STAT 425 – HW4

Assigned on Tues Sept 27, due on Fri Sept 30

Section 1.7: Counting Methods

Be sure to explain clearly and thoroughly how you determine your answers to all questions.

1. a) Suppose that 3 men and 3 women take an exam. Assume that there are no ties and that all 6 people have equal knowledge and ability, so all possible orderings according to exam score are equally likely. Determine the probability that the 3 highest scores are all from the same gender.

b) Generalize (a) to consider $k$ people of each gender, for $k \geq 1$, and find the probability that the $k$ highest scores are all from the same gender.

2. I once heard that Johnny Carson became aware of the birthday problem, and so he asked his audience whether anyone in the group shared his birthday, October 23.

a) Explain how this question is different from the birthday question we posed in class.

b) Let $n$ represent the number of people in the audience. Determine the probability that at least one person shared Johnny’s birthday, as a function of $n$. Explain/justify every step in your solution.

c) Suppose that Johnny had 250 people in his audience that evening. Determine the probability that at least one person would have matched his birthday. Is this event more likely than not?

d) Produce a graph of the probability in (b) as a function of $n$. Start with $n = 1$, and include enough values of $n$ that the probability exceeds .99. (Feel free to use Excel or Minitab or R or another software package.)

e) What is the smallest value of $n$ for which the probability exceeds .5? Repeat for exceeding .9 and for exceeding .99.

Not to hand in: Consider working on exercises 1-10 at the end of section 1.7 in the text.