Applied Statistics HW 13

1. In a lottery game, there are 60 people playing. Each person picks a number from 1 to 100 (and multiple people could pick the same number). Then a machine produces a number between 1 and 100 at random, and whoever had picked that same number wins. Denote by X the number of winners.

   a. Can X be described with a binomial distribution? i.e. does it correspond to the number of successes in a binomial setting? Explain exactly what the trials are, what success means etc.

   b. What are the chances, that we will have at least 2 winners?

   c. Are the events "We will have at least 2 winners" and "We will have at least 1 winner" independent of each other?

2. John has a 4-sided die where the number 1 is twice as likely as the other three numbers. He proceeds to roll the die twice and add the outcomes. Denote by X the resulting sum, which is a random variable. Determine its probability distribution.

3. We roll a 4-sided die two times. Each time it comes a 4, you win \$3, each time it comes 1 through 3 you lose a \$1. We denote by X the amount of money you gain from this game.

   a. What are the possible values for X and their probabilities (i.e. the probability distribution of X)?

   b. What are your chances of losing in this game?

4. Admissions is working through their data to try to estimate enrollment for the coming year. They separate the prospective students into three categories. Category A consists of students who for a number of reasons are very likely to come to Hanover. Only 5% of the prospective students fall into this category, however there is a 95% chance that a student in category A will decide to come here next year. Category B consists of students who have expressed an interest to some extent, in the form of deposits or campus visits. This category comprises 25% of the prospective students. A student in category B has a 65% chance of coming to Hanover. Finally, the remaining students are placed in category C. There is only a 32% chance that a student from category C will come to Hanover.

   a. What percent of the prospective students would decide to come to Hanover?

   b. What percent of the students in the incoming class will be from category A? How does that number compare to the percent of prospective students that are in cate- gory A? How does that make sense?

c. Admissions decides to consolidate categories A and B. What percent of the students from this new category will come to Hanover? What percent of the incoming students will be from this new category?