



Understanding the central limit theorem

0.1 Level 1

This exercise should be revision: Use the blocks below to generate 50 uniform random variables. Plot points on the graph at $(i, \frac{1}{i} \sum_{j=1}^i X_j)$. There should be 50 such points as i should take values from 1 to 50 and the sum should run over the random variables generated.

0.2 Level 2

This exercise should also be revision: Use the blocks below to generate 50 uniform random variables Plot points on the graph at $(n, \frac{1}{n-1} \left[\sum_{i=1}^n X_i^2 - \frac{1}{n} (\sum_{i=1}^n X_i)^2 \right])$. There should be 49 such points as n should run from 2 up to the number of variables generated. [Click here](#) if you want to watch the explanatory video.

0.3 Level 3

Lets investigate if the values for $\mu_j = \frac{1}{n} \sum_{i=1}^n X_i$ that we generate for a particular value of n have the same value. Use the blocks to generate 10 values for $\mu_j = \frac{1}{n} \sum_{i=1}^n X_i$. Each of these 10 values of μ_j should be generated by adding together 10 uniform random variables. Plot each of these 10 points at (j, μ_j) . Are all the values of μ_j that you obtain the same? [Click here](#) if you want to watch the explanatory video.

0.4 Level 4

Now repeat the last but one exercise in which generated 10 values of $\mu_j = \frac{1}{n} \sum_{i=1}^n X_i$ by adding together $n = 10$ uniform random variables. Also estimate the sample variance from each of these sets of n data points using $\sigma_j^2 = \frac{1}{n-1} \left[\sum_{i=1}^n X_i^2 - \frac{1}{n} (\sum_{i=1}^n X_i)^2 \right]$ and hence calculate the 90 around each of your estimates of the sample mean. Draw 10 points on the graph at each of the coordinates (j, μ_j) and illustrate the confidence limit around your estimate of the sample variance using an error bar. [Click here](#) if you want to watch the explanatory video.