

Name: _____

Section: **MAT098/181C-**

MAT098/181C EXAM #4 (FORM D)

*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. • A newspaper conducted an aggressive marketing campaign to check the number of customers who have their newspapers delivered to their doors. A random sample of 275 households shows that 102 of them, have their newspapers delivered. Construct a 90% confidence interval for proportion of customers who have their newspapers delivered to their door. (20 pts)

a) Determine whether the conditions are met.

b) Construct the 90% confidence interval.

- Many celebrities and public figures have Twitter accounts with large numbers of followers. However, some of these followers are fake, resulting from accounts generated by spamming computers. In a sample of 66 twitter audits conducted in December 2015, the mean percentage of fake followers was 19.7 with a population standard deviation of 8.4. Construct a 90% confidence interval for the mean percentage of fake Twitter followers. Round final answer to one decimal place. (20 pts)
- How many BHCC students must be randomly selected to estimate the mean amount of time students spend on social media per day? We want 90% confident that the sample mean is within 75minutes of the population mean, and the population standard deviation is known to be 200 minutes. (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 nationwide survey of working adults indicates that only 60% of them are satisfied with their jobs. The president of a large company believes that less than 60% of employees at his company are satisfied with their jobs. To test his belief, he surveys a random sample of 150 employees, and 67 of them report that they are satisfied with their jobs. Can he conclude that less than 60% of employees at the company are satisfied with their jobs? Use the $\alpha = 0.05$ level of significance. (24 pts)

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- 5) Interpret the conclusion.**

5. A computer software vendor claims that a new version of its operating system will crash 6 times per year on average. A system administrator installs the operating system on a random sample of 65 computers. At the end of a year, the sample mean number of crashes is 6.8, with a standard deviation of 4.2. Use a 0.05 significance level to test the claim that the computer will not crash 6 times per year on average. (24 pts)

(EXTRA CREDIT)

1. The mean number of absences a student has per semester is believed to be about 5 days. Faculty in a university does not believe this figure. They randomly survey 10 students. The number of absences they took for the last semester are as follows:

4, 0, 1, 2, 2, 4, 8, 5, 1, 4

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 5 days? Round to one decimal place. (5 pts)

2. A company that manufactures steel wires guarantees that the mean breaking strength (in kilonewtons) of the wires is greater than 50. They measure the strengths for a sample of wires and test

$H_0: \mu = 50$ versus $H_1: \mu > 50$.

If a **Type II** error is made, what conclusion will be drawn regarding the mean breaking strength? (5pts)

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 $df = n - 1$ $\bar{x} \pm T_c \cdot \frac{s}{\sqrt{n}}$
sample size formula	$\hat{p} = \frac{x}{n}$ known $n = \hat{p} \cdot \hat{q} \cdot \left(\frac{Z_c}{E}\right)^2$ <hr/> \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 $df = n - 1$ $t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$

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