MA206 Suggested Problems
Lesson 11 Monte Carlo Simulation I

1. In Excel, create a Monte Carlo Simulation that models an Exponential ($\lambda = 1/25$) Distribution.

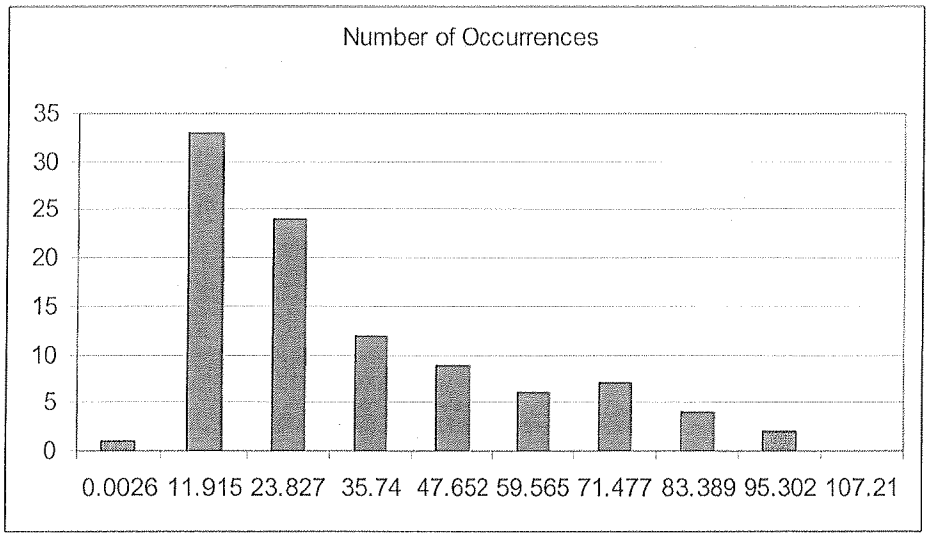
   a. What is the inverse CDF for this distribution?

CDFinverse(percentile) = $-25\ln(1 - percentile)$

   b. What is the inverse CDF for any Exponential (λ) Distribution?

CDFinverse(percentile) = $-\frac{1}{\lambda}\ln(1 - percentile)$

   c. Simulate 100 data points and make a histogram (in Excel) to demonstrate that the simulated values are actually from an Exponential Distribution.



d. What is the average of the 100 data points you simulated? What should the average be?

28.48347
The average should be close to 25.

e. Why are the averages different?

The averages are different because the sample is only of size 100. It is plausible that the averages could end up being the same, but that is a very unlikely event. If the sample was the entire population, the average would in fact be 25.

2. In Excel, create a Monte Carlo Simulation that models a Uniform (3, 10) Distribution.

a. What is the inverse CDF for this distribution?

3 + 7percentile i.e => 3 + (10-3)(percentile)

b. What is the inverse CDF for all Uniform (A,B) Distributions?

A + percentile(B-A)

c. Simulate 100 data points and find the average and the variance. Compare these with the true population mean and population variance. Why are they different? What can you do to bring them closer together?

$\mu = 6.5$ $\sigma = 4.08333$

xbar = 6.156 s^2 = 4.18288

They are different because, again, we are only looking at a sample of size 100. A much larger sample will bring these numbers closer together.

d. Make a histogram (in Excel) to show that your simulated values actually came from a Uniform (3, 10) Distribution.