Assignment #3

Due: **Monday, October 27th at 12pm in the box marked Stat 333 inside room MS 315.**

Assignments will not be accepted if they are passed in after this time.
Assignments must be understandable (logically correct as well as legible).
Marks will be deducted if the assignment does not have a cover page with your name, and pages that are stapled!

1. A study is conducted to evaluate the percentage of infected needles used by injection drug users.
   (a) If no preliminary study is available, how large a random sample is needed to form a 95% confidencje interval with an error bound of 5 percent?
   (b) A preliminary study of a random sample of 400 needles that were used before a needle exchange program was established found 270 to be HIV-positive. In the context of this study, use an estimate of p to determine how large a sample is needed to form a 95% confidence interval on the population percentage of preexchange-program needles that are HIV-positive. Comment on this result.
   (c) Produce a 95% confidence interval using the data from the preliminary study. Interpret this interval.
   (d) The government claims that 75% of needles are HIV- positive. Is this claim correct based on the sample data? Explain.

2. A 95% confidence interval for the lives (in minutes) of Kodak AA batteries is $420.6 < \mu < 479.4$. Assume that this result is based on a sample of size 100 and that the population standard deviation was used.
   (a) Construct the 99% confidence interval.
   (b) If the confidence interval $432 < \mu < 468$ is obtained from the same sample data, what is the degree of confidence?

3. Suppose that we have only the first 10 body temperatures from a study.
   36.4 36.3 36.7 37.0 36.8 36.6 36.6 36.1 36.2 37.2.

   (a) Test the claim that the sample comes from a population with a mean of 37.0°C. Did you make any assumptions?
   (b) Add 5 to each of the original temperatures listed above, then test the claim that the sample comes from a population with a mean of 42.0°C. Compare the results to those found in part (a). In general, what changes when the same constant is added to every score?
   (c) After multiplying each of the original temperatures by 10, test the claim that the sample comes from a population with a mean of 370. Compare the results to those found in part (a). In general, what changes when every score is multiplied by the same constant?
   (d) Because the conversion from the Celsius scale to the Fahrenheit (F= 9/5C +32) scale involves adding the same constant (32) and multiplying by the same constant (9/5), can you predict what will happen when the original temperatures are converted and the claim of $\mu = 98.6$°F is tested? (Note that 37.0°C = 98.6°F.) Verify or disprove your prediction by converting the original temperatures to the Fahrenheit scale and testing the claim that $\mu = 98.6$°F.
   (e) Construct a 95% confidence interval for the mean of all body temperatures based on the above sample data. Did you have to make any assumptions?
   (f) How is the margin of error affected if each temperature is converted to the Fahrenheit scale? (F= 9/5C +32)
   (g) If the confidence interval limits are denoted by *a* and *b,* find expressions for the confidence interval limits after the original temperatures have been converted to the Fahrenheit scale.
   (h) Based on the results from part (g), can confidence interval limits for the Celsius temperatures be found by simply converting the confidence interval limits from the Celsius scale to the Fahrenheit scale?

4. In 1995, 74% of Americans aged 18 and older felt that men were more aggressive than women. In 2000, a similar poll was taken. In a random sample of 1026 Americans 18 years or older resulted in 328 respondents stating that men were not more aggressive than women. Is there significant evidence to indicate that the proportion of Americans who believe that men are more aggressive than women has decreased?

5. According to the U.S. Census Bureau, 7.1% of all births to nonsmoking mothers are of low birth weight (< 5 lbs.,8oz). An obstetrician wanted to know whether nonsmoking mothers between the ages of 35 and 39 year old gave birth to a higher percentage of low-birth-weight babies. She randomly selected 240 births where the mother was 35-39 years old and found that 22 of them gave birth to low-birth-weight babies.
    (a) Is there significant evidence to support the claim that mothers between 35 and 39 have a higher percentage of low-birth-weight babies?
    (b) At what levels of significance would we conclude that it appears that mothers between 35 and 39 do have a higher percentage of low-birth-weight babies?