

# **Applications of Mathematics (Pilot)**

General Certificate of Secondary Education **J925**

## **OCR Report to Centres**

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**November 2013**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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

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## Overview

This is the first November award for the pilot specification, previous winter awards having been in January. The entry numbers were very small, presumably as a result of changes in the rules on reporting GCSE performance. Almost all candidates were entered for both units. Most candidates appeared well prepared for the units and there were relatively few gaps in responses.

Examiners noted an improvement in the quality of written communication but there continues to be a tendency to only show calculations with no reference to the situation. Candidates appeared less confident when responding to a 'show that' question. They should expect to interpret the statement and then demonstrate appropriate mathematical skills in their response.

Weaknesses evident in responses included premature rounding in calculations leading to inaccurate answers, failing to read and interpret units presented in statements or in graphs, and presenting working in a rather muddled fashion.

For all papers performance was reasonably close to the forecasts at the thresholds. A few forecast grades were missing and Centres are reminded that these are a useful guide in the awarding process.

To improve standards further Centres are encouraged to focus on the aspects raised in the detail of the reports. Centres are reminded that they are able to analyse the performance of individual candidates and of groups, comparing results to those achieved by all candidates, using the Active Results service at [www.ocr.org.uk/interchange/activeresults](http://www.ocr.org.uk/interchange/activeresults).

## A381/01 Foundation Tier

### General Comments

The entry for this unit was very small – a total of eleven candidates. The granular nature of comments inherent in such a small candidature should be borne in mind.

Overall levels of attainment were similar to previous sessions. Furthermore all candidates gained at least 20% of the available credit, although none gained more than about two thirds of the available credit. The range of attainment was narrower than usual.

The omission rate of part questions of some 8% was below previous figures, suggesting that the paper was broadly accessible to candidates. This enabled candidates to show what they could achieve.

There was no obvious indication that time was a problem for any of the candidates. The literacy demands of the paper did not appear to have a damaging effect on their ability to respond to questions. The legibility of candidates' number and written work was satisfactory or better. A minority of candidates were uncertain as to what was expected in questions indicated as assessing Quality of Written Communication (QWC).

Areas which candidates found difficult included:

- using proportion in context (Question **1(j)**)
- using operations in context (Question **1(h)**)
- calculating the areas of triangles (Question **4(d)**)
- estimating and explaining how to estimate lengths (Question **4(h)**).

Areas in which candidates showed a good understanding included:

- simple percentages (Question **1(a)**)
- using elementary indices (Question **1(i)**)
- substituting into algebraic expressions (Question **1(l)** and Question **2(a)(iii)**)
- reflecting in a mirror line (Question **4(a)**)
- calculating numerical expressions using a calculator (Question **4(e)**).

### Comments on Individual Questions

1 The majority of candidates gained at least half the available credit for this question.

In part (a), most, including over a third of the least capable, were successful.

However the majority of candidates found part (b) too great a challenge. There was no obvious pattern in the incorrect responses. The large size of a few responses suggested that candidates were distracted by the numbers 1 000 001 and 1 000 100 in the text.

Responses to part (c) showed that the large majority were confident finding simple fractions of quantities.

A large majority of candidates were successful with parts (d), (e) and (f). It is pleasing to note the success many experienced in finding the appropriate counter example required in part (d).

However part (g), which was one of the questions aimed at assessing QWC, was one of the least well done part questions on the whole paper. Performance appeared not to be a consistent function of capability. It had one of the highest omission rates and one of the lowest facilities of all part questions. A similar state of affairs was common to part (h).

Only a small minority experienced problems with the question on powers of ten which comprised part (i).

Part (j) which was similar to part (g) in its open nature was found to be too great a challenge by all but the most capable. In fact most candidates failed to gain any credit.

Both parts of part (k) were found accessible to a large majority, with the majority gaining full credit.

Most candidates found the algebra involved part (l) quite manageable, including the final part.

- 2 Although no candidates gained full credit for this question, most gained at least half that available.

In part (a) it was part (iii) that attracted most credit, with a large majority gaining full credit. This was a little surprising given that part (ii) appeared the more straightforward formula. In actual fact part (ii) had the same facility as the, on face value, more difficult square root involved in part (i).

Only a minority were able to accurately read the graph in part (b).

- 3 A quite well answered question. Most candidates were confident handling number machines within a context.

Some credit was lost in part (a) by candidates' carelessness with money units.

- 4 The majority of candidates gained at least half the available credit.

Part (a) showed that most candidates were confident in reflecting simple shapes in a mirror line.

In part (b) a number of candidates lost credit as a result of ambiguously labelling the appropriate angles. However it was clear that acute angles were most easily identified.

In part (c) the majority of candidates were successful in finding the first angle, but were less so with the other two parts.

Part (d) only attracted a minority of correct responses. Measuring the supplementary angle was a relatively common error – perhaps not unexpectedly.

The majority of candidates were able to successfully complete the calculation in part (e). A few gained partial credit.

Candidates were not confident identifying similar and congruent shapes as required in part (f).

A very large majority of candidates were able to convert metres to kilometres in part (g). However reading the altimeter scale was found a challenge by a small minority. Part (iii), which was focused on QWC and involved estimating length, was not well done, in fact it had one of the highest omission rates.

The algebraic demands of part (h) were found difficult by the majority of candidates. Only a few gained full credit, partial credit was available and a minority profited from this.

## A381/02 Higher Tier

### General Comments

Only a small number of candidates were entered for this paper. There was no evidence to suggest that candidates were short of time on this paper with all candidates attempting all questions. As always the standard of work was variable, with marks in the range 20 to 55. Presentation of work was often good with some scripts showing working that was clearly set out. For weaker candidates, working tended to be more haphazard and difficult to follow making it difficult to award method marks when the answer was incorrect. Candidates need to be aware of the need to retain sufficient figures in their workings so that their final answer is accurate; a number of marks were lost due to premature approximation of values.

### Comments on Individual Questions

- 1 This proved to be a straightforward start to the paper with almost all candidates earning four marks. In part (b), calculating the number of biscuits from the remaining butter proved to be the only error.
- 2 A majority of candidates picked up all the marks for this question. In part (a), there was some confusion about which height to use in the formulae. Almost all candidates were able to use their calculator effectively and efficiently. In part (b), almost all candidates earned full marks. When drawing graphs candidates must realise that a ruled line is expected.
- 3 This question proved more of a challenge. In part (a), most candidates attempted to convert the imperial units into metric units. A small majority were successful but there was confusion over whether to multiply or divide by 2.54. Attempting to convert into feet and inches proved more difficult; finding that 3.05m was 10 feet but then followed by an  
$$\frac{11}{20}$$
answer of 4 inches. In part (b), most candidates were able to obtain  $\frac{11}{20}$  or its decimal equivalent. Some then went on to find the capacity of the tank whilst others had little idea of how to make further progress.
- 4 In part (a) the vast majority earned both marks. Giving two congruent shapes rather than similar shapes was the only error in part (a)(ii). In part (b)(i) a variety of methods was seen, with area of triangles proving to be the most popular. Also used were the cosine rule and Pythagoras, essentially calculating the square of the side and realising that this was the area of the square. Surprisingly, not all candidates gave the correct length of the side of the tangram square, even when the correct area was obtained. Part (c) proved quite challenging with only a minority earning both marks. It was expected that candidates would use the grid on the original tangram to find 12 as a percentage of 16. Although this was seen, some candidates attempted to calculate the actual areas of the individual parts. Some attempted to use the actual dimensions of the trapezium but often came unstuck when calculating the height of the trapezium. In part (d), few were able to calculate the correct difference in perimeters. The main stumbling block was transferring dimensions from the tangram square to the pentagon. Even when correct, some then omitted one or more of the dimensions when calculating the perimeter.

- 5 In part (a), most candidates answered this question correctly, usually dividing the cost of a season ticket by the cost of a return ticket and rounding up the answer. Rounding down was rarely seen. Some evidence of trial and improvement was seen. Part (b) was challenging for the weaker candidates who made little or no progress. Those who were successful generally realised that five return journeys could be found using the profit and the loss given in the question. No candidate attempted to set up two simultaneous equations.
- 6 Part (a) proved to be a straightforward start for all candidates with most opting to use the multiplier 1.25. In part (b) there was little evidence of candidates setting up and solving an equation. When equations were seen, the incorrect use of the factor 3 was a cause of error and  $3(416 + x) = 114 + x$  was seen. The majority opted for trial and improvement, sometimes forgetting to increase the number of games won by the same amount as the number of games played. A small majority obtained all four marks.
- 7 In part (a) all candidates were able to earn some marks with only a minority earning all five marks. Calculating the journey time proved straightforward, although not all candidates converted this to hours and minutes at this stage. There was also evidence of times being changed to minutes and working with these. Some struggled to cope with the time difference but those that did usually obtained a correct answer in hours. As always, converting from times in hours to hours and minutes often caused a problem. As part (c) was the QWC question candidates were expected to show their calculations and not just provide lists of numbers. In general, candidates were able to calculate a value for the number of extra dollars but tended to lose marks needlessly, either by failing to show their calculations or by rounding numbers too early in their calculations.
- 8 A large majority of candidates struggled to make any progress. The single calculation '2400 ÷ 0.953' was not seen. Calculation year on year was used by those with the correct answer. Some candidates were able to earn one mark for an appreciation of compound percentages.
- 9 A majority of candidates showed no understanding of volume scale factors. Some used the scale factor of the heights as their volume scale factor whilst some simply reduced the volume of the larger pot by 60%. Where volume scale factor was used candidates tended to earn all the marks.

## A382/01 Foundation Tier

### General Comments

The vast majority of candidates had been well prepared for this paper and they appeared to have sufficient time to complete it. It was encouraging to see that candidates remain able to apply their mathematical understanding to both familiar and unfamiliar situations. It was pleasing to see so many candidates showing their calculations and reasoning to justify their answers. Again there were good responses to the two QWC questions – **1(f)(ii)** (where students had to consider whether to invest in a boom) and **1(g)(ii)** (where students had to find the cost of the cheapest possible pipeline). Students seemed increasingly confident in starting these questions without the need for further scaffolding.

### Comments on Individual Questions

In question 1(a) the vast majority of candidates were awarded full marks in both parts (i) and (ii). It was encouraging to see different methods used to find the volume of the stack of barrels.

In part (b) there was a great deal of correct answers with occasionally a wrong answer of \$27 seen in part (b)(i) and on a few occasions only two correct years were listed in part (b)(ii).

In part (c) a significant proportion of candidates gained the correct maximum value in part (i) but few candidates could get beyond finding the 100000 parts in their answer to (ii) and could not articulate why the ship was breaking international law. There was considerable success in parts (iii) and (iv) where almost all candidates took their area from part (iii) and transformed it into their correct volume.

Virtually all candidates managed to write two million in figures in part (d)(i), but in part (ii) many candidates failed to remember to consider the 12 hours in their response. Candidates usually managed to make a start with a calculation for the smallest number of barrels but few went on to achieve the correct answer of 3 barrels, with an unrounded answer of 2.2 seldom seen. Candidates did seem to understand what the inequality actually meant but few could show the inequality on the number line in a fully correct manner. There were a pleasing number who spotted one correct inequality in part (iv), with  $1 \leq n \leq 3$  usually the correct inequality found.

The majority of candidates scored full marks in part (e). The most common error was to record an answer of 100 in part (ii), which was the distance from Port Said rather than the distance from Suez which was asked for in the question using bold print.

In part (f) a high proportion of candidates did find the correct probability as a fraction, which they then usually managed to convert to the correct decimal. In the QWC part (ii) there were a good number of correct answers seen, with the two methods either comparing one year (£0.4 million compared to £0.6 million) or comparing a series of years (usually either 20 or 40 years) seen in equal measure with similar amounts of success. In the same part a few candidates did not seem to know how to start and a few found relevant figures but then made the wrong conclusion.

Virtually all candidates identified the correct GPS coordinates in part (g)(i) and a healthy number then went on to identify the shortest distance for the pipeline in part (ii). Those with the correct line almost always followed it through to find the correct cost of the pipeline. Weaker answers often had a stepped join between the oil terminal and the oil refinery. It was very encouraging to see the number of candidates who could successfully subtract  $-65$  from  $60$  in part (iii).

In part (h) very few candidates managed to draw the correct net, with the most common error being the addition of three 8 by 4 rectangles to the diagram. A pleasing number of candidates did manage to find the correct volume in part (ii) which they usually then managed to divide into 1000. Answers of 10.4 were seen as candidates failed to realise that the number of cuboids needed to be rounded up to the next integer. In part (iii) a large number of fully correct answers were seen.

There were a pleasing number of correct triangles constructed in part (i), with good candidate responses showing the arcs drawn. Occasionally a correct reflection of the required triangle was seen.

In question 2(a) a minority of candidates correctly found the volume of sand. Other candidates usually added only one six to the 8 m and 16 m, though sometimes they did go on to multiply their area by the depth of 0.5 m, thus gaining some credit.

In part (b) there were a pleasing number of candidates who managed to use Pythagoras effectively in their argument, though some were inelegant and lacking in precision.

In part (c) most candidates correctly found the cost of the tonnes of gravel and then correctly found their total cost. A few candidates either forgot to include the gravel or sometimes failed to round their answer to the nearest hundred as required.

The financial aspect in part (d) did trouble all but the best candidates, though some fully correct answers were seen. Usually the total bank cost was found but candidates seemed to be disconcerted by the payments listed in the table and chose instead to try to find out 5% of £5000 and use that in their deliberations.

In question 3(a)(i) a number of candidates expressed their answer of 8 in a fraction rather than as an index, though they then usually went on to find the correct percentage in part (ii). Most candidates were able to cope with the best answer being a value of 0 rather than perhaps 1.

In part (b) a high proportion of correct answers were seen, especially in parts (i) and (ii). Candidates seemed to understand comparative bar charts and lots of reasoned answers were seen in both parts (iii) and (iv). In part (iv) weaker answers talked about comparing one pair of bars or even a single bar, rather than looking for general conclusions from the bar chart.

Candidates were usually successful in all aspects of part (c). Some candidates did not appreciate the fact that having a low DMFT would be required in part (i) so their wrong answer was normally '10' or 'all of them'. Nearly all candidates knew how to work out both the median in part (ii) and the mean in part (iii), with only a small number of candidates mixing up the averages.

In part (d) best responses described how the DMFT of Germany and / or Poland had changed over the years along with a period of time when one country or the other had better or worse DMFT. A few candidates chose to consider single years alone which restricted their chances to gain marks. It was encouraging that candidates could often weave together a sentence or two that contained the threads of two or three marks.

In part (e) almost all candidates correctly identified Hungary on the scatter graph in part (i). A few candidates correctly identified the lack of correlation in the diagram or referred to not being able to add a line of best fit to the diagram. However, a small number of candidates managed to qualify this by referring to the lack of a pattern in the scattered points.

Part (f) was answered well generally with almost all candidates referring to the frequency of use of the mouthwash, usually a correct reason in part (i). A smaller number of candidates stated that the experiment should be conducted with a longer time frame. It was considered that a sample size of 100 was sufficient so responses that referred to 'could have asked more people' did not score here. In part (ii) a significant number of candidates managed to decide upon a frequency of using mouthwash that did not fit into Kerry's response space. Sadly only a very few candidates managed to produce a set of responses that covered all possible responses. Candidates would usually answer with either overlapping responses or responses containing gaps – in equal measure.

## A382/02 Higher Tier

### General Comments

The majority of candidates had been very well prepared for this paper and appropriately entered for the higher tier examination.

It was pleasing to see detailed mathematical reasoning to the QWC questions marked with an asterisk. However in other questions that required working to be shown, such as in the 'show that' question that was not labelled QWC, candidates did not always do so. It is important for candidates to appreciate that working is necessary in questions that require a proof.

Candidates should ensure that they read a question thoroughly; inattention to detail, for example to the units given in a question or when using information given in graphs, sometimes caused difficulties. It is especially important where values are read from graphs and then subtracted that working is shown for credit to be given.

### Comments on Individual Questions

1 A significant proportion of candidates understood the context and used their calculator appropriately, gaining full marks in both parts of this question.

2 Almost all candidates achieved full marks for part (a).

In part (b) a small number of candidates did not take account of the units of the sand and gravel depths when calculating the ratio.

Good responses to part (c) showed an appreciation of the detail required to show that Pythagoras' theorem worked for these lengths; simply stating the rule and not showing any calculations is insufficient.

In part (d) candidates generally scored highly.

3 The majority of candidates who correctly answered part (a)(i) ordered the prices to find the median.

A significant number were able to identify the high price that would distort the median in part (a)(ii).

All of parts (b) and (c) were accessible by almost all candidates.

In part (d) a high proportion of candidates showed clear reasoning to reach their conclusion. The most common approach taken was to find the maximum number of loaves that could be made and compare this to the number of days in a year.

Almost all parts of part (e) were accessible with only part (e)(v) causing difficulties in providing clear reasons.

4 In part (a) the best answers gave reasons related to the information given in the question; that is the reasons were related to the mouthwash and the timeframe.

Almost all candidates were able to provide a correct answer to part (b)(i), but only a relatively small number of candidates were able to correctly provide a set of questionnaire responses that did not overlap or contain gaps.

5 Part (a)(i) was invariably answered correctly.

Part (a)(ii) caused more difficulties, with some candidates unable to successfully convert cm to mm.

Part (b) was usually answered correctly.

6 Part (a) was generally correct.

In part (b) the best solutions saw candidates giving detail of how the measures they were using were obtained and then showing all their working clearly.

In part (c) a significantly high number of candidates gained full marks in parts (i) and (ii).

In part (c)(iii) the best responses showed their reading from the graph and all subsequent working.

The majority of parts in part (d) were answered very well by a high proportion of candidates.

In part (d)(iii) candidates tended to gain full marks or no marks. This highlighted the need for candidates to show working to gain credit.

Part (e)(i) was usually answered well and over half of candidates were able to answer part (e)(ii).

Part (f) required candidates to have knowledge of and apply basic trigonometric ratios. In general candidates either knew what to do and gained full marks or did not have a full grasp of trigonometry and gained 1 or 0 marks.

7 This question differentiated well between the best and the very best candidates. Good responses showed clear working and reasoning, especially in part (c) where many candidates also supported their calculations with a clear diagram.

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