Math For CS 2

# Assignment 1

## Question#1

Queueville Airlines knows that on average 5% of the people making flight reservations do not show up. (They model this information by assuming that each person independently does not show up with probability of 5%.) Consequently, their policy is to sell 52 tickets for a flight that can only hold 50 passengers. What is the probability that there will be a seat available for every passenger who shows up?

### Answer#1

1. Assume X as number of passengers who show up
2. X ~ Binomial (n=52, p=0.95)
3. Flight can only seat 50, so P(X <= 50)
4. P(X<=50) =
5. Approximation using normal distribution, if X ~ Bin(n, p) then X = N(µ, σ2)

Where µ = np = 52 \* 0.95 = 49.4

σ = = = 1.57

P(X <= 50) = P(Z <= (50 + 0.5 – 49.4)/1.57) = P(Z <= 1.1/1.57) = P(Z <= 0.70)

P(Z <= 0.70) 0.75

1. Approximately 75% chance that everyone who shows up gets a seat.

**Python code**

import scipy.stats as stats

# Parameters

n = 52       # total tickets sold

p = 0.95     # probability of showing up

k = 50       # maximum number of passengers that can be seated

# Calculate exact probability using Binomial CDF

probability = stats.binom.cdf(k, n, p)

print(probability)

*Result : 0.7405*

**Per binomial probability calculation above, there is a 74% chance that everyone who shows up will get a seat.**