# Problem set 3

Mathematics Club

Summer school

1. Consider a quiz game where a person is given two questions and must decide which question to answer first. Question 1 will be answered correctly with probability 0.8, and the person will then receive as prize $100, while question 2 will be answered correctly with probability 0.5, and the person will then receive as prize $200. If the first question attempted is answered incorrectly, the quiz terminates, i.e., the person is not allowed to attempt the second question. If the first question is answered correctly, the person is allowed to attempt the second question. Which question should be answered first to maximize the expected value of the total prize money received?

2. Table given below indicates the joint probabilities-

| x | Sunny | Rainy |
|---|---|---|
| Power cut | 0.2 | 0.15 |
| No Power cut | 0.6 | $p$ |

   (a)What is the probability that there will be at least one power in the next three days? (b) Find all marginal and conditional probabilities.

3. Karthikeya buys a lottery ticket in 500 lotteries.In each lottery,his chance of winning a prize is 1/1000.Use poisson approximation to find the probability that (i)he win exactly one prize (ii)he win at least 2 prizes.

4. Anjali is a star basketball player who scores (2 points) 80% of the time when unguarded, but only 40% of the time when guarded. Against the team's current opponent,she will be guarded 70% of the time.Then find the expected value of the points scored by Anjali(Hint:Use law of iterated expectations).

5. If X and Y have joint pdf which is uniform over the triangles with vertices (0,0), (0,1)and (1,0). Find the conditional pdfs.

6. Chennai's temperature is modeled as a normal random variable with a mean temperature of 34°C and a standard deviation of 5°C. What is the probability that the temperature at a randomly chosen time will exceed 45°C?(Given $\Phi(2.2) = 0.9861$)

7. The length of time (in minutes) that certain person speaks on the telephone is the random phenomenon,with probability function given by

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

(i)Find the value of A that makes $f(x)$ a pdf. (ii)What is the probability that the number of minutes the person will speak over the phone is
(a)more than 10 minutes
(b)less than 5 minutes
(c)between 5 and 10 minutes