

Mathematical Probability, Math 411, Homework 3

From the textbook solve the problems 2, 3, 8, 9, 10, 21, and 24 at the end of the Chapter 2. And also the problems below:

Problem 1. The dorm in which you live houses 1% of the total Texas A&M student population. You know 30% of the students living in your dorm, but you know only 2% of the rest of Texas A&M student population. A lot of Texas A&M students go to a party (including you) and a host tells you that he will seat you at a table with 3 other people you know. What is the probability that at least one other student at your table is from your dorm? You can assume that the number of people is large, so events of knowing different people at the party are independent.

Problem 2. If events A , B and C are independent, show that the events A^c , B and C are independent.

Problem 3. A clock tower at the Texas A&M campus rings bell every hour. Every hour, it will ring once with probability $1/3$ and twice with probability $2/3$. The numbers of times the bell rings at different hours are independent. If stay on campus for 4 hours (we hear bell on 4 occasions) what is the probability that we hear in total 7 rings.

Problem 4. Suppose we roll two dice and let X and Y be the two numbers that appear. Find the distribution of $|X - Y|$.

Problem 5. Suppose we pick a month at random from a non-leap year calendar and let X be the number of days in the month. Find the mean and variance of X .

Problem 6. A man and his wife decide that they will keep having children until they have one of each sex. Ignoring the possibility of twins and supposing that each trial is independent and results in a boy or a girl with probability $1/2$, what is the expected value of the number of children they will have?

Problem 7. A random variable has $P(X = x) = x/15$ for $x \in \{1, 2, 3, 4, 5\}$, and 0 otherwise. Find the mean and variance of X .

Problem 8. What is the probability of guessing exactly 3 out of 5 multiple choice questions, if each question has four answers?