1. June/2023/Paper_9709/61/No.4

A certain train journey takes place every day throughout the year. The time taken, in minutes, for the journey is normally distributed with variance 11.2.

(a) The mean time for a random sample of n of these journeys was found. A 94% confidence interval for the population mean time was calculated and was found to have a width of 1.4076 minutes, correct to 4 decimal places.

Find the value of n. [3]

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(b) A passenger noted the times for 50 randomly chosen journeys in January, February and March.

Give a reason why this sample is unsuitable for use in finding a confidence interval for the population mean time. [1]

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(c) A researcher took 4 random samples and a 94% confidence interval for the population mean was found from each sample.

Find the probability that exactly 3 of these confidence intervals contain the true value of the population mean. [2]

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2. June/2023/Paper_9709/61/No.6

A sample of 5 randomly selected values of a variable X is as follows:

$$1 \quad 2 \quad 6 \quad 1 \quad a$$

where $a > 0$.

Given that an unbiased estimate of the variance of X calculated from this sample is $\frac{11}{2}$, find the value of a. [3]

3. June/2023/Paper_9709/62/No.1

In a survey of 200 randomly chosen students from a certain college, 23% of the students said that they owned a car.

Calculate an approximate 93% confidence interval for the proportion of students from the college who own a car. [3]

4. June/2023/Paper_9709/62/No.3

The masses, in kilograms, of newborn babies in country A are represented by the random variable X, with mean μ and variance σ^2. The masses of a random sample of 500 newborn babies in this country were found and the results are summarised below.

$$n = 500 \qquad \Sigma x = 1625 \qquad \Sigma x^2 = 5663.5$$

(a) Calculate unbiased estimates of μ and σ^2. [3]

A researcher wishes to test whether the mean mass of newborn babies in a neighbouring country, B, is different from that in country A. He chooses a random sample of 60 newborn babies in country B and finds that their sample mean mass is 2.95 kg.

Assume that your unbiased estimates in part (**a**) are the correct values for μ and σ^2. Assume also that the variance of the masses of newborn babies in country B is the same as in country A.

(b) Carry out the test at the 1% significance level. [5]

5. June/2023/Paper_9709/63/No.2

A club has 264 members, numbered from 1 to 264. Donash wants to choose a random sample of members for a survey. In order to choose the members for the sample he uses his calculator to generate random digits. His first 20 random digits are as follows.

10612 11801 21473 22759

(a) The numbers of the first two members in the sample are 106 and 121.

Write down the numbers of the next two members in the sample. [2]

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(b) To obtain the numbers for members after the 4th member, Donash starts with the second random digit, 0, and obtains the numbers 061 and 211.

Explain why this method will not produce a random sample. [1]

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6. June/2023/Paper_9709/63/No.3

In a random sample of 100 students at Luciana's college, x students said that they liked exams. Luciana used this result to find an approximate 90% confidence interval for the proportion, p, of all students at her college who liked exams. Her confidence interval had width 0.157 92.

(a) Find the two possible values of x. [4]

Suzma independently took another random sample and found another approximate 90% confidence interval for p.

(b) Find the probability that neither of the two confidence intervals contains the true value of p. [1]