Math 310 Winter 2021 HW 1 Due Friday Jan. 29th at midnight

Your work should be typed and submitted through Canvas.

1. Contamination of mine soils in China is a serious environmental problem, The article **"Heavy Metal Contamination in Soils and Phytoaccumulation in a Manganese Mine Wasteland, South China"** reported that, for a sample of 3 soil specimens from a certain restored mining area, the sample mean concentration of Total Cu was 45.31 mg/kg with a corresponding (estimated) standard error of the mean of 5.26. It was also stated that the China background value for this concentration was 20. The results of various statistical tests described in the article were predicated on assuming normality.

   (a) Does the data provide strong evidence for concluding that the true average concentration in the sampled region exceeds the stated background value? Carry out a significance test at the level .01. Does the result surprise you? Explain

   (b) Referring back to part a, how likely is it that the P-value would be at least .01 when the true average concentration is 50 and the true standard deviation of concentration is 10?

2. The article **Caffeine Knowledge, Attitudes, and Consumption in Adult Women** reports the following summary data on daily caffeine consumption for a sample of adult women: $n = 47$, $\bar{x} = 215$mg, $s = 235$mg, and range is $5-1176$.

   (a) Does it appear plausible that the population distribution of daily caffeine consumption is normal? Is it necessary to assume a normal population distribution to test hypothesis about the value of the population mean consumption? Explain your reasoning.

   (b) Suppose it had previously been believed that mean consumption was at most 200 mg. Does the given data contradict this prior belief? Test the appropriate hypothesis at the significance level .10

3. The attached data on residual flame time (sec) for strips of treated children's nightwear were given in the article **An Introduction to Some Precision and Accuracy of Measurement Problems**. Suppose a true average flame time of at most 9.75 had been mandated. Does the data suggest that this condition has not been met? Carry out an appropriate test after first investigating the plausibility of assumptions that underlie your method of inference.

4. The incidence of a certain type of chromosome defect in the U.S. adult male population is believed to be 1 in 75. A random sample of 800 individuals in U.S. penal institutions reveals 16 who have such defects. Can it be concluded that the incidence rate of this defect among prisoners differs from the presumed rate for the entire adult male population?

   (a) State and test the relevant hypothesis using $\alpha = 0.05$. What type of error might you have made in reaching a conclusion?

   (b) Based on the P-value calculated in (a), could H_0 be rejected at significance level .20?

5. The article **Heavy Drinking and Polydrug Use Among College Students** stated that 51 of the 462 college students ina sample had a lifetime abstinence from alcohol. Does this provide strong evidence for concluding that more than 10% of the population sampled had completely abstained from alcohol use? Test the appropriate hypothesis.