

CSCI 3900C Project II (50 points)

Write an R script to accomplish the following tasks. Then compose a report using the results generated by your script. Submit BOTH (R script and report pdf file) to the Project II D2L drop box.

Please put all code in a single script file, and comment your code appropriately.

Program Tasks

1. Write the 3 functions named below to generate the specified random samples:
 - a. **GenUnifSamples**
will generate several samples from a uniform distribution between 1 and 10
 - b. **GenNormSamples**
will generate several samples from the standard normal distribution
 - c. **GenExpSamples**
will generate several samples from the exponential distribution (with default rate 1)

Each function should take two parameters:

- Sample size (no default value)
- Number of samples; the default value for this parameter should be 10000.

Each function should generate the designated number of samples from the distribution; each sample should be the designated size. Compute the mean of each sample and store it in a vector. The function should RETURN this vector.

EXAMPLES: **GenNormSamples(20, 100)** should generate 100 samples; *each* of these samples should have 20 random values from the standard normal distribution. For each of these samples, compute the mean of that sample and store it in a vector. The function then returns that vector with 100 values in it—the mean of each sample that was generated.

Similarly, **GenExpSamples(5)** should generate 10,000 samples of size 5 from the exponential distribution and return a vector of 10,000 means.

2. For each of the 3 distributions named above, do the following:
 - a. Create a theoretical density plot
 - b. Generate one sample with 10,000 values, and
 - illustrate the distribution of the sample with a histogram
 - report the mean, standard deviation, and 5-number summary
 - c. Use the function three times to generate the following 3 sets of samples:
 - 10,000 samples of size 5
 - 10,000 samples of size 25
 - 10,000 samples of size 500
 - d. For each set of samples listed in part c, your function should return a vector of means. Describe the distribution of those means as follows:
 - Illustrate the distribution of those sample means with a histogram
 - Report the mean, standard deviation, and 5-number summary of the means

Report

- Show all plots generated, appropriately labeled. Add any additional explanation needed to make it clear what each plot represents.
- Compare the individual sample and the three sets of sample means for the different sample sizes. Discuss how they compare to each other and how they compare to the theoretical distribution. Your comparison should include
 - Shape of distribution
 - Center of distribution (mean, median)
 - Spread of distribution (standard deviation, range)
- Review (or look up) the Central Limit Theorem. Explain how this theorem is related to the results you have reported above.