

Quiz 3

I. True/False Questions (circle one) (2 points each).

- True or False 1. The sampling distribution of means approaches a normal distribution as n increases.
- True or False 2. There is only one error bound formula for estimating a population mean.
- True or False 3. Rejecting a true null hypothesis is a Type II error.

II. Multiple-choice Questions (circle one) (2 points each).

4. The Central Limit Theorem for Sums states that these sums follow a normal distribution with standard deviation

- a. $\frac{\sigma_x}{\sqrt{n}}$ b. $\sqrt{n} * \sigma_x$ c. σ_x d. $\sqrt{\frac{pq}{n}}$

5. The Student's t-Distribution has all these characteristics, **except**

- a. symmetric b. $\mu = 0$ c. $\sigma = 1$ d. $df = n - 1$

6. If H_0 states $\mu \geq 5$, then H_a must say

- a. $\mu < 5$ b. $\mu = 5$ c. $\mu > 5$ d. $\mu \leq 5$

III. Essay Questions (show all works for full credit, round probabilities to 4 decimal places).

7. A manufacturer produces 25-pound lifting weights. The lowest actual weight is 24 pounds, and the highest is 26 pounds. Each weight is equally likely so the distribution of weights is uniform. A sample of 100 weights is taken.

- a. What is the distribution for the mean weights of 100 25-pound lifting weights? (1 points)
- b. Draw the graph and find the probability that the mean actual weight for the 100 weights is less than 24.9. (5 points)
- c. What is the distribution for the sum of the weights of 100 25-pound lifting weights? (1 points)
- d. Draw the graph and find $P(\sum x < 2450)$. (5 points)
- e. Find the 90th percentile for the total weight of the 100 weights. (3 points)

8. A hospital is trying to cut down on emergency room wait times. It is interested in the amount of time patients must wait before being called back to be examined. An investigation committee randomly surveyed 70 patients. The sample mean was 1.5 hours with a sample standard deviation of 0.5 hours.

a. Identify the following: (4 points)

- i. $\bar{x} =$
- ii. $s_x =$
- iii. $n =$
- iv. $n - 1 =$

b. Define the random variables X and \bar{X} in words. (2 points)

c. Which distribution should be used for this problem? (1 points)

d. Construct a 95% confidence interval for the population mean time spent waiting (State the confidence interval, sketch the graph, and calculate the error bound). (5 points)

e. Explain in complete sentences what the confidence interval means. (1 points)

9. Jeffrey, as an eight-year old, established a mean time of 16.43 seconds for swimming the 25-yard freestyle, with a standard deviation of 0.8 seconds. His dad, Frank, thought that Jeffrey could swim the 25-yard freestyle faster using goggles. Frank bought Jeffrey a new pair of expensive goggles and timed Jeffrey for 15 25-yard freestyle swims. For the 15 swims, Jeffrey's mean time was 16 seconds. Frank thought that the goggles helped Jeffrey to swim faster than the 16.43 seconds.

Conduct a full hypothesis test using a preset $\alpha = 0.05$. Assume that the swim times for the 25-yard freestyle are normal. (10 points)