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, 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.

(a) Are being a woman and having a doctorate as the highest educational degree independent of each other among ASA members?

(b) I regularly attend the annual meeting of the ASA, the Joint Statistics Meetings, which typically has more than 6000 attendees. On the first night of the conference there is a mixer for the attendees (as I’m sure you would imagine, a party like this is off the hook). Consider the attendees of the party as being typical of the ASA membership. If I walk up to a randomly chosen man at the mixer, what is the probability that his highest educational degree is a doctorate?

(c) In part (b) above, why did I need to say that you should “consider the attendees of the party as being typical of the ASA membership”? How do you think they might not be typical? What would be the consequences if they were not typical in those ways? I am not asking for a specific numerical answer, but rather general comments about why the answer provided in part (b) might be problematic in
3. 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?

4. 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 an 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 11