Homework
Biostatistics (STAT:3510; Bognar)

1. The longevity of IV pumps (in months) has a normal distribution with mean μ months and standard deviation $\sigma = 8.0$ months. Suppose $n = 16$ IV pumps are randomly selected and the sample mean longevity $\bar{x} = 42.5$ months.

   (a) Test $H_0 : \mu = 40$ versus $H_a : \mu \neq 40$ 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.*

   (b) Based upon your answer in (1a), does the mean longevity μ significantly differ from 40 months? Why?

   (c) Find a 90% CI for the mean longevity μ.

   (d) Based upon your answer in (1c), will the $p-$value for the test in (1a) be less than α or greater than α? Why?

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

   (f) Based upon your answer in (1c), does the mean longevity μ significantly differ from 55? Why?

   (g) How many IV pumps would be needed for $se(\bar{x})$ to equal 1.0?

   (h) Even though the sample size $n < 30$, we were able to perform the above analysis. Why?

2. The diastolic blood pressure, X, of smokers follows a normal distribution with mean μ and standard deviation $\sigma = 15$, i.e. $X \sim N(\mu, \sigma = 15)$. The diastolic blood pressure of 3 randomly selected smokers was:

   125 140 125

   (a) Find a 95% CI for the population mean diastolic blood pressure μ.

   (b) Test $H_0 : \mu = 140$ vs. $H_a : \mu \neq 140$ at the $\alpha = 0.05$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (c) Find the $p-$value for the test in 2b.

   (d) Based upon your answer in (2c), does the population mean diastolic blood pressure μ significantly differ from 140? Why?

   (e) Based upon your answer in (2a), does the population mean diastolic blood pressure μ significantly differ from 140? Why?

3. The amount of time per day (in hours) office workers spend working on a computer can be modeled by a normal distribution with mean μ and standard deviation σ. A manager wants to infer about the population mean μ, so he randomly selects 5 employees and observes their computer time over the course of a day. The raw data is:

   6.5, 7.1, 5.9, 6.2, 6.3

   (a) Compute the sample mean $\bar{x}$ and the sample standard deviation s.

   (b) Find a 99% confidence interval for μ.

   (c) Based upon your answer in (3b), does the population mean time μ significantly differ from 7 hours? Why?

   (d) Based upon your answer in (3b), does the population mean time μ significantly differ from 8 hours? Why?

4. 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 (4a), does the population mean weight loss μ significantly differ from 5.5 pounds? Why?

   (c) Based upon your answer in (4a), is 8 a plausible value for μ? Why?

   (d) Based upon your answer in (4a), is 5 a plausible value for μ? Why?

5. Suppose a random sample of size 9 was obtained from a normal population with mean μ and standard deviation $\sigma = 6.3$. It was determined that the $p-$value for the test $H_0 : \mu = 80$ versus $H_a : \mu \neq 80$ was 0.8336. If $\bar{x} > \mu$, find a 95% confidence interval for μ.