CENG 222

Statistical Methods for Computer Engineering

Spring 2020-2021

Homework 1

Due date: 11 04 2021, Sunday, 23:55

Introduction

In this assignment, there are 2 questions related to the 2^{nd} chapter and the beginning of the 3^{rd} chapter in 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.

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 and yellow dice have six faces (similar to usual dice) and red dice have eight faces. The face values are as following;

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

a) What are the expected values of a single die roll for all three colors? *(6 pts)*
b) Your options are either rolling "2 red and 1 yellow" OR "2 yellow and 1 blue". What are the expected values for each option? Which option would you choose if you want to maximize the total value?*(8 pts)*
c) For part b, what would change if it is guaranteed that the blue die's value will be 4? Which option would you choose in this case?*(8 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?*(16 pts)* (Each color has equal probability in random choosing)
e) What is the probability that the total value will be 6 when a single red die and a single yellow die is rolled together?*(12 pts)*

Q2. (**50 pts.**)
Assume that A and I denote the number of electric outages happened in a single day in Ankara and Istanbul respectively. The joint probability table for the number of electric outages for these two cities are given in Table 1.

a	i	P(A=a, I=i)
0	0	0.08
0	1	0.13
0	2	0.17
0	3	0.02
1	0	0.12
1	1	0.11
1	2	0.22
1	3	0.15

Table 1: Joint probability table of random variables A and I.

a) What is the probability that there are no electric outages in Ankara and two electric outages in Istanbul?
b) What is the probability that there are two electric outages in Ankara and no electric outages in Istanbul?
c) What is the probability that there are two electric outages in total?
d) What is the probability that there is a single electric outage in Ankara?
e) What is the distribution of total number of electric outages in both cities.
f) Show whether the electric outages in Ankara and Istanbul are independent or not.

Parts a and b are 5 points, remaining parts are 10 points.

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 3 late days for this homework. For each day you have submitted late, you will lose 20 points. The homeworks you submit after 3 late days will not be graded.
- Cheating is forbidden. The violators will be punished according to the department regulations.
- Follow the course page on COW for any updates and clarifications. Please ask your questions on COW 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 zip file named "hw1.zip" that contains both **your latex source** and also **the compiled version of it in pdf format**.