Biostatistics

HW 8

The points assigned to each problem will be determined by the current TAs.

Hint: When sigma is estimated by S (the sample standard deviation), use T tests

1 **(10 marks)** Bags of a certain brand of tortilla chips claim to have a net weight of 14 ounces. The net weights actually vary slightly from bag to bag and are normally distributed with mean μ. A representative of a consumer advocacy group wishes to see if there is any evidence that the mean net weight is less than advertised. For this, the representative randomly selects 16 bags of this brand and determines the net weight of each. He finds the sample mean to be $\overline{X} = 13.82$ and the sample standard deviation to be $S = 0.24$. Use these data to perform an appropriate test of hypothesis at 5% significance level.

2 **(10 marks)** The time needed for college students to complete a certain maze follows a normal distribution with a mean of 45 seconds. To see if the mean time time μ (in seconds) is changed by vigorous exercise, we have a group of nine college students exercise vigorously for 30 minutes and then complete the maze. The sample mean and standard deviation of the collected data is 49.2 seconds and 3.5 seconds respectively. Use these data to perform an appropriate test of hypothesis at 5% level of significance.

3 **(10 marks)** To assess the accuracy of a laboratory scale, a standard weight that is known to weigh 1 gram is repeatedly weighed 4 times. The resulting measurements (in grams) are: 0.95, 1.02, 1.01, 0.98. Assume that the weighings by the scale when the true weight is 1 gram are normally distributed with mean μ.

a) Use these data to compute a 95% confidence interval for μ.

b) Do these data give evidence at 5% significance level that the scale is not accurate? Answer this question by performing an appropriate test of hypothesis.

4

Example: *Given the following GPA for* 6 *students*: 2.80, 3.20, 3.75, 3.10, 2.95, 3.40

a. Calculate a 95% *confidence interval for the population mean GPA.*?

b. If the confidence level is increased from 95% *to* 99% , *will the length of the confidence interval increase, decrease, or remain the same*??

c. If the confidence level is kept at 95% *but the sample size is quadrupled to*? $n = 24$?

5

Example: The hypothesis $H_0: \mu = 15$ is to be tested against $H_A: \mu \neq 15$ with $\alpha = 0.05$.

A random sample results in : n = 20, $\bar{X} = 17.5$, $s = 5.9$

a. which distribution should be used ? why ?

b. what is the P-value ?

c. What's your conclusion regarding the null hypothesis ?

d. repeat (b) , (c) if the alternative hypothesis $\mu \geq 15$

e. repeat (b) , (c) if the alternative hypothesis $\mu \leq 15$