Assignment 6: Due to Nov 4, 2019

*** * Please print your assignment and submit it to the lecturer on the due date, thanks for your cooperation.**

1. A group of investigators are studying a treatment that can reduce LDL Cholesterol (低密度脂蛋白胆固醇水平) level. The reduction of LDL at the end of the observation period was recorded from the treatment and control sample of participants, which were randomly selected from a specific patient population. From the past studies, the standard deviation of the reduction in LDL for this population from this treatment is around 20. What's the sample size so that one can have an 80% power to detect a 10 units average reduction in LDL (i.e., effect size of 10 units) at 5% level of significance for two-sided t-test. How about the sample size if one-sided test is used?

2. "Drug X is administered to 100 patients with a particular disease. 50 improve. Test whether this drug is better than drug Y, which is known to produce improvement in 45% of patients." Calculate the critical value and p value (alpha=0.05)

3. A student collected a large amount of demographic data from school children in a depressed area. Since this population was possibly malnourished, she was concerned that the children would have a hemoglobin level below the healthy average. The healthy average is 13 g/dL. She had collected a sample of size 120 children.
   Sample hemoglobin levels: Mean = 11.7 g/dL, Standard deviation = 3.2 g/dL

   a. Please run a hypothesis test comparing the hemoglobin levels in her sample population to the healthy average value. (alpha=0.05)
   b. Please estimate the p-value using simulation, and show your results with graph. Re-run the test with a sample size of 30.

4. Time magazine reported the result of a telephone poll of 800 adult Americans. The question posed of the Americans who were surveyed was: "Should the federal tax on cigarettes be raised to pay for health care reform?" The results of the survey were:

Non-Smokers	Smokers
$n_1 = 605$	$n_2 = 195$
$y_1 = 351$ said "yes"	$y_2 = 41$ said "yes"
$\widehat{p}_1 = \frac{351}{605} = 0.58$	$\widehat{p}_2 = \frac{41}{195} = 0.21$

Is there sufficient evidence at the $\alpha = 0.05$ level, say, to conclude that the two populations — smokers and non-smokers — differ significantly with respect to their opinions?