STAT/MA 41600
In-Class Problem Set #15: September 21, 2016

1. Suppose X and Y are independent Binomial random variables, each with $n = 4$ and $p = 2/5$. Find $P(|X - Y| = 1)$, i.e., find the probability that X and Y differ by exactly 1.

2a. Suppose X is a Binomial random variable with $n = 5$ and $p = 1/2$. Find $P(X \leq 2)$.
2b. Suppose Y is a Binomial random variable which is independent of X and which also has parameters $n = 5$ and $p = 1/2$. Find $P(X \geq Y)$.
2c. Is $X + Y$ a Binomial random variable too? If so, what are the parameters? If not, then why not?
2d. Is $X - Y$ a Binomial random variable too? If so, what are the parameters? If not, then why not?

3. Reconsidering the random variables X and Y from question 2:
3a. What is $\mathbb{E}(X + Y)$?
3b. What is $\mathbb{E}(X - Y)$?
3c. What is $\mathrm{Var}\,(X + Y)$?
3d. What is $\mathrm{Var}\,(X - Y)$?

4. Consider a die with 2 red sides, 2 green sides, and 2 blue sides. Roll the die 5 times, and let X denote the number of times that the die has a red result.

Flip a coin 5 times, and let Y denote the number of times that the coin shows "heads."

4a. Find the probability that X is an even number.
4b. Find the probability that X and Y are equal.