

ELEG 3143 Assignment # 11

1. A random number generator produces the following sequences of random numbers: 0.276, 0.123, 0.072, 0.324, 0.815, 0.312, 0.432, 0.283, 0.717.
 - (a) Find the sample mean.
 - (b) If we know the random numbers are uniformly distributed between 0.000 and 0.999, find the variance of the sample mean.
 - (c) How large should the sample size be in order to obtain a sample mean whose standard deviation is no greater than 0.01?
2. (Matlab question) Generate 100 sets of 10 each of a uniformly distributed random variable extending over the interval (0, 10).
 - (a) For each set of samples compute the sample mean, which is an estimate of the population mean. Thus you will get 100 different sample means.
 - (b) Compute the mean of the sample means, and compare this to its theoretical value.
 - (c) Compute the variance of the 100 sample means, and compare this to its theoretical value.
3. In a class of 50 students, the result of a particular exam is a true mean of 70 and a true variance of 12. It is desired to estimate the mean by sampling, without replacement, a subset of the scores.
 - (a) Find the standard deviation of the sample mean if only 10 scores are used.
 - (b) How large should the sample size be for the standard deviation of the sample mean to be one percentage point (out of 100)?

- (c) How large should the sample size be for the standard deviation of the sample mean to be 1% of the true mean?
4. A random number generator produces the following sequences of random numbers: 0.276, 0.123, 0.072, 0.324, 0.815, 0.312, 0.432, 0.283, 0.717. Find the sample variance if an unbiased estimator is used.
5. A Gaussian random time function with mean 2 and variance 4 is sampled so as to obtain independent sample values. How many sample values are required to obtain an unbiased estimate of the mean of the time function, with a standard deviation that is 2% of the true mean?