Name: _____ **Section: MAT098/181C-**

MAT098/181C EXAM #4 (FORM A)

A scientific calculator is permitted. ***Cellphones may not be used as calculators and must be off or on vibrate during the exam****. Show all work on the test or on the work*

1. Of the first 10,000 votes cast in the 2016 election, 5,180 were for candidate A. Find a 95% confidence interval for the proportion of votes that candidate A will receive. Round to three decimal places. (*20 pts*)

   a) Determine whether the conditions are met.

   b) Construct the 95% confidence interval.

2. A researcher wants to estimate the average time a person spends waiting every day in Boston. The researcher chooses a random sample of 51 people and finds the average wait time is 53 minutes per day with a sample standard deviation of 29 minutes. Construct a 95% confidence interval for the average time a person spends waiting every day in Boston. Round final answer to one decimal place. (*20 pts*)

3. How many BHCC students must be randomly selected to estimate the mean annual salary after their graduation? We want 95% confident that the sample mean is within $1,200 of the population mean, and the population standard deviation is known to be $10,580. (*12 pts)*

For the problems (4) and (5), please state:

1) **Null, Alternate Hypothesis, type of test & level of significance**
2) **Check the conditions.**
3) **Compute the sample test statistic, draw a picture and find the P-value.**
4) **State the conclusion about the Null Hypothesis.**
5) **Interpret the conclusion.**

4. A new study has found that more than 90% of college students admit to using their devices for non-class activities during class times. A professor surveyed a sample of 425 randomly selected college students and found that 92% of them use their devices for non-class activities in class. Use a 0.05 significant level to test the claim that more than 90% of college students use their devices for non-class activities in class. (*24 pts)*

For the problems (4) and (5), please state:

1) **Null, Alternate Hypothesis, type of test & level of significance**
2) **Check the conditions.**
3) **Compute the sample test statistic, draw a picture and find the P-value.**
4) **State the conclusion about the Null Hypothesis.**
5) **Interpret the conclusion.**

5. According to a study, average smartphone life expectancy now reaches 4.7 years. A randomly selected sample of 46 individuals reported that their smartphone stop working after an average of 4.2 years. Assume that we know the population standard deviation of smartphone life expectancy is 1.2 years. Use a 0.05 significance level to test the claim that the average smartphone life expectancy is not 4.7 years. (*24 pts)*

(EXTRA CREDIT)

The mean number of absences a student has per semester is believed to be about 4 days. Faculty in a university do not believe this figure. They randomly survey 9 students. The number of absences they took for the last semester are as follows:

0, 0, 1, 3, 4, 4, 5, 5, 6

Let $x =$ the number of absences a student had for the last semester. Assume that x follows a normal distribution. Should the faculty team believe that the mean number is 4 days? Round to one decimal place. (*5 pts*)

Confidence Interval for Population Parameters

Concept	Population Proportion p	Population Mean μ	
confidence interval formula	$\hat{p} \pm Z_c \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	σ known $\bar{x} \pm Z_c \cdot \frac{\sigma}{\sqrt{n}}$	σ unknown $\text{df} = n - 1$ $\bar{x} \pm T_c \cdot \frac{s}{\sqrt{n}}$
sample size formula	$\hat{p} = \frac{x}{n}$ known $n = \hat{p} \cdot \hat{q} \cdot \left(\frac{Z_c}{E}\right)^2$ $\hat{p}$ unknown $n = \frac{1}{4} \cdot \left(\frac{Z_c}{E}\right)^2$	$n = \left(\frac{Z_c \cdot \sigma}{E}\right)^2$	

- 90% confidence interval: $Z_c \approx 1.645$
- 95% confidence interval: $Z_c \approx 1.960$
- 99% confidence interval: $Z_c \approx 2.576$

Hypothesis Testing

Concept	Population Proportion p	Population Mean μ	
test statistics	$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$	σ known $z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$	σ unknown $\text{df} = n - 1$ $t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

- If the P-value $< \alpha$, we reject the null hypothesis.
- If the P-value $\geq \alpha$, we fail to reject the null hypothesis.