Math 4310 Name:

HW #1

(1) We need to estimate the average porosity of bone samples. From measurements taken on similar populations we estimated that the standard deviation is $\sigma = 0.6$. What sample size n is needed to estimate the true average porosity to within 0.3 with 99% confidence?

(2) The mean caffeine content μ of a certain energy drink is under examination. A measure taken on a random sample of size $n = 16$ yields $\bar{x} = 2.4$ g/l.

(a) Assuming that the standard deviation is known to be $\sigma = 0.3$, find the 95 confidence interval for μ.

(b) If that the standard deviation is unknown but the sample standard deviation is $s = 0.3$, find the 95 confidence interval for μ.

(3) According to a manufacturer, the average time X taken by a drug to be totally absorbed is 60 min. From measurements on $n = 8$ randomly selected patients, we finds the following data for the absorption times (in minutes):

$$X_1 = 64, X_2 = 59, X_3 = 62, X_4 = 63, X_5 = 60, X_6 = 66, X_7 = 62, X_8 = 61.$$

(a) Assuming that X is normally distributed, test the hypothesis that the absorption time indicated by the drug manufacturer is too low (that is, test the alternative hypothesis $\mu > 60$), using significance level $\alpha = 0.05$.

(b) Repeat the test of hypothesis with $\alpha = 0.01$.

(4) Minor surgery on horses under field conditions requires a reliable short-term anesthetic producing good muscle relaxation, minimal cardiovascular and respiratory changes, and a quick, smooth recovery with minimal after effects so that horses can be left unattended. The article "A Field Trial of Ketamine Anesthesia in the Horse" (Equine Vet. J.,1984:176–179) reports that for a sample of $n = 73$ horses to which ketamine was administered under certain conditions, the sample average lateral recumbency (lying-down) time was 18.86 min and the standard deviation was 8.6 min. Does this data suggest that true average lateral recumbency time under these conditions is less than 20 min? Test the appropriate hypotheses at level of significance $\alpha = 0.10$ and compute the p value.

(5) A sample of 12 temperature readings (in Fahrenheit) were collected from a bacterial population and resulting readings were as follows:

105.6, 90.9, 91.2, 96.9, 96.5, 91.3, 100.1, 105.0, 99.6, 107.7, 103.3, 92.4.

Does this data suggest that the population mean temperature under these conditions differs from 100? State and test the appropriate hypotheses using $\alpha = 0.05$.