

Homework 9

1. Copy the following questions to your answer sheet and remember them: (30')

(1). Suppose that X_1, X_2, \dots, X_n is a random sample from a population $X \sim N(\mu, \sigma^2)$, where σ^2 is known. Then, a confidence interval for the unknown parameter μ with confidence level $1 - \alpha$ is _____.

(2). Suppose that X_1, X_2, \dots, X_n is a random sample from a population $X \sim N(\mu, \sigma^2)$, where σ^2 is unknown. Then, a confidence interval for the unknown parameter μ with confidence level $1 - \alpha$ is _____.

(3). Assume that X_1, X_2, \dots, X_n is a random sample from a population $X \sim N(\mu, \sigma^2)$, where μ is unknown. Then, a confidence interval for the unknown parameter σ^2 with confidence level $1 - \alpha$ is _____.

2. In order to confirm the formaldehyde concentration in a solution, a random sample of size 4 is obtained with observed sample mean $\bar{X} = 8.34\%$, and sample variance $S^2 = 0.03\%$. Suppose the population X obeys a normal distribution $X \sim N(\mu, \sigma^2)$. Find the confidence interval for μ and σ^2 under confidence level 95%, respectively. ($t_{0.025}(3) = 3.182, t_{0.025}(4) = 2.776, \chi_{0.025}^2(3) = 9.348, \chi_{0.975}^2(3) = 0.216$). (30')

3. A researcher has conducted 4 independent experiments to measure the melting points of iron, and the results are as follows: $1550^\circ\text{C}, 1540^\circ\text{C}, 1530^\circ\text{C}, 1560^\circ\text{C}$. Suppose that the melting points of iron obeys a normal distribution $X \sim N(\mu, \sigma^2)$. Find a confidence interval for the mean μ of the population X under confidence level 0.95. ($t_{0.025}(3) = 3.182, t_{0.025}(4) = 2.776$). (20')

4. Suppose that X_1, X_2, \dots, X_n is a random sample from a population $X \sim N(\mu, \sigma^2)$, where σ^2 is unknown. Then, the statistic for testing the hypothesis $H_0 : \mu = 0, H_1 : \mu \neq 0$ is _____. (t-test) (10')

5. In the problems of hypothesis testing, the significance level α means that () (10')

A. $P(H_0 \text{ is accepted} | H_0 \text{ is false})$; B. $P(H_0 \text{ is rejected} | H_0 \text{ is true})$;
C. the confidence level; D. nothing but a real number.