STAT22000 Autumn 2017 Homework 4

All page, section, and exercise numbers below refer to the course text (OpenIntro Statistics, 3rd edition, by Diez, Barr, and Cetinkaya-Rundel.).

Reading: Section 2.2 (Just Bayes’ Theorem), 2.4, 2.5, and 3.1, 3.4 (Skip 2.3, 3.2 and 3.3)

Problems for Self-Study: (Do Not Turn In)

- Exercise 2.21, 2.23, 2.25, 2.35, 2.41 on p.121-125 and 3.3, 3.5, 3.11, 3.25, 3.31, 3.33 on p.158-165
- Answers can be found at the end of the book.

Problems to Turn In: due 3 pm of Friday, Oct. 27, on Canvas.


2. Exercise 2.36 on p. 124. In part (a), “profit” means “payoff – cost = payoff −$2,” and a “probability model” means a table listing all the possible values of the random variable and the probability of each value, just like Table 2.21 on p.105 in the textbook. In addition, please do an additional part (c): Find the standard deviation of Andy’s profit.

3. Exercise 2.40 on p. 124. Here are some clarification about the problem.
   - For part (a), you can assume that you bet $3 on red on a single round, though the probability model, expected value, and the SD of your earning would be identical if you bet $3 on black. As described in the problem, you can only bet on red or black but not green.
   - For part (a), when you bet $3 in a single round, you pay $3 to play the game, and you get $6 back if you win and nothing if you lose. Here, “winning” means the net profit (which can be $6 −$3 = $3 or $0 −$3 = −$3).
   - For part (b), in each of the three rounds you pay $1 to play and you get $2 back if you win and nothing if you lose. So your “winning” in each round can be $2 −$1 = $1 or $0 −$1 = −$1.

4. There are two major tests of readiness for college, the ACT and the SAT. ACT scores are reported on a scale from 1 to 36. The distribution of ACT scores for more than 1 million students in a recent high school graduating class was roughly Normal with mean $\mu = 21.5$ and standard deviation $\sigma = 5.4$. SAT scores are reported on a scale from 600 to 2400. The distribution of SAT scores is approximately Normal with mean $\mu = 1498$ and standard deviation $\sigma = 316$.

   (a) Jessica scores 1825 on the SAT. Ashley scores 28 on the ACT. Assuming that both tests measure the same thing, who has the higher score? Report the z-scores for both students.
   (b) Jorge scores 2060 on the SAT. Assuming that both tests measure the same thing, what score on the ACT is equivalent to Jorge’ SAT score?
   (c) Reports on a student’s ACT or SAT results usually give the percentile as well as the actual score. The percentile is just the cumulative proportion stated as a percent: the percent of all scores that were lower than this one. Renee scores 2040 on the SAT. What is her percentile?
   (d) What SAT scores make up the top 15% of all scores?

5. Exercise 3.10 on p. 159

6. A student takes a multiple-choice quiz with 5 questions, each with four possible selections for the answer. A passing grade is 60% or better (i.e., answering at least 3 of 5 questions correctly). Suppose that the student was unable to find time to study for the exam and just guesses at each question. Find the probability that the student . . . . (The problem continues on the next page)
(a) gets exactly 3 questions correct.
(b) passes the exam.
(c) How many questions would you expect the student to get correct?
(d) Obtain the standard deviation of the number of questions that the student gets correct.