Problem Session 9/21

1. Exercise 2.15

2. The Dow Jones Industrial Average consists of the 30 largest companies in the U.S. Assume that over the next year each of the 30 stocks has a ranking from best performer to worst performer (with no ties), and that each stock has equal probability to fall anywhere in that ranking.

   (a) If you pick 5 stocks at random, what is the probability that you pick exactly the top 5 performers?

   (b) If you pick 10 stocks at random, what is the probability that your picks include all of the top 5 performers?

   If you pick 10 stocks from the Dow Jones, what is the probability that your picks will include all of the top 5 performing stocks over the next year? (Assume that each of the 30 stocks has equal probability to land anywhere in the performance ranking.)

3. Exercise 3.18

4. It is estimated that 6 out of every 1,000 people have autism spectrum disorder, i.e., there is a 0.6% chance of being born with the disorder. Of people with autism spectrum disorder, 80% are male. Let A be the event that a person has autism spectrum disorder, and M be the event that a person is a male. Also, assume in this problem that it is equally likely to be born male or female, that is, $P(M) = P(M^c) = 0.5$.

   (a) What does $P(M \mid A)$ mean in English? What is its value?

   (b) What does $P(A \mid M)$ mean in English? What is its value?

   (c) What is the probability of being a female with autism spectrum disorder? (First write down the probability expression in terms of A and M, and then compute.)

5. Exercise 4.5

6. The police make a lineup of 5 people to present to a witness. Two people in the lineup are suspects, and the other three are not. The people line up in a random order. Let X be the random variable measuring how many people are in between the two suspects. What is the probability mass function for X?