Sampling and Estimation – 2022 A2 Nov Math

1. Nov/2022/Paper_9709_61/No.1

The heights, in metres, of a random sample of 10 mature trees of a certain variety are given below.

5.9 6.5 6.7 5.9 6.9 6.0 6.4 6.2 5.8 5.8

Find unbiased estimates of the population mean and variance of the heights of all mature trees of this variety. [3]

2. Nov/2022/Paper_9709_61/No.5

A builders' merchant sells stones of different sizes.

(a) The masses of size A stones have standard deviation 6 grams. The mean mass of a random sample of 200 size A stones is 45 grams.

Find a 95% confidence interval for the population mean mass of size A stones. [3]

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(b) The masses of size B stones have standard deviation 11 grams. Using a random sample of size 200, an α% confidence interval for the population mean mass is found to have width 4 grams.

Find α. [4]

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3. Nov/2022/Paper_9709_62/No.1

Each of a random sample of 80 adults gave an estimate, h metres, of the height of a particular building. The results were summarised as follows.

$$n = 80 \qquad \Sigma h = 2048 \qquad \Sigma h^2 = 52\,760$$

(a) Calculate unbiased estimates of the population mean and variance. [3]

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(b) Using this sample, the upper boundary of an $\alpha\%$ confidence interval for the population mean is 26.0.

Find the value of α. [4]

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4. Nov/2022/Paper_9709_62/No.5

X is a random variable with distribution B(10, 0.2). A random sample of 160 values of X is taken.

(a) Find the approximate distribution of the sample mean, including the values of the parameters. [3]

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(b) Hence find the probability that the sample mean is less than 1.8. [3]

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