Level 3 Certificate

Quantitative Problem Solving (MEI)

OCR Level 3 Certificate Quantitative Problem Solving (MEI) **H866**

OCR Report to Centres June 2017

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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

01 Introduction to quantitative reasoning

General Comments:

This is the second time that this qualification was examined, and candidates seemed better prepared to tackle the questions. Candidates generally scored well with percentages, drawing and interpreting charts and tables and estimating calculations. Conversion of metric units and working with numbers in standard form continue to cause difficulties as did distinguishing between situations involving repeated percentage change and those that were more straightforward. Candidates seemed better prepared to interpret their answers in the context of the question. Many candidates could have done better if brief comments indicating or clarify their thinking were included with their calculations and if better use of ≈ in problems involving numerical estimation. Some candidates used the blank spaces rather than the answer boxes for their answer and Examiners had to search for their work.

Comments on Individual Questions:

Question No.

Q1(i) and (ii). Many good answers were seen to parts (i) and (ii). Some candidates did not recall that there are 52 weeks in a year, with many using 4x12 = 48 weeks and lost the final A mark. A number of candidates divided the percentage by 52 and changed the situation into one involving compound interest, losing most of the marks.

Q1(iii) The answer was given in this question and some candidates who had an understanding of the problem did not include "1 in …" and lost the final mark. Marks could have been improved for some by indicating that $500{,}000^2 \approx 253$ billion. Some good answers were seen using a tree diagram but many used 1 in 253 billion as the probability on the second branch. Others had clearly prepared for a question which asked them to calculate the probability of winning the lottery and included this even though it did not relate to the question.

Q2(i) Most candidates were able to interpret the correlation between deprivation scores and smoking prevalence but many phrased their answer in such a way that a causality was stated or implied.

Q2 (ii), (iii) and (iv). Candidates mostly understood what was required of them and the ranges of acceptable values gave credit to candidates who understood the question but did not read the scale accurately. Some lost method marks by not indicating that they were attempting to subtract the lower quartile from the upper quartile, and some candidates performed the order of operations incorrectly in (iv).

Q2(v) Candidates were not always clear that they were looking for evidence of variability and some just repeated their answer to (i).

Q3(i), (ii) and (iii) Almost all candidates could read the information from the tables and most had a correct graph. Some lost a mark for not joining their points.

Q3(iv) The intention here was that candidates work with integers throughout and the mark scheme reflected this. Marks were often lost by candidates who assumed that the instruction not to use a calculator meant that long multiplication was being tested, and they were awarded only 2 marks out of 5.

Q4(i) Many candidates did not grasp that they were asked to comment on house prices which were falling until Feb09 and then increasing. Much detail was given about the variations in percentage changes and received no credit.

Q4(ii) This was quite well answered even by candidates who did not score well in (i).

Q4(iii) This question can neatly be answered using the multiplier method and many good answers were seen. Some candidates only used one percentage change scoring 1 of 4 marks. There were many candidates who used "×1.7" , "÷0.017", and "÷0.983" showing that the multiplier method is not always well understood. Candidates did not always notice that their answers were not sensible values in the context.

Q4(iv) Most gained at least partial credit; common errors involved re-stating a correct reason they had already given. A noticeable number, quite correctly thought that Hanna might have damaged her house resulting in a fall in value or improved it resulting in a rise in value. Responses involving errors in the chart etc. did not gain credit.

Q5(i) and (ii) Usually well answered although some gave the reason in (ii) as "that's too much for a sandwich" which is the answer to a different question. Some lost marks by giving two age ranges, not picking up on the clue in the wording of the question.

Q5(iii) and (iv) Not many candidates picked up that this was a standard question of calculating the mean from a grouped frequency. Many got 1 mark for the total frequency but then used it inappropriately to try to obtain a sensible value. Many gave the modal class as their answer.

Q5(v) Most candidates were able to get 3 of 5 marks here, but many failed to see the pattern in the values and so had a line of incorrect answers.

Q5(vi) Many candidates did not notice that there was an error in the question, and gave the formula for cell C2. Some gave the formula for the number sold per day (cell B2) which also gained full credit. Where a candidate indicated that there was an error in the question, they automatically were given full marks as a special case. Overall, candidates scored slightly better in (vi) than in (vii) which suggests that not many candidates were disadvantaged by the error.

Q5(vii) Most candidates gave a formula containing A2*B2 for 1 mark but many lost the second mark either by omitting the = or by having D2 = at the start of the formula. Any formula that could be dragged down successfully was awarded full credit, typically inclusion of $ or brackets.

Q5(viii) and (ix) Follow through was allowed from an incorrect table in part (v) so most students were awarded a mark in (viii). The expected method $(880 \times 20) - 8000 = £9600$ profit per month was often not seen and candidates began again calculating the profit, often including the cost of making the sandwiches twice, or omitting it altogether. The final mark was allowed from an incorrect value of profit providing there was a calculation involving income and costs.

Q6(i) This question caused a good deal of difficulty as most candidates did not seem to know the conversion factor from cm^3 to m^3. Further difficulties were caused as there was a lack of clarity in the working where a few words to explain their working may have helped. Candidates had not anticipated this question from the pre-release material so were unprepared for it.

Q6(ii) This was the most difficult question on the paper and was omitted altogether by many candidates. Candidates who worked throughout in cm^3 were the most successful. One mark was given for finding the surface area of the lake in any unit, and the first method mark for dividing the volume by the surface area in any unit. Candidates were required to be very clear how the given answer in cm had been obtained, so some candidates who claimed the given answer did not get full marks.

Q6(iii) This was intended by answered using multipliers, and was done quite simply by many candidates. Those who worked with the volume of the lake and reduced the volume three times often made errors with the large numbers involved. Quite a large number of candidates simply added the values, showing a flawed understanding of percentage change.

Q6(iv) Only half the candidates chose the correct graph here, many choosing the linear graph instead.

Q6(v) Many instances of a correct trial and improvement method gained full credit, but some did not write down enough evidence that n = 9 was not enough and only that n = 10 was the solution. Some credit was given to candidates who had an incorrect indicial equation but had a valid method to try and solve it. Many candidates who had chosen the linear graph in (iv) simply divided 50 by 7.

Q6(vi) Most sensible comments were credited but we did not allow “same glacier” nor “same units”.

02 Critical maths

General Comments:

The vast majority of candidates were well prepared for the examination, not just in terms of their knowledge and understanding but also in terms of their willingness to tackle problems in a variety of contexts.

Most candidates showed a good understanding of mathematical and statistical concepts, skills and techniques in their responses. Many were able to confidently apply mathematical and statistical thinking and reasoning to evaluate quantitative information and explain a wide range of real-life problems.

Most candidates set out their working in a way which made it clear what they had done. This is especially important in problem solving, or in questions where candidates are asked to show that a given answer is true. However, there was still scope for improvement in this area for some candidates.

Accuracy was also an issue for some candidates; as there were questions that clearly indicated the use of rounded or approximate values, and others where exact values were required throughout calculations.

Comments on Individual Questions:

1(i) Nearly all candidates were able to identify the point representing Mexico from the given information and to read off the value from the graph.

1(ii) Nearly all candidates got some marks here, with the most common mistake being to say that a high percentage of the adult population saying they have good health causes high life expectancy. There was evidence from the notes that some candidates made by the question that they realised that correlation can never imply causality.

2 There were many successful attempts at this question with the clearest ones involving dividing the whole area into 10 small squares. The most common errors were either to double count the overlap or to get the ratio of grey to the whole area rather than grey to white.

3(i) Most candidates rounded the figures to one significant figure and then did a simple calculation to check the given result as required. A few stated that 2066 divided by 812 is 2.54 with no evidence to indicate that they had worked without a calculator, and consequently did not score any marks. A significant minority engaged in long multiplication or long division with unrounded figures; this was sometimes successful but far more time consuming than an estimation method. Occasionally, candidates wrote down figures which implied an estimation method, but did not show clearly enough what calculation was being checked nor did they state that 2.5 was about right.

3(ii) The most successful attempts were from candidates who realised that towards the end of the graph female numbers are higher than male numbers so the number of males per female should be less than 1. There were a few attempts at reading from the graph to check all the figures in the table, but these were rarely successful in identifying all three of the wrong numbers.

3(iii) There were many successful and clear answers to this question; the most common error was not to find the percentage out of the total.

3(iv) Most candidates were able to complete this successfully and to give the final answer to a sensible degree of accuracy. A small minority of students did not know what a million was and so could not successfully complete this question. Occasionally, candidates failed to round the final answer sensibly, as indicated in the question.

4(i) Some candidates didn't realise that the 4% of candidates who did not appear in the table did not get a grade; and therefore worked with percentages out of 96 rather than 100. This was condoned in part (i) as they effectively found the answer required before going on to change to a percentage out of 96. Some candidates scored a method mark but not the answer mark due to addition errors. A few candidates wrote down an incorrect answer with no working and so could not score.

4(ii) Some candidates used the information in the pre-release material to give a completely correct response, but a large minority did not appear to be familiar with the content of the pre-release. Unsuccessful attempts usual started by making incorrect assumptions about how the numerical GCSE grades relate to the letter grades without making use of correct answers to part (i) and the pre-release information.

4(iii) This question was answered well by the majority of candidates, who mostly used the mean to compare student performance; but with a significant number failing to use their results to order the three students. Some attempts either did not describe a method at all or did not describe how the method was to be used to compare candidates. A small minority of candidates spent time describing a method which could not be used by a college to compare students.

4(iv) Most answers were a sensible reflection on the drawbacks of their chosen method in part (iii). A few wrote something general or non-specific, which did not seem to be relevant eg some students are better at some subjects than other students.

5(i) Nearly all candidates were able to give a reasonable estimate of the length of a typical car in metres.

5(ii) There were many completely successful attempts at this question, with candidates dealing efficiently in their calculations with Imperial to metric conversion, length of queue and the two lanes of traffic. However, some candidates did not know that there are 1000 metres in a kilometre and a few had 2m long cars for 10 miles with no gaps between them; this is unrealistic. Occasionally, stronger candidates worked clearly with a gap between vehicles, but others tried unsuccessfully to adjust answers to allow for gaps between cars by subtracting a distance from a previously calculated number of cars. A few candidates either ignored the information that there are two lanes or halved the number of cars in one lane.

6(i) Candidates either worked with representative frequencies or with probabilities – both methods could lead to success but students working with representative frequencies seemed to generally find it easier to find the probabilities in parts (i)B and (ii). The most commonly seen errors were to mistake 0.5% for 5% or to subtract 0.5% from 100% incorrectly.

6(ii) Candidates who did not successfully complete part (i) were rarely successful with part (ii), though some gained a method mark for using relevant values from their tree diagram.

6(iii) Nearly all candidates were able to outline a sensible action for the bank to take. A few suggested contacting the police, which given the high number of false positives was not a sensible action in the context.

7(i) Only a minority of candidates were able to correctly match all the features with their reason for use. Those who correctly matched one feature usually did so either for "randomised" or for "impulsivity questionnaires".

7(ii) Most candidates correctly stated that the reason was to prevent bias, although some got confused between completion and analysis of questionnaires and a small minority gave a vague, general or unclear response and did not score.

7(iii)A The vast majority of candidates got this correct; the main error was to fail to include the negative sign.

7(iii)B Most candidates were able to say how the data showed that the treatment group seemed to reoffend less than the control group, but some answers were so vague that they seemed to be a restatement of the question without any reference to specific relevant features of the data.

7(iii)C Most candidates were able to explain how the data showed that some prisoners committed more than one crime in the first year after leaving prison, showing a good understanding of the data given in the question.

7(iv)A Most candidates were able to do this correctly.

7(iv)B Very few candidates got this correct; even those who stated an appropriate formula were not able to apply it correctly.

7(v) Most answers were incorrect, based on the false premise of calculating the percentage in each group and stating that it was not close enough to 50%. A few candidates did try to use their mean and standard deviation to make a judgement as required, but with only the very strongest candidates doing so completely correctly.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553