Homework 2

1. There are roughly 200 national research universities in the United States, about 40% of which are private (the other 60% being public). According to 2012 figures, 75.9% of the (undergraduate) students who attend a national research university attend a public university. The graduation rate (the proportion of undergrads who graduate within six years) at public universities is 68.6%, while that at private universities is 81.3%.

(a) The child of a friend attended a national research university, but didn’t graduate within six years. What is the probability that they attended a private university?
(b) How do you account for the fact that less than one-fourth of students attend private universities when 40% of national research universities are private?

2. The American Statistical Association (ASA) is the leading professional organization for statisticians in the United States, with more than 19,000 members. According to information from the Association, currently 34.6% of ASA members are women. They also report that 56.6% of their members report a doctorate as their highest educational degree, and 29.6% of members with doctorates are women. Consider these observed proportions as true probabilities for ASA members. Are being a woman and having a doctorate as the highest educational degree independent of each other among ASA members?

3. The September 2020 issue of *Sports Illustrated* contained a story about wearable devices that sports teams and organizations are providing to their athletes to help detect COVID-19. Among these devices is technology that provides constant monitoring of different cardiac functions. The story included discussion with Michael Snyder, the director of Stanford’s Center for Genomics and Personalized Medicine. In particular, Snyder described a study started this past spring in which it was found that “in about 80% of subjects who contracted COVID-19, heart rate spiked significantly after infection, often several days before any other symptoms appeared.” Treat this as a true probability, rather than an estimate from the study. Why does this number by itself provide no useful information about whether this device is useful as an early warning detector of COVID-19 infection? What would we need to know in order to be able to
assess its usefulness in that role? Be as specific as possible in your answer.

4. An aerospace company has submitted bids on two separate federal government defense contracts, A and B. The company feels that it has a 40% chance of winning contract A and a 60% chance of winning contract B. It believes that winning contract A is independent of winning contract B.
   (a) What is the probability that the company will win both contracts?
   (b) What is the probability that the company will win exactly one of the contracts?

5. Suppose now that the aerospace company in question (3) feels that it has a 35% chance of winning contract C and a 65% chance of winning contract D. Given that it wins contract D, the company believes that it has a 40% chance of winning contract C.
   (a) Are the events winning contract C and winning contract D independent?
   (b) What is the probability that the company will win neither the C nor the D contract?
   (c) What is the probability that the company will win at least one of the C or D contracts?
   (d) If the company wins contract C, what is the probability that it will win contract D?

Homework due: October 6 by 10:00 PM. All homeworks MUST be submitted through the NYU Classes Assignments tab. You are welcome to complete your homework either by hand or using a text processor like Word, but I urge you to either write out or print out your homework, scan it (either using a scanner or a smartphone app), convert it to a pdf file, and upload it in that form through NYU Classes. The reason is that that is the operation you are going to need to do when taking the midterm and final exams, and I strongly encourage you to have some experience with those steps before the midterm so you will be familiar with what is involved.