Homework 11
Elementary Statistics & Inference
STAT:1020, BogNAR

Name: ______________________________

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1. The amount of time per day, X (in hours), office workers spend working on a computer can be modeled by a normal distribution with mean μ and standard deviation σ, i.e. $X \sim N(\mu, \sigma)$. A manager wants to infer about the population mean μ, so he randomly selects 5 employees and observes their work habits. The raw data is:

$$6.5,\ 7.1,\ 5.9,\ 6.2,\ 6.3$$

It can be shown that the sample mean $\bar{x} = 6.4$ and sample standard deviation $s = 0.4472$.

(a) Test $H_0 : \mu = 6$ vs. $H_a : \mu \neq 6$ at the $\alpha = 0.01$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

(b) Based upon your answer in (1a), does the population mean computer time μ significantly differ from 6 hours? Why?

(c) Find the $p-$value for the test in (1a).

(d) Based upon your answer in (1c), does the population mean computer time μ significantly differ from 6 hours? Why?

(e) Find a 99% confidence interval for μ. Interpret the CI.

2. Wood et. al (1988) studied the efficacy of diet for losing weight. The study, which lasted one year, involved only men. The weight loss for dieting men follows a normal distribution with mean μ and standard deviation σ. A group of $n = 16$ dieting men lost an average of $\bar{x} = 7.2$ pounds with standard deviation $s = 4.4$ pounds.

   (a) Find a 90% confidence interval for μ.

   (b) Based upon your answer in 2a, does the population mean weight loss μ significantly differ from 5.5 pounds? Why?

   (c) Test $H_0 : \mu = 5.5$ vs. $H_a : \mu \neq 5.5$ at the $\alpha = 0.10$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (d) Approximate the $p-$value for the test in (2c).

   (e) Based upon your answer in (2d), does the population mean weight loss μ significantly differ from 5.5 pounds? Why?

   (f) If we were to test $H_0 : \mu = 11$ vs. $H_a : \mu \neq 11$ at the $\alpha = 0.10$ significance level, would the $p -$ value be less than α or greater than α? Why?

   (g) Approximate the $p-$value for the test in (2f).

3. The resistance (in Ohms) of a certain type of resistor (an electronic device) follows a normal distribution with mean μ and standard deviation σ. A technician randomly selected 25 resistors; the mean resistance was $\bar{x} = 971$ with standard deviation $s = 68$.

   (a) Find a 95% confidence interval for μ.

   (b) Based upon your answer in (3a), does the mean resistance μ significantly differ from 1,000? Why?

   (c) Suppose we wish to test $H_0 : \mu = 1{,}000$ versus $H_a : \mu \neq 1{,}000$ at the $\alpha = 0.05$ significance level. What is the $p-$value for the test?

   (d) Based upon your answer in (3c), does the mean resistance μ significantly differ from 1,000? Why?

   (e) Suppose the significance level $\alpha = 0.10$. Does the mean resistance μ significantly differ from 1,000? Why? *Hint: No further computations are necessary; you can answer this question based on the* $p-$value *in part (3c).*

   (f) Suppose the significance level $\alpha = 0.01$. Does the mean resistance μ significantly differ from 1,000? Why? *Hint: No further computations are necessary; you can answer this question based on the* $p-$value *in part (3c).*