

Boston University
MA 581
Probability, Discussion
Summer 2, 2013

Set Theory

1. Generalize the inclusion and exclusion rule to three sets.
2. Ian, Wes and Hunter live together. Each of them has the same Boston Celtics cap and wear it to school everyday. One morning, they all get up late and pick the caps in a hurry. what is the probability that at least one person wears his own cap?

Classical Probability

1. Consider n distinct balls and N distinct bags. We assign the balls randomly to the bags. Find the probability that:
 - (a) there is one ball in the pre-fixed n bags
 - (b) there is one ball in n bags
2. Consider a bag with a white balls and b black balls. Draw a ball one by one without replacement. Find the probability that the k -th ball is a white one.
3. Consider a sample of a defective bulbs and b indefective bulbs. Draw n ($n \leq a$) bulbs from the sample. Find the probability of event $A_k = \{\text{the number of defective bulbs is } k\}$
4. Lijun has two chalkboxes with n chalks in each. She randomly picks one box and selects a chalk from that box when she gives the lecture. One day, she finds out that the box picked is empty. What is probability that the other matchbox contains exactly m chalks.

Geometric Probability

1. (*waiting time*) Suppose that you are waiting for the BU shuttle bus at the Marsh Palza. The shuttle runs every 30 minutes during the summer weekdays. Find the probability that your waiting time is less than 10 minutes.
2. (*meeting*) Wes and Hunter plan to meet sometime between 7pm and 8pm at The Cornwalls Bar in Kenmore. Unfortunately, their cellphones are not working so that they cannot call or text each other. But they has agreed that whoever gets there earlier will wait the other one only for 20 minutes. In other words, the earlier guy will leave immediately 20 minutes after his arrival. What is the probability that they will see each other?

3. (*Buffon's needle*) There are parallel lines with distance a to each other on a plane. You are going to throw a needle of length l ($l < a$). Find the probability that the needle intersect with any of the parallel lines.