**Problem Set 4**
**(Lecture 7 & Lecture 8)**
**Due: 9/25**

***Question numbers and pages based on 7th Edition, please make sure you check and do the proper questions if using a different version****

1. For each of the following, decide whether the random variable of interest is indeed a Binomial Random Variable. If it is, properly label the distribution as we have in class. If not, identify why not (hint: remember that when we choose a sample of subjects from a population, we can assume independence if the sample is random and the population size is at least 20 times larger than the sample).
    a. A die is rolled 4 times with the RV X reflecting the number of "3's"
    b. The random variable X represents the number of tosses until we get 7 "Heads"
    c. A student who has no clue uses an independent random guess to answer each question on a test consisting of 25 multiple choice questions (each with 5 options) and 4 T/F. The random variable X represents the number of questions correct.
    d. A student who has no clue uses an independent random guess to answer each question on a test consisting of 29 multiple choice questions (each with 5 options). The random variable X represents the number of questions correct.
    e. Suppose that among 20 donors in a blood drive, 8 have blood type A. Three of the 20 donors are chosen at random. Let X be the number of donors with blood type A that are chosen (out of 3).
2. Austin decided to give Taylor Swift another chance. So, he listened through all her songs from 2009. There were 8 in total. Let the random variable X be the number of songs in which she complained about some boy. The probability of complaining about a boy is 56%.
    a. Does X follow a distribution that we covered in class? If so, how do we know? Properly label the distribution.
    b. How would your answer to part (a) change if Taylor Swift only put out 1 song in 2009 instead of 8?
    c. Verify that the probability that Taylor Swift complains about a boy in at least 2 songs equals the probability that Taylor Swift complains about a boy in more than 1 song.
    d. What is the expected number of songs that Taylor Swift will complain about a boy in?
    e. How much are we "off" by when we use the expectation to estimate the number of songs Taylor Swift will complain about a boy in?
    f. What is the probability that the number of songs Taylor Swift complains about a boy in is within 1 standard deviation of the mean (identify the interval we are interested in and then calculate the probability)? Since 3 is almost in the interval, include this in your probability calculation. What does this imply about the shape of the distribution (hint: think Empirical Rule)?

3. Textbook Exercise 3.55
4. Textbook Exercise 3.71
5. Textbook Exercise 3.76
6. Textbook Exercise 3.97