MTH 316 Practice Problems 1

1. What is the difference between nonparametric statistics and parametric statistics?

2. The lifting capacities of industrial workers are assumed to be normally distributed with mean = 65 lbs and standard deviation = 10 lbs.
a. What is the probability a randomly selected worker can lift more than 80 lbs?
b. What is the probability that a randomly selected worker has a lifting capacity that is between 65 and 70 lbs?

3. How does as hypothesis test differ from a confidence interval? Please explain.

4. By measuring the heights of 62 six-year old girls selected at random, an investigator determined that a 95% CI for the population mean height μ of six-year-old girls was (42.2 inches, 46.1 inches). Answer the following questions with "Yes", "No", or "Can't Tell" and give a brief explanation.

a. Does the population mean lie in the above CI?
b. Is the probability the population mean is in the confidence interval 0.95?
c. Does the sample mean lie in the above CI?
d. For a future sample of 62 six-year-old girls, will the sample mean lie in the above CI?
e. Using the same sample, a 99% confidence interval for μ will be narrower than the above CI.

5. **a.** Does the sign test rely on the binomial distribution? Please explain.
b. Does the Wilcoxon signed-rank test rely on the binomial distribution? Please explain.
c. Does the t-test rely on the binomial distribution? Please explain.

6. Let X = the number of dots that appear on the upper face of a fair die. Find the following.
a. $\mu = E(X)$.
b. $\theta = median(X)$.
c. $\sigma^2 = Var(X) = E[(X - \mu)^2]$.
d. The cumulative distribution function of X.

7. Please see problem above. Suppose that $n = 2$ so that the die is rolled twice. Notationally, the sample can be represented as (X_1, X_2).
a. Find the distribution of $X_{(2)} = max\{X_1, X_2\}$.
b. $P(X_{(2)} \leq 4)$.

8. **a.** Can the Central Limit Theorem be employed as a nonparametric procedure? Please explain.
b. Can bootstrapping be employed as a nonparametric procedure? Please explain.

9. Suppose that the population underlying the sample is normally distributed. Show that the sample mean is asymptotically more efficient than the sample median when estimating the center of the population.

10. What are the advantages/disadvatanges of collecting data in a paired fashion as opposed to two independent samples?