Oxford Cambridge and RSA

GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education **J926**

OCR Report to Centres June 2014

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General Certificate of Secondary Education

Methods in Mathematics (Pilot) (J926)

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 2, 3(e), 5(d) and 9(b) required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Performance in these questions was generally good, but in 3(e) some candidates did not give evidence of trying different combinations, and in Q9(b) some candidates appeared to find the investigative nature of this part daunting. Question 9(b) was the QWC question as indicated by the asterisk on the question number. As such it was expected that candidates should set out the solution in a clearly explained way and many candidates found this part to be challenging.

It was encouraging that there were good attempts at the probability questions with fewer candidates giving non-numerical answers when probability answers were required. Q10 part (a) involved using a Venn diagram and many candidates scored well on this.

The omission rates for this paper seem to be 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 a large majority of candidates getting the correct answer in part (a) and a majority having the correct answer in part (b). 514 and 504 were common wrong answers to part (a).

2 This question was very well answered, with most of the candidates who scoring 2 marks. Very little working was shown in most cases. A few candidates scored 1 mark for the addition of the ages totalling 15 which was either by 13 and 2 or 7 ½ and 7 ½. Very few gave Mrs Archer with 8 years and not Mr Bing with 7.

3 Part (a)(i) was answered correctly by almost all the candidates. Parts (a)(ii) and (a)(iii) were also well attempted, although sometimes candidates gave an even number and a number which was not a multiple of 5, through either not reading the question clearly or not understanding the terms.

A substantial minority had the answer to part (b) correct and there were a variety of incorrect answers.

A large majority had correct answers to parts (c) and (d).

Most candidates seemed to understand that they had to perform a subtraction for the problem in part (e), but many seemed to write one solution down and not think about trying out other combinations to gain the smallest answer. Many candidates gained 2 marks for a correct subtraction and realising that there should only be a difference of 1 in the tens digits, but quite a number scored just one mark, usually for a correct subtraction. A very small minority earned the 3 marks for the correct solution.

4 Part (a)(i) was very well answered by a large majority of candidates, with 27 being the most common wrong answer. In part (a)(ii) there were a number of answers of 26.21 seen, but a majority of candidates did answer correctly.

Part (b)(i) was very well answered. Those who did not score a mark generally put ‘thousand’. Part (b)(ii) was not well answered by most candidates. A large majority tried to work out the actual answer, rather than an estimate. Of those who did estimate, a good proportion estimated both values to the degree which was required on the mark scheme, and then went on to give the final answer correctly. Others scored part marks, usually for the 5000 rather than the 30, and a number of candidates scored the special case of 26×5000=130000 for two marks.

5 Part (a) was answered correctly by most of the candidates with, “green” being the most common wrong answer.

Part (b) was far less well answered, with “blue” being a very common wrong answer.

Finding the probability in part (c) was well answered by a large majority of candidates, although some candidates used 10 as the denominator. There were also some who thought that a word, such as ‘likely’, is adequate when asked for a probability.

It was pleasing to see many good attempts at the problem in part (d) and most candidates scored 1 or 2 marks for having a total of 10 and/or having the correct equal amount of a colour. It was only a very small minority who earned the full 3 marks. The majority lost the mark for keeping green at 6, as it was given that the probability stayed the same, and these candidates did not seem to understand that by taking marbles out of the bag, the number of green would have to decrease in order for this to happen.

6 In part (a) a large majority of candidates had correctly ruled lines and those who did not score 2 marks, usually earned 1 mark for the at least three of the points being plotted.

In part (b) very few scored the full three marks and this was because there were very few correct perpendicular lines drawn. Many scored 2 marks for a correct parallel line. Those candidates who scored 1 mark usually earned it for two lines through the correct two points, rather than a parallel or perpendicular line.

7 Most candidates had the correct reflection in part (a).

A very large majority also earned at least one mark for the rotation, with the majority of those earning two marks for the correct answer although many earned 1 mark for a rotation either in the wrong direction or of 180°.

The translation in part (c) caused more problems with a number of candidates leaving this blank and a variety of incorrect attempts. There were however a good minority of fully correct answers and also many candidates gaining 1 mark for translating the correct amount in one direction, or reversing the translation components.

Part (d) was well answered, but marks were lost through candidates only giving one of the two letters or giving an extra incorrect one.

Finding the scale factor was well understood in part (e). It is difficult to tell whether some candidates understood the word 'congruent' in part (e) or whether they were just naming transformations, as 'enlargement' did crop up frequently alongside a correct answer. Many were giving letters of the triangles despite none of them being congruent. A few candidates did not answer this question.

8 Many candidates did not know how to multiply the fractions in part (a). Those who did often scored 1 mark for 3/36, but then failed to simplify. A common error was to add the numerators and multiply the denominators to give 4/36.

Part (b) was well answered in both sub parts. In sub part (i) mostly 7/10 was given, but there were a number of answers of 70/100 seen. In sub part (ii) a common error was 17/10.

In part (c) a majority of candidates did not have the correct answer, with a range of incorrect answers given, but a common error was to give 2.5.

In part (d) few candidates had a correct argument. A large majority of candidates tried to say that 2 and 5 were not factors of 14, or that 2 was and 5 was not. Very few gave 7 as a prime factor. Some said that 2×7=14 but did not explain about the 'primeness' of these.

9 Although Q9 had a relatively high omission rate it was encouraging that part (a) was well attempted by a good minority of candidates, and there was a reasonable number gaining both marks here. Many earned 1 mark for identifying the prime factors but leaving them as a list rather than showing them multiplied. A large number also gained a mark for at least making a start on a factor tree. Common incorrect responses were to simply list factors or give 1 or more factor pairs.

Some candidates were put off even attempting part (b), possibly due to its investigative nature, and some thought that just to fill in the answer line was sufficient, despite the amount of working space provided. A large majority of candidates scored no marks in part (b). Good candidates however, were gaining 4 marks here by showing different dimensions of cuboids and finding some surface areas. Some candidates scored 1 or 2 marks by considering at least one more correct cuboid or finding the surface area of the given cuboid. A main misconception was to compare the areas of the different faces of the cuboid. Many candidates did not consider area of the faces.

10 A large majority of candidates scored at least 1 mark in part (a), usually for the '10'. A few scored SC1 for the two numbers adding up to 17. Very few scored for the '7' without the '10'.

In part (b) there were often good answers presented, with follow through marks awarded quite often in part (b)(ii). In part (b) it was encouraging that very few candidates had incorrect notation, although there were cases of fractions seen along with wording which was not contradictory.

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 6b(ii), 11, 13b above 0.1. Very few candidates produced marks in single figures suggesting that there were smaller numbers for whom entry at the Foundation Tier may have been a more rewarding experience. Question 13 proved a very demanding end to the paper and probably contributed to 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 and, in questions 5a and 5b, the failure to understand the processes, led to a fairly substantial loss of marks by some candidates.

Questions 7b, 8b, 9b and 13b required candidates to interpret and analyse problems and use mathematical reasoning (AO3). With the exception of question 7b, candidates found these very challenging and marks were fairly low.

Question 7b was also the QWC question as indicated by the asterisk on the question number. As such, it was expected that candidates would investigate the situation fully. It proved a satisfactory test with a range of responses and marks which reflected the overall spread of marks for the paper.

Working was usually shown but sometimes was muddled and difficult to follow. The examiners reported some difficulty in reading some of the numbers which candidates wrote.

Comments on Individual Questions

1 There were many correct lines with some calculating coordinates using all x values while others used only 2 or 3 values and drew their line through these. Some had correct points for the positive x values but incorrect for negative values. It is hoped that, at higher level, candidates should have been expecting a straight line and checked obviously wrong points. A few had short lines or correct points not joined. In part (b), the correct answer was very common, sometimes after an incorrect line, but a number used the intersection with the $y = 2$ or $x = {}^{-}2$ lines.

2 All four parts were well done by many candidates and the award of 4 marks was fairly common. In part (a) ${}^{-}36$ was a very common error from $(6 + 3) \times {}^{-}4$ and in part (b) ${}^{-}10$ or 4 were frequently seen after $7 - {}^{-}3$ or ${}^{-}3 - 7$.
4 000 000 was the most common wrong answer in part (c) presumably forgetting the extra zero from $8 \times 5 = 40$. Extra zeros were fairly common in part (d) with 9000, 9 000 000 and even 90 000 000 000 being frequently seen.

3 Middle and high ability candidates did part (a) well. ${}^{-}4g$ was often seen with the $12f$ either from removing the bracket as $7f - 1g$ or following ${}^{-}3g - 7g$. A few did not simplify after removing the bracket or only partially simplified either the f or g terms but not both. Some followed ${}^{-}3g - 7g$ by $+10g$.
Parts (a) and (b) were well done by a large majority of candidates although some weaker candidates gave fairly predictable wrong answers of y^{12} and m^4.

4 This whole question was well done by a majority of candidates. A common error in part (a) was to put 15 in the subset C ∩ S' and hence 2 in (C U S)'. This was somewhat disappointing as a lead had been given by potting the 3 in C' ∩ S. The rest of the question was done well although some candidates simply wrote 5 in part (b)(iii) rather than the probability.

5 Part (a) produced a very mixed response. Better candidates spotted that a total of 5 decimal places in the two numbers to be multiplied meant there should be 5 in the answer. Only a few stated that since 4 × 8 = 32, the answer should end in 2, with a few making errors in 4 × 8. Most tried to estimate the answer using eg 5 × 2 or 6 × 2 which of course did not work as a method. Some seemed to think that whole number parts and decimal parts could be worked separately.
Conversely a good rough estimate was a suitable method for part (b) but counting decimal places which many suggested did not work. Better candidates realise that dividing by a number less than one meant that the answer was bigger than the dividend, but that was not always expressed very well.
Parts (c) was much better done than parts (a) and (b) In part (i) some omitted the three zeros or rounded to the nearest hundred or ten thousand. There was some confusion between significant figures and decimal places in part (ii) where 0.00568 was also quite common.

6 Better candidates did part (a) well. Common errors were to reverse the *x* and *y* movements or to draw a triangle with the bottom point at (1, –3). Almost all candidates recognised the scale factor as 3 in part (b) but only the better candidates could find the equation of the mirror line. It was disappointing that many candidates did not attempt to draw the enlargement.

7 A large majority were able to gain full marks in part (a) but it was also fairly common to see the correct factors just listed or even as a sum. The usual method was to use a factor tree. Just a few merely listed all the factors of 60.
Part (a) was the QWC question and candidates were expected to show the investigation fully. Most made a good attempt but some omitted one or more of the cuboids, usually 2 × 2 × 15, or gave extras or repeats. Repeats were not penalised. Extras, usually had sides of 1 cm but also some had a volume not equal to 60, were only penalised for full marks. Some numerical mistakes were also made in otherwise correct methods for surface area. This resulted in a small majority of candidates gaining half marks or more for the question. Unfortunately all too many higher level candidates were unable to calculate the surface area of a cuboid which should be a basic skill. Common misconceptions were confusion between surface area and volume and thinking surface area meant the area of the top. Having said all that, there were many excellent solutions and it was pleasing to note how many saw the connection with part (a) of the question.

8 Part (a) was well done by a large majority of candidates. As four term factorisation is not on the specification, part (b) was set as an AO3 question to see whether candidates would recognise the common factor $2x + 3$. Many did recognise the common factor but most could not proceed to the fully factorised form $(2x + 3)(x + a)$.

9 Most candidates could reach the correct fraction for the addition. Only the weakest added the numerators and denominators. Part (b) was also an AO3 question and only the best candidates recognised that the answer to part (a) meant that $\frac{5}{6}$ of the trench was dug in one hour and hence the answer was reached by calculating $1 \div \frac{5}{6}$. The most common wrong answers were 1.5 hours from assuming they dug half the trench each or 2.5 hours from averaging 2 and 3.

10 Part (a) was quite well done with most reaching the figures 72 but some having difficulty getting the correct power of 10. Part (b) proved more difficult. Unfortunately the majority of candidates could not cope with dividing 2.4 by 3 or 24 000 by 30 000 000. Even some of the better candidates who did reach 0.8×10^{-3} followed this with 8×10^{-2}.

11 Better candidates knew the method of multiplying the numerator and denominator by $\sqrt{3}$ and the very best could proceed to $4\sqrt{3}$. Some only multiplied the denominator and hence reached $12\sqrt{3}$. A large number of candidates, however, seemed to write random calculations and answers with just a few seeming to reach the correct answer fortuitously.

12 Parts (a) and (b)(i) were well done by the majority of candidates. However treating the events as independent in part (b) was relatively common. Unfortunately many candidates in part (b)(ii) added instead of multiplied and vice versa. Some gained partial success with one of the two products. That said, the better candidates showed the fully correct method although this was sometimes spoilt by adding numerators and denominators in the final calculation.

13 This question proved the most difficult on the paper. It was, of course, an AO3 question and was expected to test the best candidates. Many candidates have little understanding as to how to set out a geometrical proof with correct reasons for each of their statements. Some worked with numerical answers in degrees. In part (a), those using the method with TPQ as isosceles usually did not justify this by stating that tangents from a point to a circle are equal. Those using a line OT usually did not justify it as bisecting angle PTQ or being at right angles to PQ. In part (b) many candidates stated what they had to prove i.e. they used the alternate segment theorem to justify statements. Those reaching angle POQ = $108 - x$ usually failed to justify it with reasons. A few candidates picked up one or two part marks by stating that the radius was at right angles to the tangent or that PRQ was $90 - \frac{1}{2}x$ due to the fact that the angle subtended at the circumference was half the one subtended at the centre. There were however, just a few excellent solutions from the very best candidates.

B392/01 Foundation Tier

General Comments:

Entry for this paper was lower than last year but most candidates were appropriately entered with few very high marks seen. Candidates performed well on questions involving basic sequences, inverse operations and basic angle facts. Some candidates appeared to be unfamiliar with some of the more demanding topics such as rearranging formulas, angles of a regular polygon, the *n*th term of a sequence and using Pythagoras to find the distance between two points. Unfortunately many also lost marks on some of the easier topics such as finding perimeter of a shape and rounding to a given degree of accuracy. There were also a number of occasions when the use of money notation was poor. Candidates generally showed their working, but too often it was presented in a rather muddled manner.

There were three questions addressing QWC. For two of the questions 7b and 13b most candidates realised that they needed to show their calculations and write a conclusion. In 17b candidates realised that they had to give an explanation rather than simply give examples to justify the statement. In 10a, not a QWC question, candidates appreciated that they needed to show calculations to support the given solution.

Candidates appeared to be adequately equipped although it seemed likely that some were using unfamiliar calculators.

Comments on Individual Questions:

Question No 1

Most candidates were able to perform the calculation in part (a) but many were unable to then write their answer correct to the nearest penny. Common wrong answers included 235.55 and 235.6. The calculation in part (b) proved more problematic with many candidates not using the correct order of operations and 15 489 000 was a common error. Rounding to the nearest thousand pounds proved even more challenging and so full marks were only obtained by about a quarter of the candidates.

Question No 2

Most candidates were able to continue the first two sequences but the third term-to-term rule proved more challenging with many simply adding on 6 and so 16, 22, 28 was a common wrong answer. Others having found the 3rd term 26 then made simple errors in their arithmetic.

Question No 3

About a quarter of the candidates were unable to find a perimeter in part (a)(i), either giving the area or counting the squares around the shape (for example the perimeter of the 3 by 2 rectangle was often given as 14 cm). Most candidates recognised that the perimeters were even numbers.

About a third of candidates gave fully correct solutions in part (b) but a similar number failed to score at all. A common error was to ignore the instruction re using nine squares. Candidates were more successful in finding the largest perimeter than the smallest with the possibility of a square often not being considered.

Question No 4

This question was very well answered, particularly parts (a) and (c).

Question No 5

Most candidates understood equivalent fractions, decimals and percentages. Generally the two percentages were correct but some failed to simplify 4/10. Only the ablest candidates gained full marks as finding the equivalences for 66 2/3% proved problematic with common errors including giving the pair 11/25 and 0.44 and giving either truncated answers for the decimal, 0.66 or 0.6, or sometimes whole number answers such as 66.

Question No 6

In part (a) most candidates were able to identify at least one of the angles of 130° (and avoid any mislabelling) and many found all three. In part (b) most candidates were able to work out one of the angles, generally a = 60°. Only the better candidates were generally able to find c =70°.

Question No 7

Almost all candidates were able to find the cost of one carton in part (a) but a substantial number omitted units or used units incorrectly.

The majority of candidates attempted to find the cost of single cartons in part (b) but again some lost marks for incorrect monetary notation or truncating answers. Some candidates used more informal methods, such as comparing the 6 carton and 10 carton prices to £3.60 and full solutions did gain credit.

Question No 8

It was surprising that part (c) was the most successful part in this question. The common error in part (a) was 15/8 having added 1 and 7/8. In all three parts a significant number of candidates gave decimal answers and this gained partial credit in part (c).

Question No 9

The majority of candidates answered parts (a) and (b) correctly. It was disappointing that only about a half of the candidates were able to identify a cuboid with square faces as a cube. Some gave answers such as square-based prism but many gave names of 2D shapes. A common error when finding the dimensions of the cube was to divide 1000 by 3 or 6. About a quarter of candidates found possible dimensions in part (d) with 5, 5 and 40 being the most common correct solution. Others found three different integers with a product of 1000 and some had solutions such as 20, 20 and 2.5, forgetting that they were using centimetre cubes.

Question No 10

In part (a) a minority of candidates were able to write a satisfactory justification for the number of tiles. The most common correct answer was to find the area of the floor and the area of one tile and divide. A common wrong answer was 450 – 300 = 150. Others tended to multiply and divide numbers until they reached 150. In part (b) about a quarter of the candidates gained full marks. Various diagrams and calculations were seen from other candidates but they were rarely credit worthy, other than those who used the ratio 1 : 3.

Question No 11

A minority of candidates scored in part (a). Errors were varied but it appeared that more candidates thought $a>17$ meant ‘a is less than 17’ than ‘*a* is more than 17’. Some failed to write a full inequality so needlessly lost a mark. Candidates were clearly more familiar with the demand in part (b) but very few scored full marks. A common error was to give a final solution $x = 7$ rather than $x < 7$.

Question No 12

In both parts many candidates just swopped x and y. A few used a correct method in part (b) but then failed to write their final expression in an acceptable form. Others tried to use a correct method but made an error in the order of operations on in the inverse operation.

Question No 13

Most candidates were able to find 8% of £1.50 in part (a)(i). Others tried to use a non-calculator method but made errors with finding 1%. Candidates were generally able to score in part (ii) but a surprisingly large number subtracted rather than added their amount in (i).

In part (b) about a quarter of candidates were able to find one quantity as a percentage of another and they generally scored full marks. A significant number found the multipliers from fruit to jam but they always assumed the larger multiplier, strawberry, meant greater percentage. Some used proportionality or fractions, but not all were successful.

Question No 14

Most candidates scored at least one mark in this question but very few scored full marks. There was very little evidence of any working such as substituting values.

Question No 15

In part (a) about a third of candidates divided 360 by 15 but some then subtracted 24 from 360 or 180. Few candidates used their answer in (a) to complete part (b), other than those who appeared to just halve their answer to part (a).

Question No 16

Very few candidates realised that they needed to use Pythagoras to calculate the length AB. Some realised they needed to find AB but they generally assumed it was 6 and gave an answer of 36 and others 'manipulated' the coordinates, for example two solutions seen were 4.3 × 10.6 = 45.58 and 10 × 4 = 40 and 6 × 3 = 18 then total 58.

Question No 17

Most candidates worked out that there were 17 squares in the 5^{th} pattern. In part (b) very few were able to find the expression for the nth term and the common answer was $n + 4$. About half the candidates made a reasonable attempt to explain why there could not be an even number of squares in the squares, usually referring to the starting square being odd and then adding on 4 an even number each time.

Question No 18

Few candidates were able to find the correct values in part (a). Some simply recorded 7 6 5 4 assuming that the graph was linear. Almost all candidates were able to plot the coordinates in part (b) and some correct curves were seen. There was a tendency for the turning point to be pointed. Few candidates were able to answer part (c) sometimes because they could not follow through from (b) but more often because they did not appreciate what was required.

Question No 19

Over half the candidates scored some marks in this question, usually for attempting to find the area of the square, but only the ablest scored full marks. A common error was using the wrong formula or values for the area of the circle. A few lost a mark for premature rounding of the circle area.

B392/02 Higher Tier

General Comments:

The marks of candidates entered for this paper ranged from 5 to 90 with 63% scoring more than half of the marks available. Centres appear to have a good understanding of the requirements for this specification and very few candidates stand out as being entered at an inappropriate level. It is apparent that students are being well advised regarding their method of approach to the examination and the majority are showing appropriate working with fewer questions left with no response. The nature of the questions left scope for all candidates to positively demonstrate their knowledge and skills and there was no evidence of candidates having insufficient time to consider all questions.

Presentation continues to improve slowly and better candidates are generally adopting a logical approach when problem solving (eg Qs 5, 7, 11c, 13a and 16). There is, however, still a significant number who lose marks on this type of question due to an inability to plan an appropriate route through to a solution. A minority still scatter work in a random fashion around the page in an effort to find something that may lead them somewhere. The question that required candidates to show good quality written communication (Q14) was answered effectively up to a point, but solutions accompanied by an explanation based on the one key issue (scale factor for area) were in a minority. In most responses a general case was not considered and many simply gave the side length of the hexagons an arbitrary value and embarked upon complex calculations with varying degrees of success. However, it was clear that the question was generally identified as QWC and, in many cases, an effort was made to ensure statements were clear and accompanied by written justification and calculations.

Mathematical instruments were not a necessity on this paper but calculators were often required and used to reasonable effect - premature rounding of values did cause some problems (particularly in Q13a). Algebra continues to improve although many still prefer to work with embedded values in equations - the questions involving the use of brackets were generally well answered.

Comments on Individual Questions:

1 It was very rare to find a candidate who didn't apply the correct method in part (a) and thus obtain the answers required. The figures involved ensured a good start to the paper and the only misconception of any note was to divide 360 by 5 and then by 7 to get £72 and £51.43. Part (b) was also well answered by a large majority with the occasional misread or misunderstanding of the question leading to 27 ÷ 2 × 3 = £40.50. There was an almost equal mixture of fraction and decimal answers in part (c) but these were invariably correct and the vast majority scored the mark here. The calculation in part (d) also caused few problems and most managed to arrive at a response equivalent to 7½. However, a considerable number failed to convert their answers (7.5, 15/2, etc.) successfully to a mixed number and lost a mark for an incorrect form or due to a failure to cancel correctly. Occasionally, the multiple of 35 was applied to both parts of the fraction to give 105/490, 21/98 or 3/14.

2 The use of a calculator seemed to be instrumental in the high level of success in parts (a) and (b). Only a relatively small number of responses displayed any evidence of the method normally associated with these problems. Common wrong answers in (a) were 1/10 and 11/100. The large majority understood how to work out the reduction of an amount by a percentage in part (c) although few attempted the more direct method of 42.95 × 0.8. The use of 42.95 - (10% + 10%) sometimes caused problems with rounding or truncating leading to an answer of £34.35 or £34.37. The reverse percentage required for part (d) was less well answered. The most common error was to use 261 × 0.84 leading to answers of 219 and 220 (or 219.24 from those who failed to consider that the answer related to a number of people).

3 Those who understood that the sum of exterior angles was equal to 360° and divided by 15 invariably went on to obtain the correct answer in part (a). There was a considerable number, however, who attempted a more complex method by finding the sum of interior angles (2340°), dividing by 15 and then subtracting from 180° in order to get to the correct response. However, many made errors in these calculations and frequently used interior + exterior = 360° leading to an answer of 204°. Others simply stopped at the interior angle of 156°.
Part (b) showed a better understanding of interior + exterior = 180° and many candidates who failed to get a correct response in the first part gained a follow through mark for correctly subtracting their answer to (a) from 180°.

4 In part (a) it was evident that the processes required for manipulating linear equations was generally understood and the negative value of x only affected a minority (16 – 10 often became 26 or -6). Many of these managed a special case mark for proving that they could solve an equation in the form of $3x = n$.
Part (b) proved to be more challenging but the better candidates coped well with the fraction with the most successful starting the process by multiplying by 3. Many resorted to converting ⅓ to a decimal (0.33 or better required) but the use of 0.3 meant that both working and answer failed to score due to loss of accuracy (eg answer of 19.2).

5 The majority of candidates realised that they needed to form a right angled triangle with AB as the hypotenuse and went on to provide clear working leading to a correct response. It was pleasing to note that so many went from $\sqrt{45}$ to an area of 45 without the need for further calculation. Those who did resort to a calculator often showed evidence of premature rounding and obtained a less accurate result in the range 44.89 to 45.02 without loss of marks. The most common incorrect answers were 36 from 6 × 6 and 26.83... (perimeter) from 6.7082 × 4.

6 Part (a) was answered well by so many that it was not possible to identify any common errors. Part (b) was also reasonably successful with most realising that a difference of 4 in the terms resulted in that number appearing in the formula. This was usually correctly given as $4n – 3$ but occasionally appeared as $4n + 1$ (probably as a result of using $n = 0$ for the first term) although the most common incorrect response was $n + 4$. Explanations for part (c) usually involved either an explanation of why $4n – 3$ couldn't be negative or a description of one square initially in place with an even number of squares added each time. In each case written explanations often missed a key point and failed to score both marks (eg failure to mention that a multiple of 4 must be an even number or that the sequence started at 1).

7 The better candidates produced some excellent work here with many working in terms of π throughout. Most made an attempt at this question with the majority scoring at least one mark. Common errors involved use of the circumference for a complete circle or the inevitable confusion with the formula for area. There was also some doubt about the base of the shape and many seemed to think that it was included in the calculation for circumference and, hence, felt the need to subtract 5 or 10 from their perimeter rather than add the radius of the larger semi-circle.

8 This was well answered with many different pairs of numbers giving a product of 3.2×10^8. A few miscalculated the number of zeros but still managed to gain a mark by arriving at a number with a value of 3.2×10^n as an incorrect response. The most common errors were to divide by 2 to get 1.6×10^4 or to find the square root of 3.2 usually leading to $1.78... \times 10^4$. A large number of answers seen did not use standard form.

9 The table in part (a) was usually completed successfully with occasional errors coming from $x = -1$ (leading to $y = 2$ or 1) or from $x = 0$ (leading to $y = -2$). It was equally rare to find that their points had been plotted incorrectly in (b) but the drawing of the graph was less successful. Marks were often lost for careless curves that missed their points by an unacceptable margin or for points joined by straight lines. In part (c) the majority knew how to use their graph although some only gave one solution, missed the negative sign from -0.4 or made errors in reading the scales. Some tried to solve the equation by calculation but usually failed and resorted back to the graph.

10 Finding the mid-point in part (a) was straightforward for the large majority of candidates but a small number encountered a problem with the negative value. It was rare to see any working. Those who understood the concept of a perpendicular bisector usually managed an accurate locus in (b)(i) despite the distinct absence of any construction (not deemed necessary due to use of square grid). There were occasional arcs, not joined, and a number of random points located at various positions between A and B. The other error of note was a locus arising from points which were equidistant from the line connecting A and B resulting in two parallel lines connected by semi-circular ends. The better candidates used $y = mx + c$ to obtain the correct equation with a gradient of -1 but there were many who really didn't understand where to start often failing to give an equation at all or simply leaving the answer space blank.

11 In part (a) expansion of the brackets was well executed by most candidates. Errors usually involved a failure to correctly square the first terms giving $2x.2x = 4x$ and sometimes gathering the other terms to get $12x$; 3×1 was often given as 4. Although part (b) was less well answered it was pleasing to note the large number of students who could both recognise and factorise the difference of two squares. Those who did not share this knowledge often tried to use just one bracket but using expansion as a check should have told them that their answer was incorrect. In part (c) better candidates started with the correct equation, re-arranged to get a trinomial and used the formula to obtain the two correct roots before discarding the negative value and rounding to leave 6.36. The majority, however, scored at a lower level with many failing to multiply the two sides properly leading to $x^2 = 19$ and 4.3588. Trial and improvement resulted in some success and the award of method marks where appropriate.

12 A very high proportion reached 4.9 in part (a) scoring full marks. Most of the remainder gained the method mark for either a correct substitution (before failing to find the square root of the whole quotient) or for failing to round to 1 decimal place. In part (b) many found the rearrangement difficult and only the most able candidates scored full marks. Common errors were failure to obtain $4\pi^2$ when squaring, subtracting 2π instead of dividing and multiplying by *g* as a first step.

13 In part (a) the majority identified the need to use Pythagoras and went on to complete the question effectively with some losing a mark due to premature rounding at an intermediate stage. The best candidates realised that finding a square root at this stage was not necessary and reached $\sqrt{49}$ without resorting to the use of a calculator. Many simply found the length of one of the diagonals on a face of the cuboid. A small number had no idea that Pythagoras was required and simply multiplied the figures given in the diagram ($2 \times 3 \times 6 = 36$ then $36 \div 2 = 18$) finding half of the volume. Part (b) tested trigonometry from a different direction to the way that it would normally be taught. Those who understood the question simply placed values on the diagram to give AC = 2BC and scored both marks. Others embarked upon a calculation involving a stated side and trigonometry with some success. A number of impossible solutions could have been avoided with a little thought (eg AB must be the longest side because it is the hypotenuse). Many evaluated the angle of 63.43° (and 26.57°) but didn't know how to proceed with this information.

14* This question was designed to test QWC and the very best candidates handled it well by providing a concise solution, well explained and based on the fact that an area scale factor of 4 (2^2) is obtained from a length factor of 2. The majority of these spotted that the shaded area was 3/4 of 1/6 of the whole shape and gave an accurate answer of 1/8 with minimal fuss. At the other end of the scale, however, a large majority scored one mark only for simply realising that the hexagon could be divided so that each kite shaped section (when joined to the centre) consisted of 1/6 of the whole shape. Many of these then applied a factor of 2 to give a final answer of 1/12. Others showed a little more understanding and realised that the shaded part was larger than the small piece attached to it and, still using a factor of 2, arrived at 1/9. A large number assigned a value to various lengths, including the sides of the two hexagons, and used a variety of calculations (including some quite complex trigonometry) in an attempt to obtain the fraction required. Among these, perhaps the most successful were those who worked on a right-angled triangle obtained from using 1/12 of the large and small hexagons. This made it easier to see that the ratio of areas within the larger triangle was 3 : 1. The quality of presentation and explanation always plays a vital role in awarding marks for this type of question but, in too many examples seen here, there was very little structure to the candidates' thinking which made many of their arguments difficult to follow.

15 The majority of candidates didn't seem to understand the concept of inverse proportion and a considerable number simply scored a special case mark for an answer of 1.25 in part (a) obtained from the use of direct proportion. Those who started their response with a correct equation ($p = k/v$) usually went on to obtain $k = 8$ and a correct answer of 3.2. Part marks, other than SC, were exceptionally rare here – it was mostly a case of either knowing how to do it or not knowing where to start. In part (b) most of those who had used inverse proportion earlier scored at least one mark for a correct substitution of their value for k into $0.5 = k/v$. Many of these failed to process the equation correctly and re-arranged to get $v = 0.5 \times 8 = 4$. An answer of 1 from 1.25 in (a) was common.

16 Candidates should be made aware of the requirements for responses asking them to "show that" and to emphasise the point that starting with the given value/fact will inevitably lead to no marks being awarded. This was the case in the vast majority of responses to part (a) and only a very small number scored any marks at all here. The given side length of 17.3 (or 8.65) almost invariably appeared in the first line of working. Additionally, there would be some benefit gained from coaching the skill of producing a simplified drawing from a diagram shown in the stem of the question. Another common error was the number who, possibly due to seeing the 3-D diagram, launched into calculations involving the volume of the sphere. Others obviously thought that the area (or circumference) of the circle was significant. Part (b) was far more successful and it was pleasing to see the correct volume obtained by "legitimate" means. A large proportion of successful candidates used $\frac{1}{2}ab\sin C$ to find the area of the equilateral triangle eliminating the need to use another calculation to obtain the vertical height. There was a significant number who thought that the area of the triangle was $\frac{1}{2} \times 17.3 \times 17.3$ but they usually scored B1 for multiplying by a length of 10 leading to a volume of 1496.4... Others used 17.3 as the vertical height or as the length of the prism. Again the role of the sphere was often misunderstood and some attempted to subtract its volume from their volume of the prism.

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