GCE

Quantitative Methods (MEI)

Advanced Subsidiary GCE AS **H133**

OCR Report to Centres June 2015

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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Advanced Subsidiary GCE Quantitative Methods (H133)

OCR REPORT TO CENTRES

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.

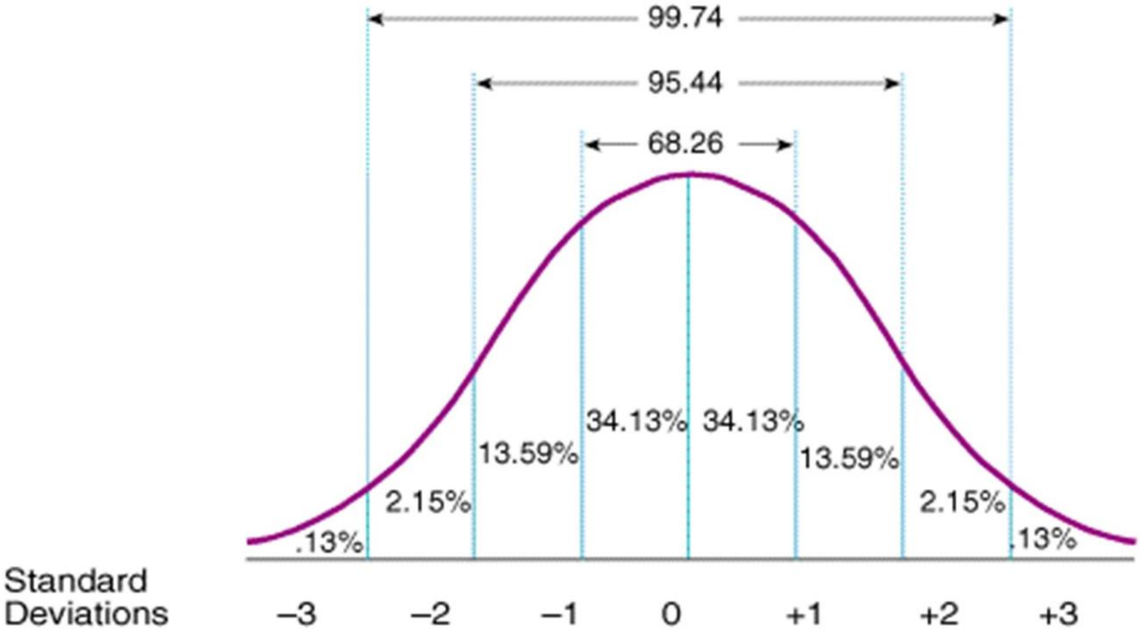

Figure 1: Normal Distribution

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.

G245 Statistics 1

General Comments:

The majority of candidates coped very well with this paper and a large number scored at least 60 marks out of 72. There was no evidence of candidates being unable to complete the paper in the allocated time. Most candidates had adequate space in the answer booklet without having to use additional sheets.

Candidates performed fairly well on the first conditional probability question (Q 2(ii)) but not very well on the second one (Q 8(iii)). In Q 5(iii), although candidates usually found the mean, median and mode correctly, many gave a poor explanation of whether or not the mode was useful. Many candidates found Q 6(i) very difficult, often providing explanations which were not convincing. Q 7 on the binomial distribution and hypothesis testing was fairly well answered, with many candidates defining the hypotheses correctly, defining *p*, carrying out the hypothesis test correctly and also giving their final answer in context with an element of doubt. Q 8(v) was sufficiently challenging to differentiate between the best candidates.

As last year, most candidates supported their numerical answers with appropriate working, but when written explanations were required, the poor handwriting and in some cases the poor use of English of some candidates made it difficult to determine what they were trying to say.

Too many candidates are still losing marks due to over specification of some of their answers. Over a third of candidates lost a mark in Q 1 and/or Q 6(ii) due to this. For example in Q1(i) candidates often gave an answer of 419.13, some adding 'to 2dp', which they thought was appropriate accuracy. Of course, it is the number of significant figures rather than the number of decimal places that is important, and giving a standard deviation to 5 significant figures is not sensible and so attracted a penalty.

Comments on Individual Questions:

Q1 (i) Almost all candidates found the mean and most also found the standard deviation correctly, although this answer was often over specified to 419.13. It seems that candidates incorrectly think that the number of decimal places is the crucial thing rather than the number of significant figures. A few candidates made errors in calculating S_{xx} or calculated the variance or the root mean square deviation.

(ii) This question was very well answered with about two thirds of candidates scoring full marks. Full follow through was allowed from answers to part (i). Few candidates lost marks for over specification here as those who did had already lost a mark for this in part (i). The most common error was to add 14.5 to the standard deviation as well as the mean. A few candidates multiplied their answers by 40.

Q2 (i) A This was very well answered, although a number of candidates gave the number that watched cycling and not football rather than the probability. A few had the wrong divisor, usually 186 or 100.

Q2 (i) B Again this was very well answered with only a small minority of candidates making errors. The most common errors were to include those people who watched all three sports or to miss out one of the six who watched 1 or 2 sports.

(ii) Approximately two thirds of candidates answered this correctly. Of the rest, some were able to get a method mark for the correct denominator but then failed to get the correct numerator, often thinking that it was 12 rather than 15. Some candidates either did not recognize this as a conditional probability question, or did not know about conditional probability.

Q3 **(i)** This was very well answered. However, a few ignored the question and assumed 54 or 50 cards in a pack, or that the card had not been replaced. Another common wrong method was to find 1 - P(both aces) = $1 - (4/52)^2 = 168/169$.

(ii) Surprisingly, only two thirds of candidates scored this easy mark. Most realised that they had to multiply their answer to part (i) by 10 but some then rounded their answer to a whole number, thus losing the mark. A smaller number incorrectly raised their answer to part (i) to the power of 10.

Q4 **(i)** This was very well answered.

(ii) This was again usually well answered, although a fairly common error was to add the two combinations rather than to multiply them.

(iii) This was another well answered question with even those who had added in part (ii) still usually scoring both marks on follow through. Candidates who tried to use a probability method (instead of simply dividing their answer to part (i) by their answer to part (ii)) were rarely successful, and even if they did have the correct product of 15 probabilities, they rarely multiplied this by any, let alone the correct combination.

Q5 **(i)** Most candidates scored all three marks, although some did not accurately align the leaves or did not provide a suitable key and thus scored only 2 marks. Very few candidates scored less than 2 out of 3.

(ii) This was very well answered with only a few thinking that the skew was positive.

(iii) The mean, median and mode were usually given correctly although one or two candidates lost a mark due to over-specification of the mean or rounding of the median. However, the final mark for the comment was awarded to only under a quarter of candidates. Many candidates gave general descriptions of the usefulness of the mode rather than commenting on this particular case. Too many candidates stated incorrectly that the mode was useful. Those who correctly stated that it was not useful, often followed this with an incorrect reason such as: being unaffected by outliers, data being negatively skewed or not being close to the mean and/or median.

Q6 **(i)** A variety of techniques was used to answer this question, including some novel approaches that at times were hard to follow. The most common approach was to sum the required combinations of 1, 2 and 3 sixes in the set rather than the neater solution of subtracting from 1 the combinations that were not required (no sixes). Unsurprisingly, many candidates subtracted the other given probabilities from 1, gaining no marks.

(ii) Candidates who worked in fractions almost always gained full credit, whether or not they converted to decimals at the end. Many candidates who worked in decimals lost a mark for over-specification. Some candidates also lost marks by not showing sufficient working despite getting answers fairly close to the correct ones. However, over three quarters of candidates gained at least 4 marks out of 5.

Q7 **(i)** **A** This was generally very well answered.

(i) B Although around two thirds of candidates answered this correctly, some candidates included P(X=18) in their method and thus were only able to gain 1 mark out of 3.

(i) C The majority of the candidates found this part straightforward, but a minority lost the mark when they rounded their final answer to 15 or 16.

(ii) In recent years, candidates have been doing better on hypothesis test questions than in the past, and this was again the case this year. Many fully correct responses were seen. Most candidates scored the first three marks for the hypotheses, with most now knowing that they need to define p. The vast majority of successful candidates used the probability method, finding P($X \geq 19$) and then comparing this to 1%. It was pleasing to see that most candidates gave their final answer in context and with an element of doubt stating something to the effect of 'there is not enough evidence to suggest that…'. Those who tried to use the critical region method were less successful on the whole. As ever, some tried to use point probabilities, being able to gain only the first three marks for the hypotheses. A few candidates tried to use tables and there full marks available for correct interpolation from tables.

(iii) Candidates who gained more or less full marks in part (ii) tended to gain full marks in this part. In this part, no marks were available if point probabilities were used.

Q8 (i) Most candidates calculated the inter-quartile range and used it correctly to find the limits for outliers. However, a few used the median instead of the quartiles to add to and subtract from 1.5 × inter-quartile range. Many candidates neglected to comment on outliers at each end separately (only commenting if there were outliers overall).

(ii) This question was well answered (even by candidates who had struggled with earlier questions). Many answers were left as fractions (which were exact) with very few marks lost for over-specification. However, many candidates squashed their work up into the first part of the answer space, not realising that there was more space on the next page. A few candidates forgot to take into consideration 'non replacement' and starting with $(7/20)^3$, gained only 1 mark, although plenty of follow through marks were available in parts (iii) and (iv).

(iii) Although over half of candidates gained at least 2 marks out of 3 here, a number of candidates did not use the straightforward P($A|B$) = P(A)/P(B) here, and instead mistakenly calculated P($A \cap B$) = P(A) × P(B), and then cancelled out a term on the top and bottom of the fraction. This illustrates the lack of deep understanding here of independence and conditionality. A disappointing number of candidates were quite happy to give an answer greater than 1 for P($B|A$).

(iv) This was well answered, although a common incorrect method was 2 × P(A).

(v) Only approximately a quarter of candidates produced a completely correct answer, although many went through the correct answer on the way to a wrong one. Most of the correct answers used the 6/20 × 5/19 method, with a large minority then compromising this with another term multiplied or added.

G246 Decision Mathematics 1

General Comments:

Arguably the most discriminating assessment task is to explain or to justify. This paper had 11 marks allocated to answers which required candidates to write in words, 4 on Q1, 1 on Q2, 3 on Q3 and 3 on Q4. Most candidates were sadly lacking in their abilities to do this.

Good written communication and good mathematics go hand in hand. They require the same skills – clarity and precision of thought. At all stages of mathematical assessment, candidates bemoan such questions, preferring algorithmic manipulative tasks. The fact is that these writing questions test higher level skills and understanding so they are inherently more difficult.

Many candidates lacked physical dexterity in writing, so examiners often had a difficult task just to decode what had been written, before trying to make sense of it. There was a high correlation between readability and sense, but there were some examples of poor readability allied with good sense.

Trainee teachers of all disciplines are required to attain …
Standard 3.3: demonstrate an understanding of and take responsibility for promoting high standards of literacy, articulacy and the correct use of Standard English, whatever the teacher's specialist subject
(The Teachers' Standards can be found on the GOV.UK website:
https://www.gov.uk/government/publications/teachers-standards)

Teachers of mathematics, however long qualified, should note this requirement, because working on it within mathematics offers great help to mathematical thinking.

Comments on Individual Questions:

Question No.1

(i) Many candidates lost one or both marks on this question by confusing tops and bottoms of chairlifts and ski runs.

(ii) Many candidates missed the word "map" in the question, and tried to answer subsequent parts by referring to graph theoretic results. They missed the point that, in this part they were being asked to interpret a (bipartite) graph back to "reality".

(iii) One or two very good candidates shrank the chairlifts to points, and then worked in the resulting directed graph. That was good, but not at all necessary.

(iv) Markers had a fine line to negotiate in awarding or not awarding the explanation marks here. Many candidates gave routes which did involve repetition, but that by itself does not mean that there must be repetition. On the other hand, one has only to say that there are, for instance, two runs served by C, so that C must be repeated. So, for instance, the candidate who stated that having arrived back at the bottom of B, run 5 still remained to be done, with no other details given, would not have been awarded the mark for explaining why B and C have to be repeated.

(v) Comments as per part (ii).

(vi) The question referred to "this information". Candidates who described the characteristics of bipartite graphs in general, without reference to this specific situation, did not qualify for the mark.

Question No. 2

(i)&**(ii)** This question was answered well. Some candidates made mistakes with the arithmetic, but such errors escaped heavy penalty.

Question No. 3

(i) This question was conceived as an integer programming problem, which is why such phrases as "no more than" and "no less than" appear in part (i). With a discrete region, the status of the boundaries is important, whereas for a continuous region, that is not the case. In the event, this was lost on nearly all candidates.
Only a minority of candidates realised that for the second mark, there had to be an explanation of how the "75%" generated the "1/3".

(ii) Apart from testing understanding and the ability to explain, part (i) was intended to set up part (ii). Very few candidates appreciated this, and very few indeed scored all 5 marks here.
(Strictly, the feasible region should be a set of points, but the few candidates who identified the containing quadrilateral, as identified on the mark scheme, were allowed the mark.)

(iii) It seems an eminently sensible suggestion to purchase 75% of 500 coffee filters and 50% of 500 tea bags, especially since that happens to cost £50. Most candidates failed to score the mark. There really can be no complaints, since invariably they failed to answer the question. They were required to refer to the estimated demand, which was for 500 cups of hot drink per week, and they failed to do that.

Question No. 4

(a) Routine, and generally well done.

(b) **(i)** Routine, and generally well done.

(ii) That there were 3 marks allocated to this part was a clue as to what was needed … connected, no cycles and minimal. Most scored the "connected" and "minimal" marks. (Note that to prove minimality is taxing.)

(iii) There is not a great demand placed on algebraic skills by Decision Maths, but this found the candidature wanting. Most could not write down $\frac{n(n-1)}{2}-(n-1)$, which was sufficient for the first of the two marks. Many did not appreciate that the first mark was for an algebraic expression and the second for a number.

Question No. 5

(i)&**(ii)** Routine and well done. There were the usual "popular" errors, mostly relating to the dummy activity, and to slips. The mark scheme was designed so as not to penalise such slips too heavily.

(iii)&**(iv)** Scheduling questions such as these have appeared in the past and have caused problems. This was no exception. For candidates who appreciated what was required – showing who does what and when – this was difficult enough. But the majority of candidates wasted their time and effort. They could not score any marks because they failed to show who did what and when.

In part (iii) there was a mark for showing when activities C and H were scheduled. That information was needed, although those activities needed no resource.

Question No. 6

This question was very well done. Some candidates failed to ignore "9" when they needed to in their F/G/H simulation. Some failed to compute their proportions correctly in parts (ii) and (iv).

Some candidates were confused by the starting conditions … "Their last meal out was at the Greek restaurant". They included this meal in their simulations, despite the instruction "… for the next 10 of their meals out". This was quite an expensive mistake.

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