CENG 222

Statistical Methods for Computer Engineering

Spring 2022-2023

Homework I

Due date: 03 04 2023, Monday, 23:55

Introduction

In this assignment, there are two classical questions and one programming question related to the 2^{nd} chapter and the 3^{rd} chapter of your text book. While answering the questions, please **show your work** and the steps of your calculations. Give an explanation about what numbers mean in those steps. Otherwise, you may not get any point. Also, include the code for the programming question in your report.

Questions

Q1. (**50 pts.**) You are given several dice of three different colors; red, blue and yellow. These are not ordinary dice, their face values are differing. Blue dice has six faces (similar to usual dice), while yellow dice has eight and red dice has ten. The face values are as following;

Blue: 1-2-3-4-5-6
Yellow: 1-1-1-3-3-3-4-8
Red: 2-2-2-2-2-3-3-4-4-6

a) What are the expected values of a single die roll for all three colors? *(6 pts)*
b) You are supposed to roll three dice and try to maximize the total value. You are given an option to roll a single die of each color, or three blue dice. Which option would you prefer and why? *(6 pts)*
c) For part b, what would change if it is guaranteed that the yellow die's value will be 8? Which option would you choose in this case?*(6 pts)*
d) You randomly choose a color and roll a single die of that color. If it is known that the value of the die is 3, what is the probability that the rolled die is red?*(20 pts)* (Each color has equal probability in random choosing)
e) What is the probability that the total value will be 5 when a single blue die and a single yellow die is rolled together?*(12 pts)*

Q2. (**25 pts.**)
You are planning to buy a new phone, however you can't afford the full price and have to wait for a discount. There are two different phone companies. Company A has 80 distributors and each of these offers a discount with a probability of 0.025 on a specific day. Company B has a single distributor and it

offers a discount with a 0.1 probability on a specific day. These companies act independently of each other.

a) What is the probability that at least four distributors of company A will offer a discount tomorrow? *(10 pts)*
b) Starting from today, what is the probability that you can buy a phone in two days? *(15 pts)*

NOTE: When calculating a probability in this question, indicate which discrete distribution family you use.

Q3. (**25 pts.**)
Using Octave or MATLAB, make an analysis of **Q1b**. Over 1000 iterations, roll the dice and provide the following;

- Average total value for the first option (rolling a single die of each color)
- Average total value for the second option (rolling three blue dice)
- Percentage of the cases where the total value of the second option is **greater** than the first option

Add your code to your report. Also add a screenshot of the output of Octave/MATLAB where the three items listed above is clearly visible. Briefly comment about the results.

Specifications

- You are expected to write your answers in LaTeX format. You can use the given template.
- Please do not skip the calculation steps. Show every step of your work.
- You have a total of 2 late days for this homework. For each day you have submitted late, you will lose 25 points. If you submit your homework at least 2 days later than the deadline, you will get zero.
- Cheating is forbidden. The violators will be punished according to the department regulations.
- Follow the course page on ODTUClass for any updates and clarifications. Please ask your questions on ODTUClass instead of e-mailing if they do not contain some part of the solution. If they contain, you can send an email to "mduymus@ceng.metu.edu.tr".

Submission

Submissions will be done via ODTUClass. If you do not have access to ODTUClass for some reason, please send an email to assistants about that. You are expected to submit a single PDF file named "hw1.pdf".