Recitation Session 7

Problem

1. *Hunter and Duck* Ten hunters are waiting for ducks to fly by. When a flock of ducks flies overhead, the hunters fire at the same time, but each chooses his target at random, independently of the others. If each hunter independently hits his target with probability p, com- pute the expected number of ducks that escape unhurt when a flock of size 10 flies overhead.

2. *Conditional Expectation.* S_n be the number of successes in n trials, what is $E(S_m|S_n = k)$ for $m \leq n$, what is $E(S_m|S_n)$? If X and Y are independent what is $E(X + Y|X = x)$.

3. *Correlation and Dependence.* Suppose that a random variable X takes on three values $\{-1, 0, 1\}$ with equal probability. Let $Y = X^2$.

   a. Are X and Y independent?

   b. Are X and Y correlated?

4. *Random walk.* A particle moves on a line at integer sites. At each step it can move one step to the left, one step to the right, or stay at the same place, all with equal probability. After 10,000 steps what is the probability that the particle is 100 steps away from its starting point.