STAT/MA 41600
In-Class Problem Set #15: September 19, 2018

1a. Draw five cards from a deck with replacement (and reshuffling) in between the draws. Let X denote the number of cards with pictures of people (Jacks, Queens, and Kings) that appear. Is X a Binomial random variable? If so, what are the parameters? If not, then why not?

1b. Draw five cards from a deck, this time *without replacement*. Let X denote the number of cards with pictures of people (Jacks, Queens, and Kings) that appear. Is X a Binomial random variable? If so, what are the parameters? If not, then why not?

2a. Suppose that X_1, X_2, X_3 are independent Bernoulli random variables, each of which has expected value $2/3$. Define $X = X_1 + X_2 + X_3$. What is the expected value of X? What is the variance?

2b. Define $Y = 3X_1$. What is the expected value of Y? What is the variance?

2c. Are X and Y independent or dependent?

2d. Is X a Binomial random variable?

2e. Is Y a Binomial random variable?

2f. Calculate $P(X = Y)$.

3. Roll three 4-sided dice. Let X denote the minimum of the values that appear.

3a. Is X a Binomial random variable?

3b. We know that $X = X_1 + X_2 + X_3 + X_4$, where the X_j's are indicator random variables, i.e., where $X_j = 1$ if $X \geq j$, and $X_j = 0$ otherwise. Are the X_j's dependent or independent? Why?

4. Select 10 bears (with replacement) from a collection containing six colors of bears. Suppose that Mary likes purple and orange bears, and X is the number of these purple and orange bears among the 10 selected bears. What is $P(X \geq 2)$?