Assignment 2

1. Raindrops are falling at an average rate of 20 drops per square inch per minute. What would be a reasonable distribution to use for the number of raindrops hitting a particular region measuring 5 inches2 in t minutes? Why? Using your chosen distribution, compute the probability that the region has no rain drops in a given 3 second time interval. A reasonable choice of distribution is P

Ans:-

Consider time is 1 minute

20 drops → 1 $inch^2$

x drops → 5 $inch^2$

Therefore x = 100 drops

For time is 3 seconds

100 drops → 1 minute → 60 seconds

x drops → 3 seconds

therefore x = 5 drops/3 seconds

Here we will use Possion's Distribution for computing the Probability. Since the poisson distribution works well when there is some interval given.

P = Poisson's Distributed

X = Is the event of rainfall happening

$$P(X = 0) = (e^{-mu} * \mu^x)/x!$$

$$P(X = 0) = (e^{-5} * 1)/1 = 0.0068$$

2. Let X be a random day of the week, coded so that Monday is 1, Tuesday is 2, etc. (so X takes values 1, 2,..., 7, with equal probabilities). Let Y be the next day after X (again represented as an integer between 1 and 7). Do X and Y have the same distribution? What is P(X)

Ans:-

X can have values ranging from {1,2,3,4,5,6,7} having equal probabilities of $1/7$ and hence it is **Uniform Distribution.**

If the X is fixed, Y should certainly be the next day after the X. and hence the Y is not a distribution but it is a certain event dependent of the X.

Hence we can say that the X and Y doesn't have the same distribution.

$P(X) = 1/7$