

Statistics 430 Exam.

The exam is closed book. You may not use a calculator. Full credit will only be given for complete, clear and accurate answers. Show all your work. You may find it helpful to recall $P(AB) = P(A|B)P(B)$.

1. An insurance company has high-risk, medium risk and low-risk clients. The high-risk clients have a probability of 0.05 of filing a claim. The medium-risk clients have a probability of 0.03 of filing a claim and the low-risk clients have a probability of 0.01 of filing a claim. The proportions of clients in each of these categories (high, medium, low) are 0.1, 0.3 and 0.6 respectively.
 - (a) What is the chance that a random selected client is high risk and will issue a claim?
 - (b) Suppose that 500 clients are selected at random. Use the Poisson approximation to find the chance that there are no more than 2 claims.
 - (c) Suppose that the insurance company insures 100 high risk clients. What is the chance that exactly 5 of these clients issues a claim?
2. There are two urns labeled 1 and 2. Urn 1 contains 4 blue balls and 2 green balls. Urn 2 contains 5 blue balls and 1 green ball. A four sided die is thrown. If it comes up 1 then one ball is chosen from Urn 1. Otherwise (die is 2,3 or 4) one ball is chosen from Urn 2.
 - (a) Give a complete tree diagram for the above experiment including all the associated probabilities.
 - (b) What is the probability that the die came up 2 or 4 given that at least one of the balls chosen is blue?
3. A four sided die with numbers 3,4, 5 and 6 is thrown until the total score of all the throws adds up to at least 10. Let N be the total number of times that the die is thrown.
 - (a) What is the chance that the sum of the first two tosses is 8?
 - (b) Write down a table for the probability distribution of N .
 - (c) What is the chance that exactly one four is observed given that $N = 2$?
4. A purchaser of electrical components buys them in lots of size 10. Thirty percent of the lots have 2 defective components, ten percent of the lots have 1 defective component and sixty percent do not have any defective components. The purchaser selects a lot at random and then looks at 3 components randomly selected from the lot. What is the chance that none of these three components are defective?
5. Fifty percent of a large community is in favor of reducing school taxes. A sample of 100 people is taken. Use the normal approximation to approximate the chance that exactly fifty of the people in the sample are in favor of reducing school taxes.