STAT/MA 41600
In-Class Problem Set #19: September 29, 2017

1. Let X be a random variable with parameters $N = 10$, $M = 4$, and $n = 3$. Is X more likely to be even or odd?

2. Bob rolls three dice; let X denote the number of 5's that appear. Alice draws five cards from a deck without replacement; let Y denote of Queens that appear.
2a. What kind of random variable is X? What are the parameters?
2b. What kind of random variable is Y? What are the parameters?
2c. Calculate $P(X \geq Y)$.

3a. Consider a stack of 1000 envelopes. Exactly 7 of them are green inside, and the other 993 are red inside. We choose 10 of the envelopes (without replacement). Let X denote the number of chosen envelopes that are green inside. What kind of random variable is X? What are the parameters?
3b. Find the probability that we select exactly 1 envelope which is green inside (and therefore the other 9 selected envelopes are red inside). In other words, find $P(X = 1)$.
3c. Now reconsider **3a** but replace and reshuffle the order of envelopes, in between the selections. Let Y denote the number of chosen envelopes that are green inside. What kind of random variable is Y? What are the parameters?
3d. In this scheme with replacement and reshuffling, find the probability that we select exactly 1 envelope which is green inside (and therefore the other 9 selected envelopes are red inside). In other words, find $P(Y = 1)$.
3e. Your results in **3b** and **3d** should be very close. Are they close?

4. Consider a collection of 30 bears, namely, 10 red bears, 10 green bears, and 10 blue bears. Select 7 of the bears (without replacement), and let X denote the number of bears that are red or blue.
4a. What is the expected value of X?
4b. What is the variance of X?