COMP SCI/SFWR ENG 4/6E03 — Assignment 4

1. Processing times for a certain task on a computer system are measured - we have 100 instances that are assumed to be random samples. The sample average is 23.6 seconds and the sample standard deviation is 7.0 seconds.

   (a) Construct a 90 percent confidence interval for the mean processing time.

   (b) If one wishes to increase the level of confidence to 95 percent and keep the same width of the confidence interval, what would you recommend in terms of data collection?

   (c) Suppose we only had 49 samples, but the sample average and standard deviation were the same. Would the width of the confidence interval increase or decrease? By what proportion?

2. Suppose that samples from a distribution are generated by taking a sample from the $U[0, 1]$ distribution and taking its square root. What distribution is being sampled?

3. We wish to simulate the following system. Times between arrivals follow an exponential distribution with mean 6 minutes. There are two servers in parallel, arriving jobs must be processed by one of the two servers. Suppose that when an arrival occurs, with probability 0.5 it is assigned to the first server, otherwise it is assigned to the second server (this decision is made independently for each arrival). Processing at each server is FCFS and processing times are exponentially distributed with mean 10 minutes. Write your simulation using the framework discussed in lecture, do not use a simulation package.

   (a) We are interested in the mean number of jobs waiting in the system (including jobs being processed, if any). What is your estimate for this system?

   (b) Suppose now that an arrival joins the shortest of the two queues. How is the estimate of the mean number of waiting jobs affected?