Homework
Elementary Statistics & Inference (STAT:1020; Bognar)

1. The longevity of truck tires (in months) has a normal distribution with mean μ months and standard deviation $\sigma = 8.0$ months. Suppose $n = 16$ tires are randomly selected and the sample mean longevity $\bar{x} = 42.5$ months.
   (a) Find a 90% CI for the mean longevity μ.
   (b) Based upon your answer in (1a), does the mean longevity μ significantly differ from 55 months? Why?
   (c) How many tires would be needed for $se(\bar{x})$ to equal 1.0?
   (d) Even though the sample size $n < 30$, we were able to find the CI in (1a). Why?

2. 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:

   `125 140 125`

   (a) Find a 95% CI for the population mean diastolic blood pressure μ.
   (b) Interpret the CI in part (2a).
   (c) Based upon your answer in (2a), does the population mean diastolic blood pressure μ significantly differ from 100? Why?

3. 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) Interpret the CI in (3a).
   (c) What is the margin of error at (95% confidence)?
   (d) How many drivers would be needed for the margin of error (at 95% confidence) to equal 0.686?
   (e) Could we find the CI in (3a) if the sample size $n < 30$? Explain.

4. The gain of a certain type of MOSFET transistor follows a normal distribution with mean μ and standard deviation $\sigma = 11$. An electrical engineer randomly selected 16 transistors, and determined a CI for μ to be $(71.5, 81.5)$.
   (a) What percent confidence interval is this?
   (b) How large of a sample size n would be required for the margin of error to equal 2 at 95% confidence? *Round your answer up to the next whole number.*

5. The gain of a certain type of JFET transistor follows a normal distribution with mean μ and standard deviation σ. An electrical engineer randomly selected 7 transistors, and computed $\bar{x} = 116.2$ and $s = 7.8$.
   (a) Find a 95% confidence interval for μ.
   (b) Interpret the CI in (5a).
   (c) Based upon your answer in (5a), does μ significantly differ from 120? Why?
   (d) Could we find the CI in (5a) if the gains did not follow a normal distribution? Why?

6. The amount of time per day (in hours) office workers spend working on a computer can be modeled by a normal distribution with mean μ and standard deviation σ. A manager wants to infer about the population mean μ, so he randomly selects 5 employees and observes their work habits. The raw data is:

   6.5, 7.1, 5.9, 6.2, 6.3

   (a) Compute the sample mean $\bar{x}$ and the sample standard deviation s.
   (b) Find a 99% confidence interval for μ.
   (c) Interpret the CI in (6b).
   (d) Based upon your answer in (6b), does μ significantly differ from 8 hours? Why?