

Applied Statistics HW 13

1. A large campus of 23000 consists of 60% females. We are about to pick 9 people at random to form a committee. We are interested in the number of females in the committee.
 - a. Can this fit into the binomial setting? Explain.
 - b. What are the chances, that we will have no more than 2 women in the group?

c. What are the chances, that we will have no more than 2 men in the group?

d. What are the chances, that we will have at least 2 women and at least 2 men in the group?

2. Transatlantic communication was in the past done through extremely long copper cables at the bottom of the Atlantic. Such a cable would typically contain around 142 'reinforcers' (the numbers in this problem are largely made up), namely little gadgets along the way to reinforce the signal as it goes through them. Each reinforcer has a 1.3% chance of breaking down within 5 years. The system can withstand up to 3 reinforcers breaking down.

a. Can we consider the number of reinforcers that break down within 5 years to follow a binomial distribution? Explain what considerations you might have about the validity of this.

b. What are the chances, that the system will still be functional in 5 years?

3. Suppose a simplified version of a baseball game: 8 batters will go up, and each batter has a 12% chance of hitting the ball. There are no bases, so a hit is an automatic score (yeah I know, it's a VERY simplified version).
- a. What are the chances, that a team will score at least 7 points?
 - b. What are the chances, that a team will score at least 5 points?
4. 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?