OCR
Oxford Cambridge and RSA

Level 3 Certificate

Quantitative Methods (MEI)

OCR Level 3 Certificate **H863**

OCR Report to Centres June 2015

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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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G244 Introduction to Quantitative Methods (MEI)

General Comments:

Candidates have responded well to this new qualification and most attempted all the questions. In particular, candidates used their knowledge and skills appropriately to respond to the questions on presenting data Q.2, spreadsheets for calculation of profit Q.6 and formulae for comparison of clothes sizes in different countries Q.8. Candidates did not seem to have the knowledge required to respond to questions on the Normal distribution Q.7 or the skills required for questions requiring longer calculations and structured or extended comments.

The best answers showed evidence of prior discussion of the insert material, clear methodology for questions on units of speed Q.1, calculation of gradient for growth rates Q.3 and calculation of repeated inverse percentage Q.4. Candidates making use of templates or set phrases provided better extended comments. Where candidates demonstrated their familiarity with diagrams showing the percentages underneath the Normal distribution curve (Figure 1) by drawing these on their own curve, they were better able to complete Q.7.

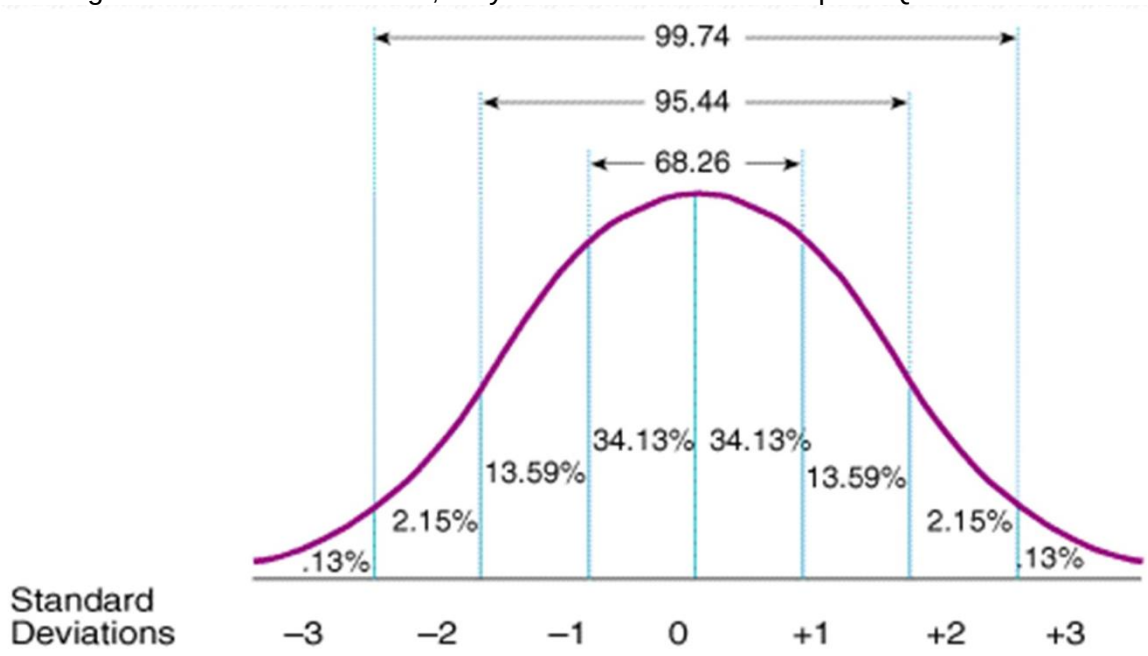

Figure 1: Normal Distribution

Candidates achieved higher marks when they presented clear, logical line-by-line working. This also enabled them to provide convincing proofs where required in Q.4 and Q.8. Annotating diagrams was helpful to some candidates but working also needed to be shown in the answer spaces provided. Candidates who underlined and circled key pieces of information in the question and copied these into the answer spaces, often were then able to complete the calculation or process required. This key skill is of particular use for Level 3 questions which are often longer and more involved.

When candidates did not achieve higher marks, it was usually because they did not answer all the parts of a question or omitted the second or third instruction in a question. The ability to think about the context of a question was useful but sometimes this distracted from commenting about the mathematical properties of the model in question and did not show sufficient analysis or generalisation of the situation.

Comments on Individual Questions:

Question No. 1

The best answers changed units of time and speed to match by converting 28 minutes to seconds first. Most candidates correctly identified the need to multiply speed by time although some divided or were confused by standard form. Candidates gained a further method mark for dividing by 1000 to convert from metres to kilometres. The very best answers then rounded to one significant figure and presented the answer as 500 million.

Candidates may find it beneficial to check their answers marking this as a “check” as there was little evidence of this and it could have avoided some of the common errors.

Question No. 2

Most candidates correctly identified Teenage Mothers for **Q.2(i)**. Errors in the calculation of ratio included dividing the wrong way up or inconsistently, for the Religion category, not choosing the highest ratio or not using data for Great Britain.

The best answers for **Q.2(ii)** focused on the labelling error for Australia immigration. The very best answers then also identified some aspect of inconsistency in the approach for the display. Common errors included referring to the text of the article, the calculation of accuracy, suggesting improvements (particularly the inclusion of metadata or base responses for each question) rather than identifying errors or failing to give two different errors. Noting the difficulty in making comparisons, particularly because overlapping bars obscures data, was preferable to comments about data being the ‘wrong way around’.

Question No. 3

Most candidates correctly plotted points and drew a curve through them for **Q.3(i)**. Those candidates who used crosses to mark points achieved greater accuracy. Some errors could have been caused by incorrectly reading the scale on the y-axis and a few candidates took several attempts to draw a curve and did not indicate their preferred curve or clearly rub out the wrong one. Candidates lost marks where double attempts caused errors at marked points or curves missed points that had been marked.

Some candidates then correctly drew a tangent or chord line on the graph to enable them to calculate a gradient for **Q.3(ii)**, others drew a gradient triangle or several to find the steepest point on the curve. Common errors were to omit to draw a suitable line or to mark two points on the line and draw lines to the axes rather than lines showing the gradient or growth rate.

Many candidates did a calculation of rise divided by run. Some divided run by rise however, and others did not convert to ‘per day’ by dividing by 365.25 or similar. Some candidates attempted unsuccessfully to describe the growth rate in words rather than perform a calculation. The best answers identified a suitable range or year for the fastest growth rate and calculated a growth rate in the allowed range. Some candidates calculated several rates but there was little evidence of checking solutions.

The very best answers indicated that death rates should be taken into account for the last mark.

Question No. 4

Some candidates demonstrated understanding of repeated percentage calculations and logarithmic scales. Most candidates who recognised 20 years was 10 lots of 2 years were able to compare 2^{10} and 1000 successfully for **Q.4(i)**. Some candidates used an example, starting with 1 or 10 and found this simplified the comparison, others made use of a table of values showing how the memory increased over years. Common errors were attempts to divide to find a factor or start with 10^3 and work backwards.

Some candidates were able to plot two points for **Q.4(ii)**, usually (1970,1kb) and (2010,1Gb). Some of these correctly plotted a third or fourth point. Only some candidates then joined these with a line. Common errors were attempting to fill in the grid as a table of different units, plotting a steeper or shallower line or a curve and a few candidates drew bar charts which were not given marks.

A few candidates were familiar with the term "logarithmic scale" and gained a mark for **Q.4(iii)**, others gained the mark for acceptable answers which mentioned a factor of 10^3, for example "it goes up in 1000s". Common errors were describing the factor as "powers of 3", commenting on the placement of the scale labels rather than the values. The very best answers included a comment indicating candidates understood that a logarithmic scale allows larger values to be displayed on the same graph.

Most candidates were able to correctly identify 50% increase as multiplying by a factor of 1.5. A key issue with **Q.4(iv)** was then recognising that the factor of 1.5 had to be squared but doubling only happened once as it took place every two years. Where candidates spotted this they gained the second mark usually for comparing 2.25 with 2 but also quite a few candidates made good use of an example situation, e.g. starting with 10 or 100. The very best answers included an equivalent percentage for doubling, some by finding the square root of 2, but more by a trial and improvement approach. Common errors were omissions of the comparison with doubling or finding the equivalent percentage.

In **Q4.(v)** most candidates scored one mark for finding 35 and 10^6 or 1,000,000 but fewer were able to demonstrate understanding of inverse repeated percentage by finding the 35th root of 1,000,000. A common error was attempting to divide to find a factor, some candidates who successfully found 1.48 then did not present the answer as a percentage.

Allowance was made for candidates who understood the context well and used the binary version of KB and MB, i.e. 1024 bytes = 1KB. This gave an equivalent factor of 1024 for Q.4(iii) and an alternative answer in Q.4(v) of 1024 squared = 1048576 leading to 1.485 or 49% when 35th root taken.

Question No. 5

Most candidates correctly filled in the tables in **Q.5 (i)** and **Q5.(ii)**. Errors were generally with rounding for **Q5.(ii)** or misunderstanding the New Treatment group table altogether, resulting in answers like 0.75 and 0.25. A recurring decimal of 0.57 was accepted for the control group.

Most candidates also correctly recognised an improvement with the new treatment for **Q5.(iii)**. The very best answers quantified this successfully as 0.14 or 14 percentage points. Some candidates compared by describing "more than half of patients improved with the new treatment" implying less than half for the control group or gave a qualitative judgement such as mentioning that some patients benefitted, often using words like "seems" or "appears" to convey an element of doubt. Common errors were describing the outcome for the new treatment group without describing its effect by comparing with control and confusion or ambiguity over the direction of the change.

Most candidates correctly found the fractions for probabilities needed for **Q5.(iv)** but there were some errors with rounding , the use of ratio or words to describe probability or the use of the incorrect denominator or incorrect conversion to percentages.

Most candidates successfully identified that less severe patients did not improve under the new treatment or did better with the usual (control) treatment for **Q5.(v)**. The best answers included some element of doubt and effect size, e.g. "It **suggests** that the structured conversations are detrimental to less severe patients **by around 25 percentage points**". A few candidates added a concern about small sample size and reference to anomaly was allowed. Some candidates suggested repeating the study. Treatment recommendations and causation were also accepted for the third mark.

Common errors on **Q.5(v)** were speculating about issues beyond the scope of the question, for example categorisation, measurement and early identification of patients, longitudinal effects (i.e. “over time”, “long term”) and variability (i.e. “different people react in different ways” or “change doctors” or issues with new treatment group). Also, some candidates were confused about the meaning of control group leading to discussion of the effects of controlled environments. More commonly candidates answered only the first part of the question, some candidates failed to discuss the results of **Q.5 (iv)** as requested but framed the comparison with the more severe patients or suggested the need to calculate probabilities for more severe patients as a next step.

Question No. 6

Most candidates demonstrated an understanding of profit and loss and an ability with spreadsheets for Q.6. **Q.6 (i)** and **Q.6(ii)** were successfully completed by most candidates. Clear working for **Q.6(i)** helped with **Q.6 (ii)**, particularly where candidates used an alternative method by calculating income – total cost rather than multiplying unit cost by demand. Some candidates who did not set out working clearly then became confused about which price led to which profit figure and so failed to make the correct calculations and comparisons as a result. Some candidates made the correct calculations but did not give a comparison.

Some candidates described the rounding and filled in the spreadsheet values for **Q.6 (iii)**. Others gave a qualitative judgement on the accuracy of the figures but no reference to the degree of accuracy either in context “nearest pound/penny” or mathematically “2 decimal places/3 significant figures”. Nearest whole number and 0 decimal places were also allowed. Some candidates then did not give total profit for row 45 to the nearest pound. £508.80 and £508.8 were allowed but not £508. Other candidates incorrectly read values from the grids on the graphs or left the spreadsheet blank or incomplete. A few candidates did not perform the correct calculations to find unit profit, total income and total profit for each row.

A variety of correct alternative answers were given for **Q.6 (iii)C** suggesting good understanding and use of spreadsheet formulae. For D2, possible alternatives were =SUM(A2-C2) and =$A2-$C2. Unsimplified formulae such as =((A2*B2)-(C2*B2))/B2 were allowed. Also, =F2/B2 provided one of the alternative versions for F2 was also chosen (otherwise there is a circular reference to cell D2). For F2, =E2-B2*C2 or =(A2-C2)*B2 were acceptable and =(A2*B2)-C2*B2 was allowed. However some candidates found this complexity unhelpful with errors in cell references or brackets resulting, for example =E2-D2*C2 or =SUM A2-C2. More common errors with spreadsheet conventions were missing = signs, using x rather than * or adding an extra reference to F2 and D2 before or after the formula. It may be helpful to emphasise to candidates that formulae should be given exactly as they would be typed into a spreadsheet formula box.

Most candidates were then able to correctly advise a sale price of £10 to maximise profit; some adding extra information to justify their answer. A few candidates missed the key value of £10, giving a wider range and some attempted unsuccessfully to discuss marginal cost or equilibrium instead, as often they did not include the three variables necessary: cost, demand and price leading to profit.

Question No. 7

Most candidates were able to sketch a normal distribution curve with the correct mean for **Q.7(i)**. The best answers included a spread which reached almost zero in the allowed range for the third mark. Candidates who marked the percentage area under parts of the curve and related this to standard deviations from the mean did better on this third mark and later parts of the question.

Few candidates spotted the model error that wind speed cannot be negative for **Q.7 (ii)**. Common errors were to describe wider modelling issues such as seasonality, daily variability or contextual factors such as the impact of planes from Exeter airport.

In **Q7.(iii)** many candidates realised that 9 was 2 standard deviations above the mean and knew that this involved the figure of 95%, sometimes giving a final answer of 5%. The very best answers then divided by 2 for the two tails to get 2.5%.

Most candidates correctly summed the values greater than 9 from the table for **Q.7 (iv)**. Common errors were to choose only the value 2.05 for a wind speed of 9 or to try to split this value or the previous value rather than recognise 9 was an endpoint. A few candidates also incorrectly summed the values.

Only a few candidates recognised that using a normal distribution model was close to being accurate for **Q7.(v)**. The very best answers deduced from **Q.7 (iii)** and **Q.7 (iv)** that there was a small positive skew to the data.

Most candidates then recognised a histogram should not have gaps for the first mark of **Q7 (vi)** but few candidates commented on the placement of numbers at the ends of intervals/bars on the x-axis. Common errors were to discuss the y-axis: frequency (density) or percentages, or making a vague comment about the x-axis.

Question No. 8

Most candidates correctly answered **Q.8 (i) A**, **Q.8 (i) B** and **Q.8 (ii) A**. The very best answers indicated the direction of conversion for **Q.8 (i)** and explained the substitution of values and answer obtained for **Q.8 (ii) A**. A common error was the calculation of a multiplicative factor rather than an additive constant for **Q.8 (i)**.

Most candidates correctly substituted again for **Q8.(ii)B** but although many recognised that a decimal answer needed to be rounded, few correctly interpreted the context and rounded to the nearest even number. Some candidates discussed rounding to the nearest size but this did not provide sufficient instructions to calculate the size and others identified the issue of which size to choose but did not present a method for solving it.

The very best answers to **Q8.(ii)C** began by adding 28 to the formula and simplified before substituting the value 81 to gain a size of 44. Most candidates only achieved the first and/or last marks here, however. Common errors came from working backwards or finding a factor rather than adding to the formula.

Many candidates correctly identified subtracting 3 as the method to convert Japanese to US dress sizes. Some candidates correctly calculated the Japanese sizes for one or more example waist measurements but did not generalise to a method for conversion. The use of tables of values might have assisted this process. A few candidates were confused by the range of waist measurements for a particular Japanese size but other candidates chose the midpoint or calculated for endpoints without difficulty.

G244 Introduction to Quantitative Analysis (Coursework)

Many of the centres entering candidates for this unit have not submitted coursework before. Sometimes the administration was not good, with Authentication forms missing, samples being sent to OCR rather than the moderator and clerical errors. Centres are asked to scrutinise instructions carefully to make sure that the work is assessed and submitted for external moderation in accordance with OCR's requirements.

- A significant number of scripts did not meet the criteria at all well, some of which were well below that standard required. Most of these were given the poor mark they deserved but a number were considerably over-marked resulting in some scaling. The following points might be useful for future submissions.
- Candidates should say why the investigation is worth doing
- The population should be clearly defined and the sampling procedure discussed.
- A variety of displays should be used to describe the sample.
- Candidates should use a spreadsheet to carry out the calculations
- Candidates should say why both the diagrams and calculations are appropriate.
- Questions raised by the work should not be simply a discussion of what candidates might do instead or in addition to what has been done but questions that arise from the conclusions drawn.

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