

## Homework 2

1. Various mathematical societies annually conduct a survey of degree-holders in the mathematical sciences (which includes statistics). According to the most recent survey, 33.5% of recent Ph.D. graduates in the mathematical sciences are female. In addition, 18.4% of the graduates are women with nonstatistics degrees, while 15.7% of the graduates are men with statistics degrees. Considering these proportions as true probabilities of an ongoing stable process, are gender and type of degree (statistics or nonstatistics) independent of each other? If not, how would you characterize this lack of independence in terms of the gender/degree relationship? (That is, in what way is the lack of independence manifesting itself?)
2. In June 2009 *Nielsen Wire* released a report based on the Nielsen NetRatings panel of 250,000 internet users. According to this report, the age distribution among users of Twitter is 16% ages 2-24, 64% ages 25-54, and 20% ages 55 and above. This can be contrasted with the general age distribution in the population of 34% ages 2-24, 42% ages 25-54, and 24% ages 55 and above (ignoring people below the age of 2). Overall, 7.2% of Americans over the age of 2 use Twitter.
  - (a) A target marketing firm wishes to concentrate its marketing efforts on Twitter users, but it isn't sure how that connects to which age groups to target. Based on the Nielsen figures, what is the probability that someone uses Twitter given that they are ages 2-24? What is the probability that someone uses Twitter given that they are ages 25-54? What is the probability that someone uses Twitter given that they are ages 55 and above?
  - (b) The Nielsen report stated that Twitter's growth has come "despite a lack of widespread adoption by children, teens, and young adults." Do you agree with this statement?
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 70% chance of winning contract C and a 50% chance of winning contract D. Given that it wins contract D, the company believes that it has an 80% 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**