Understanding the central limit theorem

MathsNET
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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 $(n, \frac{1}{n-1}\left[\sum_{i=1}^{n} X_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} X_i\right)^2\right])$. 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 $\sigma_j^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n} X_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} X_i\right)^2\right]$ 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.