3/20 as a decimal and to find at least one equivalent fraction.

8 In part (a) most candidates appeared to have met tessellations but some drew diagrams with square and rectangular gaps in random positions. Most were able to find the perimeter of the shape and to draw the enlargement. Some candidates tried to explain the area factor in the final part but they were only required to show that the area of B was four times the area of A. It was sufficient to state the two areas, 4 cm² and 16 cm².

9 About three quarters of the candidates were able to show that the rule worked for consecutive numbers. Some misinterpreted the rule and doubled the first and last numbers, others looked at the differences between numbers and in part (a)(ii) a significant number failed to give 5 consecutive odd numbers. Less than half the candidates were able to write expressions, in terms of n, for the next consecutive numbers. Most made some attempt but errors included just 2, 4, 6, 8 and incorrect algebraic expressions such as n^2. Few candidates were able to use the expressions to show that the expression was always true. They tended to simply substitute values. A few candidates having realised that they needed to use their expressions then found difficulty in simplifying their two expressions.

10 In part (a) the majority of candidates were able to record the next three square numbers. A common error was 16, 256 and 65536 from squaring the previous number. In part (b) most candidates were able to continue the sequence but a minority were able to find the nth term. The most common answer was $n + 3$.

11 Most candidates answered part (a) correctly. Marks were lost for failing to draw the straight line or for misinterpreting the vertical scale and incorrectly plotting (10, 1200). A significant number of candidates did not attempt part (b) and only about a third of candidates were able to write the correct formula. Common errors included $y = 120/x$, $y = x/120$, $y = 1200x$ and $y = 120$. A large majority were able to convert the amount in yen to pounds. The most reliable method was to find 15000/120 as those who attempted to use the graph sometimes made errors in reading the scale.

12 Most candidates scored in part (a) but only about a quarter were able to demonstrate that Kato was wrong. In general candidates converted the fractions to decimals and then stated that a third was not halfway, rather than commenting on the differences. Some did find 3/8 or 0.375 and say that this meant a third was not halfway. Part (a) was rarely assistance to candidates in answering part (b) and indeed the most common answer was 1/6. Few reached the correct answer.

13 Candidates answered all parts of this question well. The common errors were 2/10 in part (b), not ordering the parts correctly or not simplifying the ratio in part (c).

14 In part (a) over half the candidates realised that they needed to use Pythagoras' theorem but a significant number added rather than subtracted the squares. Few candidates gained full marks in part (b) but some gained part marks for attempting area of cross-section × 8. Common errors including failing to divide by 2 for the triangular prism, multiplying all lengths together and finding the surface area.

15 Candidates found this question difficult. They failed to recognise that they were finding the value of $p + q$ and so there was no need to try to find the individual values. Few appreciated that BCDEF was a pentagon and, even if they did, they stated that the sum of the (interior) angles was 360. A few split the pentagon into a triangle and a quadrilateral, making erroneous assumptions. A reasonable number of candidates scored one mark for finding the value of angle BFG but the accompanying explanation was weak.

16 Candidates made a reasonable attempt at identifying the correct multipliers. The least successful part was reducing 68 by 23% with many candidates selecting the division.

17 About half the candidates correctly solved the equation, with many structured algebraic solutions seen although some found the solution by inspection after noting that $2x - 1 = 5$. A common error was in expanding the bracket to $6x - 1$. Candidates were less successful in part (b) with many just finding a value, usually 2, which fitted the inequality. Others having solved the inequality as an equation gave an answer of 1.2.

B392/02 Higher Tier

General Comments

The marks for this paper ranged from 3 to 87, although the number above 80 or below 10 was low. Very few candidates failed to get into double figures and it was clear that the large majority had been entered at an appropriate level. The number of instances where no response was offered was low and it is obvious that students are being advised to attempt all questions. The whole paper could be completed without the use of mathematical instruments but an electronic calculator was required. The accuracy of questions involving trigonometry was sometimes affected by the use of calculators set to use radians or gradians. Centres are advised to ensure that all candidates are working with devices that have been set in the correct mode of operation (degrees) before starting the examination.

Many candidates produced work that showed a clear method and was generally well presented. Some improvement was also evident in the presentation of the lower scoring scripts for this session. It is clear that centres are encouraging students to consider their responses more carefully and ensure that answers are justified by appropriate working. The more functional questions, where little guidance is offered regarding method of approach, would benefit from greater attention to the order and care of work. Examples of questions where this may well produce better results include 9, 10 and 15.

Questions that required candidates to show good quality written communication (2b and 4 on this paper) were answered more effectively than in previous sessions and question 2 on sequences was particularly successful. The calculations offered for question 4 showed a good understanding of interior angles but incomplete work, and lack of acceptable justifications, frequently resulted in lost marks. Overall, it was apparent that candidates are identifying these questions and showing a better understanding of the need to explain each step in the process leading to their 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

1 Part (a) was usually correct with only a small minority making errors when simplifying the ratio.

In part (b) the ratio question scored well again with errors more likely to occur through incorrect ordering often resulting in a ratio of 1 : 2 : 3. The fraction was also generally correct with occasional errors when cancelling. Some assumed a total weight of 10 oz rather than 12 oz leading to answers of 1/5. The method for finding the percentage was clearly understood by most although there were those who gave the answer as a fraction. The main reason for the loss of one mark was the tendency to round to 33% or 30% (often without showing a more accurate value).

2 The majority of candidates scored both marks in part (a) and responses involving a single term were not seen. Those who failed to gain full marks invariably gave answers of 26 and 677. They had used the given expression (n^2+1) and input the previous given term (5) instead of the term number giving 5^2+1 and then used the result of this calculation to get 26^2+1 = 677.

Part (b) was the first of the two questions requiring good quality written communication and it is pleasing to note that the majority of candidates understood the need to explain every step of their work. Many scored full marks here. A relatively small number lost marks for giving a completely correct response that lacked adequate reasoning for the first two terms. Variations of n^2+1 were occasionally used with the idea that it constituted a different equation (eg $n^2+2–1$ or $n^3÷n+1$) and some poor notation was evident ($n3$). Some of those using $3n – 1$ made a similar error to that seen in part (a) leading to terms including 14 and 41.

3 Most recognised the need to use Pythagoras' theorem in part (a) and applied the process correctly. A small number lost marks because they didn't understand the need to subtract the squares. Hence, 4.2 from $\sqrt{}(3.9^2 + 1.5^2)$ was a common, incorrect answer here. Some attempted to use trigonometry with limited success due to the more complex nature of the method.

Following through from an incorrect answer in part (a) frequently allowed candidates to score full marks in part (b) usually for an answer of 25.2 or better. Additionally, most managed to score some method marks in this part for their area of the end section × 8 as long as they used a 2D value for the area. Some failed to include 0.5 when finding the area of the end and a small number simply multiplied all three sides. There were others who attempted to find the total surface area.

4 This was the second of two questions that tested written communication and failure to score any marks at all was quite a rare occurrence. Most candidates correctly identified angle BFE as 138° and the majority gave the sum of interior angles as 540° with many mentioning pentagon. Some used quadrilateral and triangle or three triangles to reasonable effect. A considerable number stated the names/shapes used to help memorise angle theorems (eg Z angles, C angles and F angles for alternate, co-interior and corresponding). These were not given credit for the required geometrical reasons. Others did not use the reasons in the correct context often confusing corresponding and co-interior or stating alternate segment for alternate angles. The other major misconception was to consider BF and the line joining C and E as parallel and incorrectly stating the lower parts of angles p and q as 138° and 42°. This sometimes led to confusion over which angle was being described as 138° and doubts about the origin of 270° in the final calculation.

5 Both questions in part (a) were answered well by a large majority of students. A rounded version of 1.2^5, without evidence of the more accurate value required, was the most common reason for loss of the first mark. The second answer, required in standard form, was sometimes converted to 7 500 000 000 000 while there was also some misunderstanding of the calculator display when $7.5\ ^{12}$ was given as a final answer.

Part (b) was equally successful with a variety of correct responses; many using 25, 50, 75 and a range of values with powers of 10. A few candidates failed to notice that both numbers were required to be whole.

6 Part (a) was answered well by the better candidates but caused some confusion among weaker students. Most managed to find the increase of 14p but fewer understood the need to divide this by 46 and it was quite common to see 14 or 46 divided by 60 or 100. Many used trial and improvement to find a number that multiplied by 46 to give 60 or 14 but did not appreciate the accuracy required with 30.5% and even 30% given as common incorrect answers.

Part (b) was generally more successful with a large number scoring full marks. More errors occurred in the part where there was a need to understand the calculation for reducing a value with a relatively small number showing a lack of understanding of multipliers. Some of these related an increase of 5% to a multiplier of 1.5 rather than 1.05.

In part (c) equivalent fractions were used appropriately in many responses although some used decimals to reasonable effect before converting back to a fraction. It was quite common to see an answer of 1/6 from using the difference between the denominators of 1/8 and 1/4.

7 A better understanding of algebra was evident in part (a) and the correct answer, with appropriate working, was provided by a large majority. The most common errors included an incorrect expansion of brackets giving eg $6x - 1$ and $5x - 3$, subtracting 3 from both sides or incorrect rearrangement of terms at the second stage often resulting in $6x = 12$ and $x = 2$. There was some use of trial and improvement.

Part (b) showed a decent understanding of inequalities and fewer students seemed to feel the need to use equations before replacing the inequality at the end of their calculation. Most reached at least $5x > 6$ with some struggling to obtain a correct final set of solutions. Common errors involved dividing 5 by 6, changing the inequality or retaining an equal sign. Some candidates attempted substitution and produced a single example of a value of x that satisfied the inequality.

In part (c) the more knowledgeable candidates factorised correctly and easily spotted at least $x = 1$ and usually both answers while some started with incorrect factors and failed to score at all. Many others chose to use the formula as their preferred method. A typical error here was a failure to deal with –4 properly, both at the start of the formula and under the square root. Some tried to rearrange the equation (eg $3x^2 - 4x = -1$ or $3x^2 = 4x - 1$) and failed to progress any further. Those using trial and improvement usually only managed to find $x = 1$.

8 The table in part (a) was correctly completed by a high proportion of candidates with occasional errors on negative signs or use of –1.25 for –1.125.

The graph in part (b) showed a high level of accuracy and neatness from the better candidates who clearly understood the requirements for producing good quality curves. Inaccurate plotting was the downfall of many others with points often way outside the tolerance allowed and some placed in the wrong quadrant. Attempts to draw a curve through all points were often spoiled by a certain degree of carelessness. A lack of understanding of the general shape of a cubic graph was evident in some cases. Lines were frequently ruled between points.

9 This was one of the more functional questions that required a more carefully considered approach with logical presentation of method. Candidates who immediately spotted the tangent function generally used it correctly and went on to find half the angle at A before multiplying by 2 and obtaining the correct angle with the minimum of effort. Many used Pythagoras' theorem to obtain AC = 7.071 before using sine or cosine to achieve the same result. There were others who used the sine rule but some of these seemed to be hampered by the presence of sine 90° and didn't seem to realise its value. Weaker candidates simply tried to use angles and, having taken the two right angles into account, assumed a split of 120 to 60 for the two remaining angles at the top and bottom of the kite. This was one of the questions where accuracy marks could be lost through the use of an incorrect mode on calculators.

10 The majority failed to access this question with any level of success. A small number found the correct radius by realising that $2r$ was found by subtracting a quarter of the circumference ($\frac{1}{2}\pi r$) from 20. A slightly larger number reached this stage but failed to make any further progress. Many others ignored the two straight lines, assumed that 20 was a quarter of the whole circumference and gained the special case mark for following through to a value of 12.73. In some responses there was some confusion between the formulae for area and circumference.

11 Part (a) was quite well answered with only a very small minority failing to score. While most understood the process of expansion there were some errors in collecting terms (usually giving the x term as $\pm 2x$). Weaker candidates had problems multiplying –3 and –1 variously given as ±4, –3, or –1.

The most common error in part (b) was a failure to square both sides of the formula before proceeding further. The minority who started correctly often went on to rearrange the terms properly and reach the required answer. A greater number showed poor understanding by trying to move *a*, *b* or *c* independently from within the square root.

Candidates who understood the need to factorise, and were familiar with the difference of two squares, gave a positive response to part (c). Many proved able to factorise the numerator but, without the factorised version of the denominator, made no further progress. A large number simply crossed out letters and numbers at random often attempting to incorrectly cancel *x* terms.

12 A majority gave correct answers in part (a) probably by reflection although at least four different trigonometric pairs were commonly seen. Most errors occurred when trying to use 20° where, unlike the more common forms, the *x* coordinate used sine and the *y* coordinate used cosine. Some gave the values in decimal form despite being asked for exact answers.

In part (b) most candidates drew a full circle with centre at the origin or part of a circle with a radius of 3 but only a relatively small minority did both and scored full marks. Many seemed to be plotting points rather than understanding the shape for this formula. It was quite common to see a radius of 4.5 from dividing 9 by 2 instead of using its square root.

The first part of (c) caused many problems with only a small minority scoring any marks at all. The equations were often added or subtracted as if they were linear in an attempt to solve them. It was common to see an explanation that started with the given trinomial and the concept of “show that” seemed to be rarely understood. This was one of the two least accessible questions on the paper.

Although the majority correctly chose to use the formula in the second part of (c) there was an overall inability to cope with the negative values involved. Using –2, in place of 2, at the start of the formula, and correctly squaring –2 within the square root, usually led to answers where the signs were reversed (0.82 and –1.82). The other common error was to incorrectly evaluate $(-2)^2$ as –4 leading to $\sqrt{20}$ and answers of 1.62 and –0.62. Despite the request for two decimal places a small number tried to factorise.

13 This was the other question that had very limited access for the large majority of candidates. It would appear that the midpoint theorem was virtually unknown and was quoted in one or two responses only. Any marks scored usually came from three line statements with no reasons given sometimes accompanied by SSS. The most common misconception was to consider triangle ABC, and often the smaller triangles, as isosceles.

14 In part (a) many treated at least one of the triangles as right angled and attempted to use Pythagoras’ theorem or various forms of inappropriate trigonometry. Some of those who used the cosine rule, and gained a mark for a correct substitution, failed to evaluate it correctly due to working out all numerical values before finally multiplying by cos48° (12.25cos48° = 8.19...).

Part (b) was generally answered a little more successfully although it was still only a minority that managed to score full marks. Again, a large number were trying to use basic trigonometry, cosine rule (with insufficient information) or even Pythagoras' theorem to find the required angle. Many candidates who selected the sine rule as their chosen method placed the sine of the unknown angle as a denominator and this invariably caused errors when attempting the rearrangement.

15 The majority of candidates scored one mark here for finding the volume of the glass (113.097) or the liquid (56.548) and it was extremely rare for anyone to progress further than this. When an appropriate method (eg $3V \div \pi r^2$) was attempted the original radius of 3 cm was often used leading to an answer of 6. Some used the incorrect formula for the volume of the cone (eg πrl), obtained 113.097 by an incorrect method and failed to score. Very occasionally the correct answer was obtained by trial and improvement. The correct scale factor for length ($2^{1/3}$ = 0.7937...) was only seen on one or two occasions.

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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