GCSE

Methods in Mathematics (Pilot)

General Certificate of Secondary Education **J926**

OCR Report to Centres

January 2013

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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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OCR REPORT TO CENTRES

Overview

Entries for individual units and for final aggregation showed a significant increase on January 2012. This increase was particularly evident for the foundation papers and for Methods 2. All examiners commented that entries appeared to have been more targeted this session, with far fewer candidates missing out questions on the higher level papers than in previous January sessions and generally only those who were competent in most areas of the specification being entered for the foundation level papers. This was a major factor that led to all papers having a higher mean mark than in January 2012 and most having a higher mean than in June 2012.

The vast majority of candidates appreciated the need to show working in their responses and so they gained partial, if not full, marks for individual questions. However, too often the working was jumbled and difficult to decipher, with numbers often appearing without any working and then being used in subsequent calculations. It appeared in many instances that candidates had failed to consider their final answers with respect to the context and whether or not these answers were sensible. Examiners commented on some improvement in the quality of written communication but there continues to be a tendency to only show calculations with no reference to the situation. For example, the inclusion in Q13 Methods 1 foundation of ‘base area’ and in Q4 Methods 2 foundation of ‘4 plant tray’ would have aided candidates’ communication. There were instances, particularly when lines were provided in the answer space, of answers being comprised of continuous text when clear mathematical statements, set out line by line, would have been more appropriate.

It was pleasing that for this session most candidates appeared to have met topics, such as Venn diagrams and tessellations, which are unique to this specification. Examiners reported an improvement in algebraic manipulation in the Methods papers but were concerned about the weak arithmetical skills demonstrated on the higher non-calculator Methods paper.

Overall results for the Methods and the Applications specifications were broadly similar although clearly many candidates were stronger in one specification than the other. For most papers performance was reasonably close to the forecasts. To improve standards further Centres are encouraged to focus on the aspects raised in the detail of the reports.

B391/01 Foundation Tier

General Comments

A good spread of performance was seen in this paper and it differentiated quite well with marks across almost the whole range. Most candidates attempted to show some working but it was sometimes disorganised and difficult to credit.

The negative number and fractions questions caused some problems, as did relative frequency and decimals. The coordinates, probability and “think of a number” questions were particularly well attempted and the Venn Diagram was also well understood.

Questions 4, 9, 11 and 15 required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Performance in these questions proved mixed with candidates scoring well on questions 4 and 11, but being less successful on questions 9 and 15.

Question 13 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. Many candidates would have benefited from clearly indicating which area each calculation related to.

In general candidates were less successful on the higher demand questions, such as those involving relative frequency and investigation of numbers that are both a square number and a cube number.

There appeared to be sufficient time for candidates to attempt the whole paper.

Comments on Individual Questions

1 This question was well answered, with a large majority getting the radius correct. In part (a)(ii) the sector was usually correct, but the most common error was giving the answer of a segment. There were some good tangents drawn, however most drew a diameter or a chord.

2 All parts of this question were very well answered. The most common error in part (a)(i) was to give 9.36 as the answer and in part (a)(ii) a common error was to give £3.20. In part (b) the small minority who got it wrong were generally adding up 50 pence a number of times and miscounting. There was little evidence of an economical method.

3 The reflection was particularly well attempted, with the most common error being to position the triangle one square too far to the right. The enlargement was well done by the majority of candidates, but some candidates simply added on squares. A number gained 1 mark by getting 2 sides correct, usually the top and left-hand side.

4 Most candidates had correct answers for both parts of this question. In part (b) some did not make use of the property that the rows and columns all needed to make 6 and they put a sign in before working out the total for each row/column according to their sign.

5 Almost all candidates scored well on the three parts of this question, very few candidates getting coordinates the wrong way round. Occasionally, D was placed at (2, 5) level with A, but these candidates nearly always earned the follow through mark for the coordinates in part (a)(ii).

6 Part (a) produced a variety of answers with a small minority of them earning the mark. Few stated that multiplying by a number less than 1 resulted in a lower number than that being multiplied. Some gained a mark by giving reasonable estimates. A good number appeared to have the idea expected, but did not convey it adequately enough to gain the mark eg "multiplying by a decimal..." rather than "by a decimal less than 1". Quite a number indicated that the answer is "too big" and this was not specific enough to earn the mark. Some were looking at the number of decimal places or the 6 ´ 2 to try to justify why the end digits of the number were not correct. A large majority had the correct answer to part (b)(i) but part (b)(ii) was answered correctly only by a small number of candidates. Common wrong answers were 1.5 or 0.15, and there were many answers that contained the digit 6.

7 A very large majority of candidates scored all three marks in this question.

8 The majority of candidates earned the mark in part (a)(ii), with many showing good details of working out, but common wrong answers in part (a)(i) were 1 from 10 - 4 - 5, and 9 from 10 + 4 - 5. There were some very good answers to part (b) but the most common answer in part (b) was $\frac{1}{2}$ from simply adding the numerator and the denominator numbers of the fraction to get $\frac{6}{12}$. Another common error was to change $\frac{1}{4}$ into $\frac{1}{8}$, giving $\frac{6}{8}$ or $\frac{3}{4}$ as the final answer.

9 The majority of candidates had the correct answer "rectangle" in part (a), and in the other two parts many gave the names of quadrilaterals, but only a small minority had the correct ones. Rhombus and trapezium were common wrong answers for part (b) and triangle and hexagon were also seen as wrong answers. A number of candidates earned the mark for part (c) by giving "kite".

10 Most candidates earned the marks for part (a) and many others scored one mark for 8 or 15 seen. In part (b) 3*n* was often seen, but a significant number of candidates did not fully simplify and left the answer as 6*n*- 3*n*. In part (c)(i) a large majority had the correct answer, and in part (c)(ii) many gained one mark for showing the first two parts of the substitution correctly, but the 4*c* was often used as 4.5. Common errors seen in part (c)(i) were to simply replace the letters with the numbers rather than multiply, hence giving 24 + 35, or to leave the letters in after the substitution was done correctly, giving 8*a* + 15*b*.

11 Part (c) was done particularly well, with many candidates giving good details of working out. The majority of candidates scored marks in the other two parts, but some lost marks in part (a) when not all the possible answers were given or odd factors of 12 were also included. In part (b), 25 was the most common correct answer but 100 was also seen. A common error was 10 or another multiple of 5 other than a square.

12 Part (a) was well answered by the majority of candidates, and of those not earning two marks, one mark was often scored for the two numbers adding to 20, giving the correct number in the universal set. Giving 20 and 35 was a fairly common wrong answer. Part (b) was well answered, with the majority earning the marks in parts (i) and (ii). Few incorrect forms such as "in" or "out of" were seen. Common errors were to just give the number in the subset, without dividing by 50, and in part (iii) 45/50, using SUP rather than S∩P.

13 There were some good attempts made for this question, but few scored full marks. Most candidates scored some marks for showing the area of at least one face. The most common error here was to fail to halve the 48 for the triangles or to not show that 48 was the total of both triangles in the working. Many candidates did not understand what was being asked of them and simply added all the lengths of the edges or did something involving angles. Some candidates used the area of the same side more than once.

14 Many candidates did not understand the meaning of relative frequency. A common error was to divide each value for number of sixes by 100, and many divided the number of throws by the number of sixes. Of those who did understand relative frequency, many had problems showing their fractions as a decimal. Part (b) had a number of good answers, but a large majority did not have the correct answer. Many said ‘Cara’ because she got closer to $\frac{1}{6}$ probability or ‘Danni’ getting the most number of sixes as the reason.

15 Very few candidates earned three marks in this question. Those that did score usually earned one mark for considering two or more squares of numbers above 3, or for 64 seen. Few candidates considered more than one cube. A majority of candidates misunderstood the wording of the question and thought that Liz was correct because 1 is the only number which has the same square and cube, rather than looking for another number which is both a square number and a cube number.

B391/02 Higher Tier

General Comments

The paper differentiated well with marks across the whole range. It also proved accessible since there were relatively few scripts with very low marks and very few cases of omitted questions. 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. This was particularly evident in Questions 1, 2 and 7.

Questions 4b, 6, 8a and 11b required candidates to interpret and analyse problems and use mathematical reasoning (AO3). Whilst most candidates were able to get some marks in these questions, full marks were relatively rarely awarded.

Question 11b was the QWC question as indicated by the asterisk on the question number. Previously the QWC question had been aimed at a lower demand question and this high demand question proved beyond most candidates. Most lacked the knowledge and skill in manipulating vectors to display any QWC.

All candidates appeared to complete the paper in the time allowed. With the possible exception of Question 4b most candidates showed sufficient working although in some questions such as Q2 this was jumbled and it was difficult to see which bit of working led to their answer.

Comments on Individual Questions

1 The work on negative numbers in part (a) was well done by many candidates. The common mistakes were the obvious ones of reaching 1 in part (i) and –10 in part (ii). In part (b)(i) most used the common denominator 8 but some used 16 or other denominators. Some weaker candidates added numerators and denominators, sometimes following a correct common denominator. In part (ii) most were able to reach $\frac{15}{90}$ but either did not cancel the fraction or made errors in doing so. A few converted the fractions to a common denominator before multiplying and then produced correct fractions or more often, incorrect fractions.

2 There were three aspects to this question, using the correct area formula, being able to multiply decimals and writing down the correct units. Only more able candidates were able to succeed in all three. Many who did decide to multiply 5.6 by 2.3 were unable to cope with the arithmetic. Others multiplied 5.6 by 2.8, often incorrectly, or tried to use splitting up methods, which were often unsuccessful. Of those who obeyed the instruction about units, most gave cm^2 but some gave cm or cm^3. A large number of candidates ignored the instruction about the units.

3 In part (a), most candidates gained one mark, for multiplying the brackets out, as +3 or - 3 was accepted for the fourth term. Only the better candidates, however, both dealt with the signs with +3 and were able to go on and simplify their expression. The simplification was marked on a follow through basis and $5x - 10 - 3x - 3$ often gained the last two marks when it was followed by $2x - 13$. All too often, however, it was followed by a further error leading to $2x - 7$, which was not awarded the marks since it came from wrong working. A number of candidates introduced an equals sign and tried to solve an equation.

Part (b) was also marked on a follow through basis and so marks were often obtained even when part (a) was incorrect. Here too, however sign errors were frequently made in isolating terms some candidates could not get from eg $5x = 11$ to $x = \frac{11}{2}$.

4 Most candidates were able to cope with the basic angle finding in this question and the majority gave correct answers to part (a). The main problems came in part (a), from candidates either misreading or misunderstanding the three letter angle convention. Hence wrong answers were often given when the correct answer was marked on the diagram. In part (b) most candidates gave angles DAC and DCA as 50°, but most omitted the working for one or both as demanded by the question. There remains confusion for some candidates between 'working' and 'geometrical reasons' but on this occasion good geometrical reasons for both angles were accepted as evidence rather than working.

5 This question was well done by most candidates with four or more marks usually obtained out of the six available. In part (a) the most common wrong answers were 3 or 8. The first three parts of (b) were usually correct although answers of x^{12}, 0 and x^5 were all seen fairly regularly. The one part that caused difficulty was (b)(iv). Although most were able to reach x^6, very few could go from there to the square root x^3. A substantial number divided the indices.

6 The better candidates did this well with many spotting that 64 was both a square and cube number. Some gained part marks by listing more square numbers and some cube numbers but occasionally errors were made meaning that 64 was missed or for example 16 was identified as 4^2 and 2^3. Many candidates thought the statement was correct as they were looking for $x^3 = x^2$ for the same value of x.
In part (b) although better candidates were successful, many simply gave a definition of a prime number with factors of only 1 and itself but gave no indication that square numbers had other factor(s).

7 It was pleasing to note the increased awareness of what relative frequency is and when it can be used as an estimate of probability. Unfortunately arithmetic often let candidates down and decimals were sometimes incorrect. Most however were able to gain 1 mark for at least two decimals correct or three fractions. It was fairly common to see the instruction about decimals ignored. Some candidates presented fractions the wrong way up. In part (b) most picked out Danni because she threw it most times. Common wrong answers were Ben because his relative frequency was highest, Cara because her answer was nearest to $\frac{1}{6}$, Danni because she got most sixes or her relative frequency was in the middle.
Part (c) was very well done and almost invariably was correct. Just a few were unable to subtract 0.37 from 1.

8 In part (a), other transformations were often included in addition to the correct ones. In particular ‘translation’ in (i) and ‘reflection’ in (ii).
In part (b), the better candidates identified reflection as the transformation but only the very best identified $x = 4$ as the mirror line. Reflection in (4, 0) was fairly common as were incorrect lines such as either axis or $y = 4$ or $y = x$. Many candidates gave a combination of transformations or a completely wrong transformation and hence gained no marks.

9 High and middle ability candidates were usually able to gain a mark for at least 4 correct decisions but only the best candidates got all 6 correct.
Very frequently $y = \frac{3}{x} + 2$ was identified as straight. Many candidates gained 1 mark for the gradients by giving 3 for the first one but fewer could get the other two gradients correct with +3 and 2 being common. A substantial number gave gradients in terms of x or

confused gradient with intercept. Gradients were often given alongside answers of 'No' but, on this occasion, these were ignored in the marking.

10 There were two anticipated methods for doing this question. Finding the reflex angle at O and halving that or forming a cyclic quadrilateral by choosing a point on the major arc AB. Most correct solutions came from the latter method. Unfortunately the vast majority either treated OABC as a cyclic quadrilateral leading to 180 - x as the answer or thought angle ABC was half angle AOC leading to $\frac{1}{2}x$.

11 The vast majority of candidates found part (a) straightforward and gained full marks. Just a few omitted letters, misplaced a letter or repeated one or two letters. The intersection was usually correct although some gave $X \cup Y$ and others $n(X \cap Y)$.
Part (b) proved more difficult although many gained one or two marks by fulfilling one or two of the conditions. The majority of weaker candidates simply drew three intersecting circles thus only fulfilling $A \cap C \neq \emptyset$. That said, the best candidates did it well.

12 There was some impressive probability work from the better candidates and most candidates were able to gain a mark for using the correct probabilities. Those who used the correct probabilities and recognised the need to reverse the order were usually but not always successful with their fraction work. A few recognised the need to look at both orders but omitted to add the fractions. A significant number used $\frac{7}{10}$ and $\frac{3}{10}$ not recognising the dependence of the probabilities.

13 Part (a) was usually correct from stronger candidates. Many candidates, however, seem unaware of what vector addition is and gave two vectors with no + sign between. An answer of $\mathbf{a} + \frac{3}{2}\mathbf{a}$ was very common.
In part (b) Very few candidates were able to make any progress. The very best were able to reach $\overrightarrow{OD} = \mathbf{a} + \frac{2}{5}(\mathbf{b} - \mathbf{a})$ but very few of them could simplify this. Even those that could reach this point were rarely able to establish the connection between $\overrightarrow{OD}$ and $\overrightarrow{OC}$.

B392/01 Foundation Tier

General Comments

Entry for this paper had doubled from last January. The overall candidature was stronger than for the June exam, possibly with Centres choosing to only enter stronger Foundation candidates at this stage.
Candidates made a good attempt at all questions with very few questions having a high 'no response' rate and it was particularly pleasing that almost all candidates scored on the last question.

Candidates were prepared to tackle more novel questions such as Q13, where they were asked to recognise the truth or otherwise of mathematical statements and give examples to back up their decisions. This was also evident in Q17b, product of fractions, and Q18b, using Pythagoras' theorem in an open context.

Candidates did well on questions involving money problems, percentages, calculator use, coordinates and basic sequences.

Some candidates struggled with the more formal algebra and tessellations appeared not to have been covered by some candidates.

A significant number of candidates confused area and perimeter, volume and surface area.

Most candidates were prepared to attempt explanations but sometimes thesewere too general and omitted clear mathematical statements. For example saying 'the angles are 360°' rather than 'the sum of the angles at a point is 360°'.

Candidates generally showed working but too often it was presented in a rather muddled manner. This was particularly evident in Q4b, one of the questions addressing QWC, where, as well as organising their responses in a more ordered fashion, responses would have been improved by the inclusion of a few words such as 4 pack and 6 pack.

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

Comments on Individual Questions

1 The majority of candidates gained full marks for this question. Others tended to make errors in the total for either bananas or oranges. Some worked out the cost of $\frac{1}{2}$ kg of bananas then forgot about the 1kg or they added in the $\frac{1}{2}$ kg twice. A few 'doubled' 75p to get £1.40. Some made an error in the overall total.

2 Almost all candidates found the terms for A and B, but the correct values for C were much less in evidence. Some reached 81 instead of 27 and then doubled it for the next value.

3 Most candidates found the shapes with equal area and over a half worked out that the triangle had the maximum perimeter. Some gained part marks for values in the shapes but it was rare to find these labelled as 'area' or 'perimeter'. The length of diagonal lines was often estimated. A significant number failed to show any working.

4 Almost all candidates performed the division and then correctly interpreted the answer in part (a). In part (b) a minority of candidates presented a clear solution to the problem. Too often calculations were just randomly jotted down in the working space. Most candidates gained at least 2 marks, often for identifying the 20 and 18 plants from the individual plant trays. Some did combine the trays but often this was just a list of prices with the final answer being seen on the answer line. Many who gave 22 as the answer did not state precisely where this had come from. It was usually possible to identify the combination used from the prices listed, but this was not always the case.

5 Almost all candidates demonstrated good calculator skills in part (a) but a few rounded 3.375 to 3.38 or 3.4.
In part (b) many candidates reached 19.1..... but then were unable to round to 2 decimal places correctly. Truncated answers were common and it was surprising to see answers such as 19.17 and 19.12. Some showed appropriate working for the method mark and some got 90.73 (but more often 90.72). A few wrote 19.10 then wrote a ‘1’ over the ‘0’ and it was not possible to identify the intended answer.

6 Almost all found 4 from a correct substitution.
In part (b), 6 was the most popular answer, followed by the correct answer of 13 and then 25. Whilst most candidates gave one of these values, other calculations such as 1200 ¸ 19 were seen.

7 Nearly all candidates gained at least 1 mark in part (a) but many entered at least one incorrect value.
In part (b), candidates often relied on a diagram and failed to investigate any patterns in the sequences. Many clearly did not recognise the square numbers, and some gave 40 or 48 for the number of unshaded tiles. Many candidates wrote out lists and often went wrong. A common error derived from the misconception that the values for the 10th term were double those for the 5th term.

8 This question was well answered with nearly all candidates giving the correct percentage in part (b). In the first part some candidates, having reached £64, then halved rather than doubled. A small number of candidates misinterpreted ‘of’ as ‘off’ and gave the answer £512.

9 About two thirds of candidates were able to draw the tessellation. Some included triangles with the hexagons but many appeared totally unfamiliar with the term and just drew 8 hexagons in the space.
Explanations in part (b) were weak, generally failing to relate to the tessellation. Some more able candidates presented a formal explanation leading to $2(n - 2)$ right angles.

10 Just under half the candidates interpreted the inequality correctly and others gained 1 mark for considering greater than rather than less than 100. A significant number of candidates missed 1 mark by stating that $n = 4$ satisfied the inequality.
The majority of candidates answered part (b) correctly, but some just tested values and rarely reached the correct answer, generally just giving 3.3 as the solution.
Just over a quarter of candidates made a satisfactory attempt at the rearrangement in part (c).

11 A popular answer in part (a) was 35, 105, 35, 40. Nearly all got the first 35, then most got the 105, but confusion set in after that for many candidates.
In part (b) about a quarter of candidates worked out that the polygon had 12 sides. As expected 6 was a common error (from 180 ¸ 30) but 5 and 7 were often seen and indeed every integer from 3 to 10.

12 Nearly all candidates plotted the three given points correctly, although a few put C at (7, 7). Very few candidates reversed the coordinates. However, candidates struggled to complete the parallelogram and point D was often wrongly plotted leading to the shape not being a parallelogram. Many candidates just tried to find the centre of a triangle. Some got the correct centre from just considering the midpoint of AC. It was however rare to see an algebraic method employed.

13 This question was well attempted by candidates. The first statement was generally recognised as being true with an appropriate example being provided. Errors for the second statement appeared to arise from failing to appreciate that they were testing whether the answer was positive or from thinking that the multiplying two negatives rule transferred directly to three negatives. A significant number gave a description as their example or considered odd positive numbers.

14 Many candidates seemed to be considering surface area in this question. Most tried to split the shape into three parts with only a few looking at the cross-section. Many miscounted the middle or right hand parts. A significant number gave 120 from considering the volume of the whole cuboid.

15 In part (a), candidates did well on the first 2 rows to be completed, although some surprisingly gave the equivalents of $\frac{1}{4}$. The last row proved much more demanding. Some got the $\frac{1}{3}$ even when other earlier parts were wrong or missing.

Less than half the candidates gained the mark in part (b) with $\frac{2}{3}$ and $\frac{3}{5}$ being the common errors.

16 This question proved very difficult for candidates, with many writing a list of calories for an ever decreasing number of minutes. As they got into decimals they became stuck and were unable to get a correct answer. Those who tried to divide numbers often got a mark for 3.3... etc, but many who reached 3.3 did not know what to do with it. Common incorrect answers were 35, 37 and 40 often from reaching 100 calories in 30mins, 50 in 15 and then estimating a figure for 120 calories.

17 The majority of candidates found the correct product but some added, some cross-multiplied and many made errors when multiplying.
In part (b) few candidates were able to find two fractions satisfying the conditions but some did manage to find a solution with one fraction >1. A significant number of candidates just found two fractions equivalent to $\frac{4}{11}$.

18 Many did well in part (a), making sensible use of Pythagoras. Some started with the 4.36^2 and generally gained 2 marks. Some candidates considered that as the question stated 'show that' they were required to write a descriptive paragraph whereas it would have been preferable to set out their answer as mathematical statements.
In part (b) more able candidates attempted to use Pythagoras, but sometimes with one length greater than 10. Other candidates considered the areas. Only the most able candidates considered both the sides and the areas.

19 Many completed the formula in part (a), or at least got one of the components.
Many drew the correct line in part (b), but some were not accurate in the drawing of the line and 'missed' (6, 180). Some did not draw their line reaching the origin and for some the line had a call out fee or did not cross the given line.

Most successfully followed through their line to give coordinates in part (c) and then many made a sensible statement about the point, with only a minority referring to 'where they cross'.

B392/02 Higher Tier

General Comments

The mark range for this paper indicates that the majority coped well and very few were entered at an inappropriate level. Candidates had obviously been well prepared and usually made an attempt to answer every problem. Sufficient time had been allocated to the paper and blank spaces were more likely to be a result of an inability to respond rather than lack of time. Additional equipment was not required for most of the questions but the majority of candidates appeared to have appropriate calculators.

The majority of candidates appreciated the need to show working in their responses and fewer marks were needlessly lost as a result. Presentation has improved to some extent but a more logical approach to some questions should be encouraged. Poor forming of letters and numbers can often lead to errors further on in the process. Weaker candidates frequently offered work that showed little evidence of a logical, progressive approach though to a solution.

The two questions requiring candidates to show good quality written communication, 9a and 10b(ii), gave contrasting results. In particular the written statement required in 10b(ii) was rarely complete enough for full marks to be awarded. It would be beneficial if time could be given to this issue, as calculations alone will rarely score full marks in this type of question. This equally applied to problem-solving questions such as 13 and 17, where presentation of working can be a factor in scoring marks. There should be a greater awareness of the effects of premature rounding of values in earlier working leading to a less accurate final answer.

There is evidence to suggest that the manipulation of algebra is improving and more complex arithmetic processes are being attempted rather than simply ignored.

Comments on Individual Questions

1 Most candidates made a good start to the paper with well over half gaining full credit in part (a) and a negligible number scoring less than two of the four marks. If errors were evident it was often the recurring decimal that caused problems with inaccurate rounding of the percentage form (usually 30%) and an incorrect fraction ($\frac{3}{10}$). The large majority scored the mark in part (b) with the most common error giving the fraction as $\frac{2}{3}$ from a ratio of 2:3.

2 A number of methods were used to work out the minutes required to burn 120 calories with the large majority scoring full marks. Those who used a calculator to evaluate 120 ´ 60/200, or its equivalent, rarely failed to reach the exact time of 36 minutes. Attempts to break the method down into stages usually succeeded. If inaccuracies occurred, they tended to be as a result of either rounding 200/60 to 3.3 (leading to an answer of 36.3636.....) or using factors of time rather than calories (eg attempting to find calories for 30, 15 or 7.5 minutes).

3 The majority of candidates understood the concept of a reciprocal and this usually enabled them to gain both marks for this question. Those who had less of an idea often gave $\frac{4}{1}$ or $^{-}4$ as the reciprocal of 4 in part (a) and 8 or $\frac{1}{64}$ as the result of multiplying $\frac{1}{8}$ by its reciprocal in part (b).

4 Both parts of this question showed a good understanding of simple algebra and most obtained a correct answer for part (a). Even though weaker candidates usually had an idea that they needed to separate the *x* terms and the numbers, some were let down by an inability to manipulate the various terms correctly and often reached either $6x = 10$ or $2x = {}^{-}5$. In part (b) those who did not gain full marks gave responses that covered every variation given in the mark scheme (most common of these was $x = 8$ and $3x \leq 14$) with only a small minority failing to score at all.

5 This question gave candidates scope for choosing a variety of different approaches to find the volume of the prism. The vast majority understood the need to divide the shape into parts. Those who chose to use the volumes of three blocks were generally more successful than those who tried to find the area of the section and multiply by *their* length. A number found the area of the cross section correctly but mistakenly multiplied by 8 instead of 3. Some candidates made errors in their calculations for volumes of the separate blocks – most commonly the right hand section (using $2 \times 3 \times 1$ instead of $3 \times 3 \times 1$) and the centre section ($4 \times 3 \times 2$ or $4 \times 4 \times 1$ instead of $4 \times 3 \times 1$). Other common answers from errors in working were 63 from a slip in finding the three separate volumes or $22 \times 8 = 176$ from a correct cross sectional area multiplied by an incorrect length. Only the weakest candidates failed to adopt a reasonable strategy. Some of these simply tried to utilise the seven dimensions given on the diagram by attempting various calculations involving addition or multiplication.

6 This question was made more accessible by the fact that a large majority understood the need for the use of Pythagoras and were able to apply the theorem correctly. In part (a) the most common approach invariably led to $\sqrt{19}$ and 4.36. A few attempted to show that 4.36 worked by including the value in their initial statement (eg $4.36^2 + 9^2$) and this scored part marks. In part (b) those candidates who found two sides that gave a diagonal of 10 usually went on to correctly find the areas of both rectangles for comparison. Those who spotted that 6 and 8 worked, or gave one length as a whole number, usually scored full marks without the need for a complex calculation. Weaker students who failed to find a correct pair of numbers often picked up two marks for a comparison of areas. A small number compared the areas of the triangles that made up the rectangles by using $\frac{1}{2}bh$ for both shapes.

7 Most showed a good understanding of practical linear graphs in this question and the number who failed to score at all was exceptionally low. In part (a) the large majority were able to give a correct equation in the accepted form and an even higher number managed to draw a quality graph crossing the given line in part (b). A small number failed to start their line at the origin and some drew the line $C = 30 + 20n$. A further increase in the overall score for this question came as a result of giving the correct co-ordinates in part (c)(i), either from a correct pair of lines or from their own point of intersection. In part (c)(ii) it was clear that most understood the need to interpret the practical situation and made reference to the prices (and hours) being equal at that point in one form or another. Only the weakest students simply made reference to the point where the lines cross or stated that it was where the *x* and *y* values were equal.

8 Part (a) was answered well and a significant majority scored both marks for multiplying the fractions correctly and giving the final response in its simplified form. Those that tried to cross multiply the numerators and denominators or started by converting to common denominators rarely progressed any further. The only other error of note was to multiply 1 × 2 to get 3 as the numerator and then cancelling to 1/6. Part marks for equivalent fractions were rarely awarded. In part (b) most correct responses used $\frac{1}{2} \times \frac{8}{11}$ or equivalent and many realised that a fraction in the form of $\frac{4}{a} \times \frac{a}{11}$ would always work. Part marks were more common here, usually for evidence of an attempt to multiply two appropriate fractions.

9 Candidates answering the first of the QWC questions in part (a) were generally aware of the need for a diagram illustrating that the pentagon could be composed of three (or five) triangles and the majority also included the appropriate calculation for two marks. In order to score full marks these two points had to be accompanied by an adequate statement to complete the proof. This was only achieved by the very best candidates. There were two main misconceptions that resulted in the withholding of marks. Some used the rule $180(n - 2)$ without stating the connection between the triangles and the pentagon. Others assumed that the pentagon was regular and worked on the mistaken belief that all angles were equal while others started from the fact that the sum of all exterior angles was equal to 360 and, therefore, the sum of the interior angles was 5 × 108. In part (b), the majority showed good knowledge of angles on parallel lines and were also able to use the sum of 540 from (a) to give both angles correctly. A significant number scored just one mark for either finding A = 132° or giving two angles in the answer that summed to 230°.

10 Most gave the correct answer in part (a) although some others made errors with signs when multiplying. Weaker candidates attempted to collect terms beyond the trinomial ignoring the rule of "like terms". In part (b)(i) the majority of candidates knew how to substitute correctly to obtain the correct three terms. The most common error here was to start by multiplying 5 and the term number before squaring and consequently gave 27, 109 and 241 as the first three terms. Part (b)(ii) was the second of the QWC questions and was answered well with most evaluating t_5 or t_{10} correctly and demonstrating that the result was not a prime number.

11 While most seemed to understand the requirements of standard form, only a minority managed to score both marks with the most common result being one mark for either 1.69 or 10^{120}. Common errors included a failure to square 1.3 and incorrect squaring of 10^{60} including 10^{62} and 10^{3600}.

12 Candidates who had some understanding of the shape of the graphs required usually gained marks. In part (a) the scorers were split fairly evenly between those who gave a good representation of the required shape and those who sketched an alternative cubic curve. Those who failed to score usually sketched either a parabola or a straight line. Part (b) tended to score either two marks or zero with only a relatively small number getting part marks. It was clear that some were trying to plot points but they were often unaware of what happened between $x = {}^{-}1$ and $x = 1$. Quite a few straight lines were drawn again in this part.

13 Around half failed to score here but stronger candidates presented their working clearly and reached a fully correct solution. Errors were quite common especially when attempting to calculate the area of the triangle by a method other than $\frac{1}{2} \times 2.1^2 \times \sin 40$. Most commonly, attempts to use Pythagoras, or the cosine rule, to find base and height rarely reached a successful conclusion. Many found the area of the complete circle but then failed to divide by 9 to obtain the area of the sector. Others used the formula for circumference. Weaker candidates often scattered calculations around the work space with little evidence of any link to their ultimate solution. Arithmetic errors and premature rounding regularly resulted in lost marks for accuracy.

14 There is evidence that far fewer candidates now rely on breaking down percentage calculations into parts (in this case 10%, 5%, 1%). Use of this method often-involved early errors that were compounded once further years were considered. The majority used a factor of 1.16 and those that used 1.16^3 were most successful. There was a good understanding of the need to round the final answer to 312 (some even stating that it wasn't reasonable to give part of a rabbit). The most common error came from use of 200 + 3 ´ 32 = 296 with a small number calculating an extra year.

15 It is still clear that only the best candidates manage inverse proportion successfully. A small minority showed a clear understanding of the process and scored full marks here. Weaker students rarely had any idea where to start and, even if they realised the need for a constant term (*k*), they did not really understand the concept of inverse proportion. It was not uncommon to see use of $\sqrt{50}$ or simply 50 while others seemed to attempt to manipulate expressions or equations with various permutations of *d*, *M*, 2 and 50. Many retained the proportion symbol throughout and failed to give an equation at all.

16 Many potentially correct responses in part (a) were spoiled by an early error in the use of the formula. Many started the substitution with $^-4$ instead of 4. This was further compounded by the evaluation of $(^-4)^2$ as $^-16$. Consequently only a small minority scored all four marks and the majority failed to score at all. Many final answers were simply the negative forms of the correct values. It is worth noting that many more candidates are attempting to solve quadratics by completing the square. In this case many of them failed to score more than a method mark for obtaining $(x - 2)^2$ without completing the equation correctly. There were a few who tried to factorise despite the need for an answer to two decimal places. Many weaker candidates simply tried to rearrange the equation and failed to make any progress at all. In part (b)(i) better candidates successfully produced two correct brackets with a further significant number scoring the method mark only due to sign errors. Weaker students usually failed to understand the form required or simply didn't understand the concept of factors at all. Part (b)(ii) was one of the questions with the highest number of blank responses and only a small minority scoring all three marks. The best candidates scored full marks and demonstrated a good understanding of the link between the previous response and the ability to factorise the denominator correctly. Most of those that picked up a method mark did so by transferring the numerator from the previous part to a fraction in this question. There were a number of attempts to cancel the unfactorised expressions given in the question.

17 Only a minority failed to score in this question although the number achieving full marks was relatively small. The best and most successful responses used Pythagoras (once or twice) followed by either cosine or tangent functions. Many of these also made the connection between two equal sides and two equal angles. Again, this type of question often brings about errors (often premature rounding) earlier in the working that spoil the final answer. A considerable number of those who had some success scored two marks for obtaining the length of AC or AO but then failed to make any further progress. The angles of the equilateral triangles (60°) were often used out of context as were the lengths of 10 cm (or 5 cm) that were sometimes transferred to lengths AO or EO. Presentation was generally better than the segment question (13).

18 Although the majority ticked the correct response in part (a), there was a surprising number who felt that it was not possible to tell if two circles are similar. In part (b) most scored either three marks for 75% or two marks for 25%. Many others made errors by working with the circumferences and some took the radius of the large circle to be 9 cm. Another common response was to give the small radius as 3 cm and the answer as 50%. In part (c), the concept of changing the scale factor for area into scale factor for length was not known by most students. Hence, many gave 1% of the radius of 6 as their final answer or used 0.06 incorrectly and made no further progress. Others found 99% of 6 and subtracted to give a final response of 5.94. Another common response was to find 99% of the large circle (0.99 ´ 113.097..) giving 111.966... and then processing this value "correctly" by dividing by p, square rooting and ending with an answer of 5.97. Only the best students scored full marks here and a significant majority failed to score at all.

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