Homework 7 **Name:** _____
Biostatistics (STAT:3510; Bognar)

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1. 5.2.8

   (a)

   (b)

   (c)

   (d)

2. 5.2.9 (assume $n = 25$ is large enough to use CLT)

   (a)

(b)

3. 5.2.14

   (a)

   (b)

4. The length of time, X (in seconds), hippopotomuses can hold their breath underwater follows a normal distribution with mean $\mu = 150$ seconds and standard deviation $\sigma = 36$ seconds, i.e. $X \sim N(\mu = 150, \sigma = 36)$.

   (a) Find the probability that a randomly selected hippopotomus can hold its breath between 150 and 200 seconds.

   (b) Suppose 9 hippopotomuses are randomly selected. Find the probability that the mean breath-holding time $\bar{X}$ is more than 183 seconds.

   (c) Suppose 9 hippopotomuses are randomly selected. Find the probability that the mean breath-holding time $\bar{X}$ is between 160 and 183 seconds.

5. The expenditures (in dollars) of customers at a coffee shop has a distribution that is strongly skewed to the right with mean $\mu = 3.50$ and standard deviation $\sigma = 2.00$.

   (a) Suppose 12 customers enter the shop (assume independence). Can you find the probability that the mean expenditure, $\bar{X}$, is more than \$3.75? If so, find the probability. If not, explain why.

   (b) Suppose 100 customers are randomly selected (assume independence). Approximate the probability that the mean expenditure, $\bar{X}$, is more than \$3.00.

   (c) Suppose 100 customers are randomly selected (assume independence). Approximate the 99th percentile of the sample mean $\bar{X}$.

6. The diastolic blood pressure, X, of smokers follows a normal distribution with mean μ and standard deviation $\sigma = 15$, i.e. $X \sim N(\mu, \sigma = 15)$. The diastolic blood pressure of 3 randomly selected smokers was:

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   125  140  125
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   (a) Find a 95% CI for the population mean diastolic blood pressure μ.

   (b) Based upon your answer in (6a), does the population mean diastolic blood pressure μ significantly differ from 100? Why?

7. In the Iowa Driving Simulator, the number of times the center line is crossed by individuals that are under the influence of alcohol has a distribution that is skewed to the right with mean μ and standard deviation $\sigma = 7$. For the 49 participants that drove after drinking alcohol, the mean number of times the center line was crossed was $\bar{x} = 10$.

   (a) Find an approximate 95% confidence interval for μ.

   (b) Based upon your answer in (7a), does the population mean μ significantly differ from 5? Why?

   (c) Based upon your answer in (7a), does the population mean μ significantly differ from 10? Why?

   (d) What is the margin of error at (95% confidence)?

   (e) Could we perform the above analysis if the sample size $n < 30$? Explain.

8. The amount of energy storage of certain type of capacitor (a small electronic device used inside a pacemaker) has a distribution that is strongly skewed to the left with mean μ pF (pico Farad) and standard deviation $\sigma = 150$ pF. An electrical engineer randomly selected 100 capacitors and determined the CI for μ is $(383, 437)$ pF. What percent confidence interval is this? *Hint: Find $\bar{x}$, find $z_{\alpha/2}$, find α, then find the percent CI.*