

MATH 4510: Review for Midterm Exam

The midterm exam will consist of about five questions and cover Sections 1.1–4.7. The exam will be in class at the regular time and location on Friday, June 29. You will be permitted to use a calculator and one page (front and back) of notes on the exam.

1 Topics to Review

You should be familiar with:

1. How to count using the basic principle of counting, permutations, combinations, and multinomial coefficients.
2. What the Kolmogorov axioms say and how to verify that a function satisfies them.
3. How to compute probabilities by counting in sample spaces with equally likely outcomes.
4. How to compute probabilities using our formulas for unions, intersections, and complements.
5. How to compute conditional probabilities from the definition, by using a reduced sample space, and by using Bayes' Rule.
6. How to determine if two events are independent.
7. How to compute expected values and variances for random variables with simple probability mass functions.
8. How to determine the constant in a probability mass function.
9. What the binomial and Poisson distributions are and when/how to use them

2 Sample exam

The following questions are a sample exam similar to the content and length of the actual exam. (Note that this sample exam does not cover every possible topic listed above.)

1. A die is rolled 5 times. How many different sequences of rolls are possible if:
 - (a) the die never lands on 4?
 - (b) the die lands on one number at least twice?
2. Alice, Bob, and Carl each attempt to solve a crossword puzzle. There is a 70% chance that Alice can solve the puzzle without making a mistake, a 60% chance that Bob can, and a 85% chance that Carl can. What is the probability that at least one of them will solve the puzzle without making a mistake?
3. In a certain area, 4% of men and 0.5% of women are colorblind. If a given person is colorblind, what is the probability that that person is a man? (You may assume that the number of men and women in the area are equal.)
4. A random variable X takes on the values -1 , 3 , and 5 with probabilities 0.1 , 0.6 , and 0.3 respectively. Find the probability mass function and cumulative distribution function of X . Compute $E(X)$ and $\text{var}(X)$.
5. You roll a fair die twelve times. Find the probability that the die will land on six at least twice.