GCSE

Applications of Mathematics (Pilot)

General Certificate of Secondary Education **J925**

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.

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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. 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 that in many instances 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. 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 the topics covered. However the examiners for Applications higher paper 2 commented that some content, in particular linear programming, appeared not to have been covered in sufficient depth. Applications' examiners reported that the majority of candidates struggle to recall and use conversions between units.

Overall results for Methods and Applications 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.

A381/01 Foundation Tier

General Comments

Performance overall appeared to be better than in the corresponding session last year (and to a lesser extent the last session). The great majority of candidates showed what they could achieve and were able to make a serious attempt at all the questions. There were some instances of part questions being left unanswered and, although these were relatively few, this was a marginal increase on the last two sessions. There was no evidence that time or literacy levels presented any problems.

Presentation and clarity of number work was generally satisfactory although instances of scant or less than clear working were in evidence. This was particularly apparent in Question 5 part (b) where a small but significant proportion of candidates presented a single number as their sole response.

Errors which tended to span the capability spectrum included poor recall of the conversion between metric units (assuming that a kilogram comprised 100 grams was sadly quite commonly seen). Candidates were inclined to treat units in general somewhat cavalierly as was evidenced by the number of wrong or mixed imperial and/or metric units given in response to Question 3 part (a)(iii). Using and manipulating algebraic expression was a significant challenge to the majority of candidates as evidenced by performance on Question 7.

The very large majority of candidates had no problem with simple numerical questions such as Question 3 part (a)(i) and (ii). Performance on the QWC question (Question 2 part (e)(i)) was better than in previous sessions. Areas of content where candidates showed a firm understanding included simple fractions and percentages, plotting coordinates and the informal use of ratio.

A number of candidates might have achieved more had they re-read some questions and reflected on their approach before actually starting. This was particularly evident in Question 5 part (b) where time spent interpreting the question would have “paid off”. Some centres advise candidates to highlight key numbers as this tends to encourage reflection.

Comments on Individual Questions

1 Overall this question was well answered by all capabilities with a very large majority gaining some credit. Perhaps not surprisingly part (b) posed the greater challenge and especially so with the less capable. Only about one in ten of all candidates gained full credit for this part and almost a quarter failed to attempt it.

2 A moderately well answered question overall but with some variation in performance between its various parts. It was very disappointing to observe that only about a third of candidates could recall that there are 1000 grams in a kilogram – by far the most common figure seen or implied was 100. The simple fraction work required in part a(ii) was accessible to the majority. This was also the case for the angle calculations in parts (b)(i) and (ii). However part (b)(iii) was the least well answered part question of the whole paper even though partial credit was available for general geometrical statements such as "opposite angles (or sides) must be equal". In part (c) the majority were able to identify congruent shapes and about a quarter gaining full credit.

Somewhat surprisingly (d)(i) only attracted a small minority who gained full credit. Some of this was the result of incorrect money notation but in a number of cases was the result of performing the required division in the wrong order. A quick consideration of the calculated cost of a single spoke might have persuaded some candidates to check their calculations. The measurement required in part b(ii) was usually accurate but credit was lost by putting incorrect units: the wrong answer of "2.4" was common whereas an answer of "2.4 cm" would have gained full credit.

Part (e) (i) was quite well answered – better than most QWC questions in the past. A common error was to attempt to give the answer in bars rather than psi as requested. The angle measurement required in part (ii) was successfully carried out by about two thirds of candidates. The most common error was to state the supplementary angle. Almost three quarters of candidates gained full credit for the numerical calculation in part (iii), which was somewhat surprising as a follow through was allowed. The success rate dropped to two thirds for the rounding of the answers in part (iii); the most common error was to round up.

3 This was the best answered whole question. An answer of "350 years" was condoned for part (a)(i) as being a slip with the present year or a more functional approach. The main area of difficulty involved the estimation required in part (a)(iii). Although in the minority there were large numbers of answers given in imperial units – where these were correct and the correct units shown full marks were available. The fraction and percentage work required in the final parts was well done by all, including the least capable and the majority of candidates gained full credit. A common wrong response to 70% as a fraction was $\frac{3}{4}$ or $\frac{1}{4}$ - possibly because they are commonly encountered fractions.

4 A quite well answered question; wherever possible (and when supported by written evidence) partial credit was available. The most challenging parts were part (a)(ii) and (c). In the former case "division by 5" was the most common error. In the latter part candidates were perhaps suspicious with having to write "one in a hundred" as a percentage as being too easy perhaps and wrote 10%, 5% or 0.1% instead so only a minority gained credit for this part question. The majority of candidates were successful in the work involving rotation and reflection symmetry towards the end of the question.

5 Overall most candidates experienced success with this question. The first part involved applying simple ratio and most gained full credit although part (b) was found to be problematic by the large majority. Many simply calculated £30 ÷ £1.65 or even £30 ÷ £1. A common incorrect answer was 19 which may well have gained some small partial credit if was clear that it arose from £30 ÷ £1.65 but unfortunately this was not often the case.

The very large majority were able to interpret the thermometer scale for part (v).

The final part of the question, part (d), which involved choosing and using word formulae was found accessible to the majority but somewhat challenging to the least capable.

6 This question proved to be one of the most challenging. This was especially so for the least capable of whom the large majority failed to gain any credit. It also had one of the largest omission rates for all candidates. The impression gained was that a proportion of candidates still think it best to work with exact values even if asked to approximate. Rounding to one significant figure correctly was only achieved by about a third of all candidates. Despite a full follow through only about a tenth of candidates experienced success with the final part of the question. There was little appreciation of the process required by $\sqrt[3]{}$. It had been hoped that candidates might recall the cube root of 125.

7 This was by far the most challenging question on the paper, and had a very high omission rate. Part (a) presented no problems for a large majority. However the algebraic demands of the last two parts proved too great a challenge for most candidates. Although partial credit was available for incomplete but correct algebraic operations few candidates availed themselves of this. A very common error in part (b) was to omit brackets as apparent from responses such as "$x – 3 \times 2 – 5$". It had been thought that the first purely numerical part of the question would have minimised common errors. A small minority gained credit in the final part by employing trial and improvement or what appeared to be inverse operation methods as opposed to formal algebra.

A381/02 Higher Tier

General Comments

A large proportion of the paper was accessible to many of the candidates although some questions proved more challenging, especially the final question. In general, marks ranged between 15 and 45 with roughly equal numbers of candidates scoring above and below this range. As in the June 2012 session the presentation of work was generally good with some scripts showing working that was clearly set out. For some candidates, working was often haphazard and difficult to follow making it difficult to award method marks when the answer was incorrect. There was no evidence to suggest that candidates were short of time on this paper although weaker candidates made no attempt at some questions.
For some candidates entry at the Foundation tier would have been more appropriate.

Comments on Individual Questions

1 Most candidates obtained the correct answer in part (a) with errors arising from numerical slips in the working or by treating 13 as the final answer and working backwards. In part (b)(i) a majority of candidates gave a correct expression but few went on to give a correct simplified expression. Others omitted the brackets around x – 3 and so 2x – 8 and x – 11 were common errors. Following a correct expression, simplified or not, it was usual to find that part (b)(ii) was correct. Other candidates were able to pick up follow through marks following an incorrect expression in part (b)(i).

2 A majority of candidates scored both marks on this question. In part (a), common errors included rounding to other than one significant figure and occasionally 400 for 487. In part (b), some candidates failed to apply the order of operations correctly and an estimated answer based on $3 \times 500 \div 4 \times 3$ was also seen.

3 A majority earned all three marks. A few picked up 2 marks for a correct method involving a numerical slip such as 100 – 65 = 45. A few of the weaker candidates earned one mark either for 35% or 60% but many of these struggled to make any headway, usually adding 65 and 40 or omitting the question altogether.

4 In both parts most candidates were able to give the correct angle. In part (a) a minority of these could not give a valid reason, sometimes stating opposite angles or corresponding angles. In part (b) a majority were unable to give full reasons for their answer, often showing their calculations instead of reasons.

5 Both parts were well answered by most of the candidates. Simple errors with the numeracy and the omission of brackets were the cause of the vast majority of errors seen.

6 A large majority of candidates earned 3 or 4 marks for well-presented solutions, with a few losing the final mark for answers of 0.7 instead of 0.70. A small minority earned two marks, usually for calculating the cost of the carrots but then followed this by dividing the weight by the cost. Another common error used £12.66 – £4.68 to calculate the cost of the carrots. One disappointing aspect was the number of candidates using 2×1.95 and $1.95 \div 10$ followed by 4×0.195, or other similar methods, to calculate the cost of the carrots.

7 In part (a), a large majority of candidates earned at least one mark with most picking up both marks. Some lost a mark by treating the petrol consumption as litres per kilometre, some by splitting the multiplications by 7.1, 7.8, 6.2 and 3.1 into parts as in question 6. This sometimes led to rounding errors or numerical slips. Part (b) proved more of a challenge and only a small minority earned both marks. There were two common errors, finding the average of 7.1 and 7.8 and also $930 \div 68.2$.

8 There were many disappointing responses with only a small minority managing to earn all four marks. In part (a), although better than part (b), a small majority earned the two marks with many of the rest picking up one mark, almost always for the correct distance. In part (b), a majority were unable to measure the correct bearing and scored no marks. The most common error was an answer of 75, the bearing of Q from P, and to a lesser extent an answer of 165.

9 Although a small majority of candidates earned at least two of the marks the modal mark was 1, usually for identifying the number of boys or girls that were ungraded. In many cases working was often haphazard and difficult to follow. Although not a QWC question candidates would be advised to annotate their working in questions like this. Many struggled to work out the number of boys or girls taking the examination. It was common to see 70 – 12 for the total number of girls.

10 A majority of candidates earned all four marks with a small number failing to make any headway. A few candidates were able to set up the two equations but could not solve them. Most errors in the solution of the equations were a result of numerical errors when multiplying or subtracting the equations.

11 Most candidates struggled to cope with the reverse percentages required in the solution of this question. Most of these simply calculated 25% of 1500 to find the profit and loss and concluded that there was no overall profit or loss. Some were able to calculate the cost price of the diesel car but then used an incorrect method for the petrol car. As this was a QWC question candidates generally made attempts to annotate their working. In some cases candidates tended to write too much explanation of their calculations. It is sufficient to write such things as ‘cost price =’, ‘profit =’, etc.

12 A majority of candidates had sufficient understanding of indices to earn both marks with a few earning only one mark by giving answers in an incorrect form. A small minority of those earning no marks made no attempt at this question.

13 In part (a) a majority of candidates earned both marks by multiplication of the correct fractions. A very small minority used specific dimensions for the rectangle and used these to show the correct fraction. Others attempted a variety of calculations including perimeters and some made no attempt at all. In part (b) a majority were able to pick up some marks but only a small minority picked up all four. Candidates who used specific dimensions generally fared better than those working with fractions, often attempting to work out $\frac{1}{4} - \frac{1}{6}$ rather than division. Part (c) proved too challenging for all but the most able candidates with many making no attempt at all.

14 Almost all candidates showed no understanding of volume scale factors and used the scale factor of the heights of the two glasses to calculate the answers to both parts.

A382/01 Foundation Tier

General Comments

All candidates appeared to have sufficient time to complete the paper. It was encouraging to see candidates applying their mathematical understanding to both familiar and unfamiliar situations. It was particularly pleasing to see so many candidates showing their working out and method to justify their answers. There was an improvement in the way students answered the QWC questions 4(e), 5(c) and 6(b) as students showed healthy combinations of text and calculations to explain their answers. Throughout the paper it was clear that some candidates experienced difficulties with the number of zeros in large numbers as well as the concept of changing units where appropriate.

Comments on Individual Questions

1 The vast majority of candidates were successful in parts (a) to (d) with a few candidates identifying the £55s in part (c) without identifying which notes made the separate £55s. Some candidates appeared to struggle with the concept of a million. Best answers usually compared their weight of a million pounds with their own body weight as their assumption, though sadly many seemed to ignore this completely. In part (e) candidates were sometimes confused by the number of banknotes and their value which was then normally correctly compared to the value of the coins. Virtually all candidates realised their answers in part (f) must add up to 1 and an impressive amount of correct answers were seen.

2 Virtually all candidates scored highly in this question as they could demonstrate their understanding of pictograms and bar charts. A few candidates erroneously compared the 200 late letters with the 800 on time letters rather than compared to the total number of letters. Any errors in the tally table made later comparisons more difficult. Best answers seen showed reference to $\frac{200}{1000}$ which was then systematically cancelled down to reveal the required $\frac{1}{5}$.

3 Most candidates managed to identify the view from S in part (a) though T and R were often confused. A healthy number of candidates managed to correctly draw the net of the Monolith despite it being quite unusual. A few candidates either added a seventh face or missed out the additional 1 by 4 rectangle that was required. There was no need for candidates to include flaps on their nets and in some cases it was difficult to ascertain whether a “rectangle” was actually a further part of the net or simply a flap to aid folding. Appropriate working out was often seen in correct answers in part (b)(ii), though some candidates still confuse ‘squaring’ with ‘doubling’ so evidence of $\sqrt{28}$ was seen, usually among weaker candidates.

4 Almost all candidates were able to access the information contained in different types of diagrams. Some candidates included both Andy & Drew in their costs and these candidates usually worked their solution through in ninths. Such candidates were rewarded with 2 out of 3 marks. Parts (b) to (d) were generally accurately answered with many candidates able to correctly interpret their findings. In the QWC part (e) a variety of comparative approaches using division or multiplication were seen and such answers usually managed full marks. Weaker responses often focussed on trying to interpret the given data or involved subtraction sums of some sort. A similar number of candidates showed their calculations but failed to provide a conclusion. There was a lot of success in parts (f) to (i) as most candidates demonstrated an understanding of scales, speed and real life graphs. Many accurate diagrams were seen in part (i) although some candidates chose to ignore the line drawn. It was exceedingly rare to award any marks in part (j) as inequalities seemed beyond Foundation level candidates.

5 There were many correct answers in part (a) with the most common approach being to find the mean rather than the median. In part (b) some candidates correctly found 10% (=1260) and then sadly doubled their answer rather than halving it. Best answers in part (b) (ii) usually considered needing to have an equal percentage of each age group. The QWC aspect in part (c) was inaccessible to most candidates although some did score part marks through trying to find the volume of the mile-long line, often by multiplying the 0.1 by 0.001. Other wrong answers often started with finding 200 cubed.

6 Candidates usually managed to highlight which squares they were counting by placing dots in the diagrams. Some sadly found the area of each rectangle rather than comparing the reservoirs themselves. These candidates generally multiplied by 0.1 twice thus in effect multiplying by 0.01. There were many excellent answers in the QWC part (b) where candidates tended to compare the total costs of buying and hiring. A few candidates successfully broke the task down and compared each item separately. A small number of candidates found their hiring charge by multiplying the values by 365. A similar number of candidates showed their calculations but failed to provide a conclusion.

7 In this question candidates were able to demonstrate their knowledge of loci. Part marks were usually seen by one or more correct circles seen though sadly some candidates did not use a pair of compasses. Very few candidates managed to draw the perpendicular bisector and thus virtually no fully correct answers were seen.

8 The vast majority of candidates scored well on this question. Some candidates struggled to explain how they could recognise the linear relationship from the graph. Some just stated that the line ‘went up’ and others said the gradient was 1. Most candidates did manage to write an equivalent statement to ‘add two and a half’. It was also pleasing to see part (b) answered so well with a lot of fully correct answers and methodical calculations shown throughout.

A382/02 Higher Tier

General Comments

There was no evidence to suggest that candidates had insufficient time to complete the paper. Examiners were pleased to note that only a small number of candidates did not attempt a question or question part.

Good use of calculators was evident and generally well done with relatively few rounding errors losing marks. However there was evidence that not all candidates had all the correct equipment for a mathematics examination, or did not know how to use it.

Clarity of explanation and mathematical justification could be improved. It is difficult for examiners to follow calculations presented in a haphazard fashion and even more problematic to second guess what calculations were used when numbers appeared, without any working, which were then used in subsequent calculations. Candidates need to be aware that method marks are awarded where method is shown and this does mean writing out calculations. Clear working greatly adds to demonstration of candidate's mathematical knowledge and understanding and allows them to gain valuable marks where they have not managed to reach a fully correct solution. Candidates should consider their final answers and/or part answers with respect to the context and whether or not these answers are sensible.

Some graph drawing was too imprecise and reading of scales incorrectly lost marks. In graphical questions, where values are read from graphs, method does include drawing lines on the graph and showing what readings are being taken.

A very small number of candidates did not demonstrate the knowledge and skills required for the demand of a higher tier unit. Examiners noted that a significant number of candidates did not appear to have covered all the content in this unit and for these candidates early entry may not have been appropriate.

Comments on Individual Questions

1 In general candidates found this question to be straightforward. The best answers in part (a) (i) stated the line was straight or the gradient was constant, common errors included stating the line was constant or giving an incorrect equation $y = x$. Part (b) was generally correct with little working was seen.

2 There were many good responses to this question with candidates showing a good understanding of what was required and achieving at least 2 marks. In better solutions all calculations were shown and evaluated correctly and referred to in the conclusion. However some candidates interpreted their answers incorrectly not realising that balloons presented the greater risk.

3 It was evident in part (a) that candidates either did not have the correct equipment or were not prepared to use it and a number of freehand drawings were seen. In general the arcs or circles were seen and centred correctly, but the perpendicular bisector was either missing or not correctly positioned. Common errors in part (b) included finding 65% of the incorrect amount or finding £3575, but not giving this as the final answer. Part (c) proved more challenging. Better responses showed all calculations used. A number of candidates were unable to find the correct number of days worked and/or the number of hours worked per day. However credit was given for finding the pay for hours worked using their figures and, where working was seen, most candidates were able to achieve at least 2 marks. Common errors in calculating holiday pay included misplaced decimal points in amounts, not dividing by 60 and writing 7.3 minutes as 0.073 hours. A significant number of candidates found a holiday pay amount higher than for hours worked and proceeded to use this in their final answer without consideration of how sensible this would be. Part (d) (i) was generally correct. The most common error in part (d) (ii) was to give values other than zero for the first three days of the week beginning 9th July.

4 The majority of candidates answered part (a) well gaining full marks. A common error seen in part (b) (i) was in determining the inequality for the final interval. Plotting in part (b) (ii) was generally good with relatively few candidates either not attempting this part or drawing a non-increasing diagram. Part (b) (iii) proved more challenging. The first and last entries were more commonly correct. A number of candidates just read the scales and did not consider what was being asked or do the necessary subtraction. Many candidates missed the fact that the total number should sum to 640 and answers could be checked by addition to 640.

5 Part (a) was generally answered correctly while part (b) differentiated well across all candidates. The best candidates were able to interpret the graph and manipulate the figures whereas more average ability candidates identified the correct values, but did not know what to do with them while weaker candidates choose numbers from the chart and tried a variety of different sums.

6 Almost all candidates gained marks in this question. The majority of candidates were able to plot points correctly in part (a) (i). Parts (a) (ii) and (iii) required candidates to use their graph; to do so required candidates to decide on joining points or a line of best fit, either was acceptable, but without a line examiners are unable to judge how candidates may have used their graph to estimate values. Where a line had been drawn the scale was read correctly in part (iii) more often than in part (ii). Part (b) required candidates to use an area scale factor, a high number did gain some marks for using the given linear scale factor. Most candidates realised that trigonometry was needed in part (c) (i) although premature rounding of 52/150 resulted in loss of accuracy. In part (c) (ii) the best responses appreciated that 'show that' requires a mathematical equality rather than an explanation in words and many correct statements using tan were seen. Only the best candidates were able to manipulate 3D coordinates and calculate the required length in part (d). Most gained some marks in this part for working out the distances required in order to calculate the required length.

7 Part (a) was generally correct with the best responses in part (i) referring to proportion or percentage. Part (b) was more challenging, better candidates appreciated the area scale factor was needed and where this was found most were able to calculate the correct radius.

8 This question was poorly attempted by the majority of candidates, in particular parts (a) and (b), who did not appear to have been prepared for questions on linear programming. A surprising number who were not able to answer parts (a) and (b) showed an ability to apply mathematics and manipulate the information given in the table and drew both the correct line and shaded the required area in part (c). Even where the earlier parts of the question had not been attempted candidates were able to score marks in part (d) and it was pleasing to see that many did not abandon this question part and did achieve marks for their profit calculation.

9 Most candidates seemed to have some knowledge of histograms and many fully correct answers were seen. A high proportion of candidates were able to interpret both tables correctly in part (a). In part (b) frequency densities were either all correct or none correct and there was no evidence of arithmetical errors. Only a minority of candidates drew graphs with incorrect width bars. Candidates did find it difficult to explain the reasoning for using different time intervals in part (c) although when part (c) was correct then part (d) was also usually correct.

10 Almost all candidates gained marks in this question grasping the, possibly unfamiliar, context and demonstrating that they could apply their mathematical knowledge. In part (a) weaker candidates were able to gain at least one mark and in part (b) the majority of candidates appreciated that the Bradford Factor would increase. In part (c) (i) candidates generally realised that once for 6 days was a possibility, but did not always find the second possibility twice for a total of a day and a half. Part (c) (ii) was the most challenging part of the question, while most candidates knew they had to manipulate $75 = S2 \times D$ they did not know how to approach a solution. It was clear from part (d) that spreadsheets were a familiar topic and candidates generally gained 2 or 3 marks in (ii) and 1 mark in (iii) for M7.

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