

Principal Examiner Feedback

Summer 2016

Pearson Edexcel Level 3 Award
in Statistical Methods (AST30)

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Introduction

Most students attempted all the questions on the paper so that there was no evidence to suggest that students had difficulty completing the paper in the given time. The vast majority of students completed their answers in the spaces provided.

Some students had not learnt all the required formulae for the examination but it was pleasing to see so many students showing the intermediate stages in their calculations.

Some students did not use a ruler to draw the bars in the histogram in question 11(c).

The design of this paper was consistent with previous papers and the performance of students on this paper was consistent with that expected when the paper was set so that a pass mark of about 66% of the total mark could be considered as showing proficiency in Statistical Methods at Level 3

Reports on Individual Questions

Question 1

A majority of the students were able find an estimate for the number of times the dice will land on 6. A common error made by some students was to divide 200 by 0.35. Generally this question was done very well by many students.

Question 2

Part (a) of this question was answered well. Many students wrote down a correct disadvantage. A common error was to simply write down 'not accurate'.

Part (b) of this question was answered well. Most students were able to write down a suitable sampling frame for the survey. A common incorrect answer was 'a list'. On its own this was not acceptable.

Part (c) of this question was answered well. Many students wrote down the correct method and obtained 6.63157.... A few students did not round the answer to 6 or to 7.

Question 3

Part (a) of this question was answered well. Most students were able to complete the Venn diagram correctly.

Part (b) of this question was answered well. Most students followed through their answers from the Venn diagram to gain the mark. A common wrong answer was 26; this was obtained by omitting 6 from the calculation.

Part (c) of this question was answered well by the more able students. Many students realised it was a conditional probability but did not understand which part of the Venn diagram was needed to be used in order to answer the question.

Question 4

Part (a) of this question was generally answered well. Many students were able to draw an ordered back-to-back stem and leaf diagram correctly but some students lost marks by not giving two correct keys.

Part (b) of this question was done well. Many students wrote down the median score of Josh and Freda and made a correct comparison. However, some students wrote down 57 as the median for Josh and therefore lost the last mark.

In part (c), students who knew how to formally identify outliers generally scored both marks. A number of students were able to identify 65 as the boundary value for the outlier but then made no comparison with 69. Students should be encouraged to make sure that they answer questions in full.

Question 5

Part (a) of this question was answered very well. A minority of students wrote down 'discrete'.

Part (b) of this question was generally done well. Most students were able to score at least 2 marks in this question - quite a few students were able to score full marks. A common incorrect answer was incorrectly identifying the nature of the skew for all boxes. Some students wrote down the values for the various summary statistics without comparing them, eg "the median for 20-39 is 16.5 and the median for 40-59 is 17.5". Students should be aware that only 1 mark is available for comparing the dispersions/spread of distributions, ie only 1 mark would be awarded for a correct comparison of both the interquartile ranges **and** the ranges of distributions.

Question 6

This question was answered quite well. Many students were able to work out a correct estimate for the number of geese in the bird reserve. A common error was to round down and obtain 142 without showing working.

Question 7

Many students were able to draw a probability tree diagram and gained full marks for part (a). A common error here was to draw just one pair of branches, either for the bag or the box or to draw a pair of branches for both the bag and the box but not link them together.

A majority of the students answered part (b) correctly. A common error was to add rather than multiple the probabilities.

Only the most able students answered part (c) well. A common error was to find the probability that one bead will be red thus obtaining an answer of 0.605. The students should then have added the probability that both beads will be red from part (b) to obtain the final answer. A better approach would have been to first find the probability that no bead will be red and then to subtract this answer from 1.

Question 8

Generally this question was done well. In part (a), most of the students were able to complete the cumulative frequency graph correctly. Only a few students used the midpoint of the interval rather than the end point of the interval.

In part (b) of this question, most of the students were able to use their cumulative frequency graph to find estimates of the median, the lower quartile and the upper quartile. Some students did not show their working by drawing the lines for the quartiles on the cumulative frequency graph. Most of the students were able to draw a correct box plot from the cumulative frequency graph. However too many students lost marks for not reading the scale correctly and the main error seen was plotting the median, the lower quartile and the upper quartile incorrectly on a different scale on the box plot.

Question 9

This question was answered well. In part (a), most students were able to recall and use the formula to calculate Spearman's coefficient of rank correlation. It was encouraging to see many students clearly showing all the steps to a correct answer.

In part (b), most students were able to state and interpret correctly the value of their correlation coefficient.

Question 10

Part (a) of this question was generally answered well. Many students were able to calculate the standardised score for Carl's jump.

Part (b) of this question was also answered well. It was encouraging to see many students giving a correct answer and a correct reason. A common error was to write that Pierre's standardised score was positive and not commenting that the other standardised score was negative.

Part (c) of this question was generally answered well. Many students were able to calculate the distance jumped by Pierre. Some students lost marks as they used 118 m instead of 115 m for the mean.

Question 11

Part (a) of this question was answered well by many students. A majority of the students could calculate the mean weight and give the correct answer.

Part (b) of this question was done well. Many students could recall or apply correctly the formula for calculating the standard deviation of a frequency distribution.

In part (c) many students realised they had to calculate frequency densities and they then drew the histogram correctly. It was pleasing to see students using a correct scale on the frequency density axis (y-axis), however, some students did not label this axis as *frequency density* or *fd*.

Question 12

Part (a) of this question was answered well. Most students were able to work out the cost of heating the house in 2012. A common error was to divide £1250 by 0.985.

In part (b), many students were able to calculate the geometric mean of the index numbers. Some students calculated the *arithmetic* mean of the index numbers rather than the geometric mean and some students included 100 in the calculation of the geometric mean.

In part (c), most students were able to interpret the answer in the context of the problem, however, they sometimes omitted to describe the increase as a given percentage.

Question 13

Part (a) of this question was answered very well. A majority of the students obtained a correct answer in the range 3.25 – 3.5.

Part (b) of this question was answered well. Many students were able to give two correct comparisons for X and Y . A common error was to say that the mean of X was greater than the mean of Y as the curve for X was taller than the curve for Y . Another common error was to say that Y is more spread out than X .

Question 14

Part (a) of this question was done much better than in previous series. Many students scored this mark but a few students got trend confused with correlation.

Part (b) of this question was done well and many students scored both marks. Many students were

able to calculate the difference between the actual value and the trend line value for quarter 2 for at least one of the years. A common error was to calculate $790 - 900$ rather than $900 - 790$ for the seasonal variation of quarter 2 for 2014 so that some students obtained -135 rather than 135 . Part (c) of this question was done well. Many students followed through their part (b). Students should have used a ruler to extend the trend line to obtain a value of 300.

Question 15

Part (a) of this question was answered very well. A majority of students obtained the correct answer. Part (b) of this question was answered well. Many students used $P(X \cap Y) = P(X) \times P(Y)$ to obtain 0.48 for $P(X \cap Y)$ and $P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$ to obtain 0.48 for $P(X \cap Y)$. Some students did not write 'yes' as their final answer. Students should make sure that they give a conclusion in questions like this.

Question 16

Generally this question was not answered well. Few students could work out the required probability. Some students used inexact decimals to approximate their fractions, e.g. 0.3 for $\frac{1}{3}$. A common incorrect method here was to select the cards with replacement and to write down the calculation as $(\frac{2}{9} \times \frac{1}{9}) + (\frac{7}{9} \times \frac{6}{9})$. Some students attempted to draw a tree diagram and then try to find the probabilities of 11 correct outcomes.

Question 17

Part (a)(i) of this question was answered quite well. Many students were able to standardise 16 kg and then were able to use the standard normal tables to find $P(X < 16)$. Many students answered part (a)(ii) quite well by standardising 12 kg and then finding $P(X > 12)$. Some students did not realise that this answer should not to be subtracted from 1. Some students worked out $1 - -0.35$, which gave an incorrect final answer. Part (c) was answered well. It was encouraging to see many students following through their answer from part (a)(i).

Question 18

Part (a) of this question was answered well. Most students were able to find $\sum x$ and $\sum y$ and then to substitute these values in the given formula for S_{xy} to obtain 418. Many students recalled the formula for the product-moment correlation coefficient correctly and obtained the correct answer of 0.831. In part (b) many students did not describe the relationship which should have been 'the greater the body mass the greater the heart mass'. Instead many students stated positive correlation.

Summary

Based on their performance on this paper, students are offered the following advice:

- read the question fully and carefully before attempting to answer it
- show working out to support the final answer
- know how to calculate a standard deviation
- write down the answers given by calculators to at least 2 decimal places but use accurate unrounded values in calculations
- be both precise and explicit in comparisons of distributions
- check to see if answers make sense in the context of the problem
- for a 'Show that ...' style question, show all intermediate stages in the calculations not just the substitution stage
- ensure that when asked to make a comparison that two or more things are actually compared
- make sure that all required formulae are learnt

Grade Boundaries

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<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

