



Assignment

Course	: Probability and Statistics
Instruction	: Hand in your solutions by the deadline (Either in english or bahasa)
Deadline	: 29/11/2022, 23.59pm GMT+7
Lecturer	: Atar F. Babgei

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1. The following 18 measurements are obtained of a pollutant in a body of water: 10.25, 10.37, 10.66, 10.47, 10.56, 10.22, 10.44, 10.38, 10.63, 10.40, 10.39, 10.26, 10.32, 10.35, 10.54, 10.33, 10.48, 10.68 milligrams per liter. Unfortunately, we don't have any previous experience with this type of experiment. Calculate a 95% lower one-sided bound confidence limit for the mean concentration in this body of water, assuming an approximately normal distribution
 2. A study was conducted to determine whether treating cows with an experimental antibiotic influences a change in its body weight. To test the null hypothesis against the alternative hypothesis, we obtained the weight change measurements* from a random sample of 36 cows, which results in a mean of 1.29 kg with a standard deviation of 5.34 kg. Rewriting these into hypotheses statement:
 H_0 : the antibiotic treatment has no effect on a cow body weight ($\mu = 0$ kg)
 H_1 : the antibiotic treatment has an effect on a cow body weight ($\mu \neq 0$ kg)
 - a. Calculate the probability of rejecting the null hypothesis if in fact it is true. Which type of error is this?
 - b. Do you reject the null hypothesis? let's say if we choose the null hypothesis p-value = 0.05. Explain your answer! **

**) The measurements consist of both weight gain (positive weight change) and weight loss (negative weight change) obtained from the samples*

***) We reject the null hypothesis if $\alpha > p\text{-value}$*
 3. A relay-specialized company developed a new contact material to increase the electrical life expectancy of their relay product. The company claims that there is an increase in the relay life expectancy by a mean of 5000 operations with a standard deviation of 120 operations. To test the hypothesis that $\mu = 5000$ against the alternative that $\mu < 5000$, a random sample of 50 pieces of relay is tested. The critical region is defined to be $\bar{x} < 4970$.
 - a. Find the probability of committing a type I error when H_0 is true
 - b. Evaluate β for the alternatives $\mu = 4970$ or $\mu = 4960$