**STAT 200 QUIZ 3 Section 6380 Summer 2015**

(For Questions 1 & 2) Mimi was the 5th seed in 2014 UMUC Tennis Open that took place in August. In this tournament, she won 80 of her 100 serving games. Based on UMUC Sports Network, she wins 75% of the serving games in her 5-year tennis career.

1. (2 pts) Find a 90% confidence interval estimate of the proportion of serving games Mimi won. (Show work and round the answer to three decimal places)

2. (5 pts) In order to determine if this tournament result is better than her career record of 75%. We would like to perform the following hypothesis test:

$$H\_{0}: p=0.75$$

$$H\_{a}: p>0.75$$

 (a) (2 pts) Find the test statistic. (Show work and round the answer to two decimal places)

(b) (2 pts) Determine the *P*-value for this test. (Show work and round the answer to three decimal places)

(c) (1 pt) Is there sufficient evidence to justify the rejection of  at the $α=0.02 $level? Explain.

 3.  (5 points)  The SAT scores are normally distributed. A simple random sample of 225 SAT scores has a sample mean of 1500 and a sample standard deviation of 300.

(a) (1 pt) What distribution will you use to determine the critical value? Why?

(b) (3 pts) Construct a 95% confidence interval estimate of the mean SAT score. (Show work and round the answer to two decimal places)

(c) (1 pt) Is a 99% confidence interval estimate of the mean SAT score wider than the 95% confidence interval estimate you got from part (b)? Why? [You don’t have to construct the 99% confidence interval]

4.  (7 points)  Consider the hypothesis test given by

$$H\_{0}: μ=650$$

$$H\_{a}: μ>650$$

Assume the population is normally distributed. In a random sample of 25 subjects, the sample mean is found to be $\overbar{x}=655$, and the sample standard deviation is $s=28.$

(a) (1 pt) Is this test for population proportion, mean or standard deviation? What distribution should you apply for the critical value?

(b) (1 pt) Is the test a right-tailed, left-tailed or two-tailed test?

(c) (2 pts) Find the test statistic. (Show work and round the answer to two decimal places)

(d) (2 pts) Determine the *P*-value for this test. (Show work and round the answer to three decimal places)

(e) (1 pt) Is there sufficient evidence to justify the rejection of  at the $α=0.02 $level? Explain.

5. (6 pts) Assume the population is normally distributed with population standard deviation of 80. Given a sample size of 25, with sample mean 740, we perform the following hypothesis test.

$ H\_{0}: μ=750$

$H\_{a}: μ<750$

1. (1 pt) Is this test for population proportion, mean or standard deviation? What distribution should you apply for the critical value?
2. (2 pts) What is the test statistic? (Show work and round the answer to three decimal places)
3. (2 pts) What is the p-value? (Show work and round the answer to two decimal places)
4. (1 pts) What is your conclusion of the test at the α = 0.10 level? Why? (Show work)

6. (7 pts) A new prep class was designed to improve SAT math test scores. Five students were selected at random. Their scores on two practice exams were recorded; one before the class and one after. The data recorded in the table below. We want to test if the scores, on average, are higher after the class.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SAT Math Score | Student 1 | Student 2 | Student 3 | Student 4 | Student 5 |
| Score before the class | 620 | 700 | 650 | 640 | 620 |
| Score after the class | 640 | 700 | 670 | 670 | 630 |

 (a) (1 pt) Which of the following is the appropriate test and best distribution to use for the test?

 (i) Two independent means, normal distribution

 (ii) Two independent means, Student’s t-distribution

 (iii) Matched or paired samples, normal distribution

 (iv) Matched or paired samples, Student’s t-distribution

(b) (1 pt) Let μd be the population mean for the differences of scores (scores after the class – before the class). Fill in the correct symbol (=, ≠, ≥, >, ≤, <) for the null and alternative hypotheses.

(i) H*0*: μd  \_\_\_\_\_\_\_\_ 0

(ii) H*a*: μd  \_\_\_\_\_\_\_\_ 0

(c) (2 pts) What is the test statistic? (Show work and round the answer to three decimal places)

(d) (2 pts) What is the p-value? (Show work and round the answer to three decimal places)

(e) (1 pt) What is your conclusion of the test at the α = 0.05 level? Why? (Show work)

7. (2 pts) True or False: The rejection region for a test at 5% level of significance is larger than the rejection region for a test at 1% level of significance. (Justify for full credit)

8. (2 pts) True or False: In a right-tailed test, the test statistic is 1.5. If we know P(X < 1.5) = 0.96, then we reject the null hypothesis at 0.05 level of significance. (Justify for full credit)

9. (2 pts) If we reject the null hypothsis in a statistical test at the 0.05 level, then we can conclude:

a. We fail to reject the null hypothesis at 0.01 level

b. We fail to reject the null hypothesis at 0.10 level

c. We do not know the conclusion at 0.01 level

d. We can definitely reject the null hypothesis above 0.01 level

10. (2 pts) Three hundred students took a chemistry test. You sampled 50 students to estimate the average score and the standard deviation. How many degrees of freedom were there in the estimation of the standard deviation?

a. 50

b. 49

c. 300

d. 299