5.2.3 Interactive: Central Limit Theorem

Central Limit Theorem - Directions for Use

1. In the "Distribution" box, create your own discrete distribution (all of whose possible values are integers between 0 and 9), either by "painting" with the mouse or your finger, or by setting the probabilities of the ten different values (the vertical axis is unlabeled since the distribution will automatically be normalized).
2. In the "Data Set" box you can move the slider to adjust the sample size (number of i.i.d. draws from the distribution you created).
3. Click "Generate Data" to generate random variables from your custom distribution, and find their average (sample mean). To replicate the experiment and build up the histogram, you can keep clicking, or (to get a lot more replications quickly) click on "Generate Data 1000 times".

What You'll Notice:

- The sample mean $\overline{x}$ for the most recent data set generated, and the expected value μ for your custom distribution.
- A histogram showing the values of $\overline{x}$ across many experiments.
- A Normal distribution overlaid on the histogram, to help assess "goodness of fit" between the distribution of the sample means and a Normal distribution. By the Central Limit Theorem, for a large sample size the distribution of the sample mean is approximately Normal, but how a good is the approximation and how much does this depend on the data distribution and the sample size?

You Should Try:

See what shape the histogram takes on when you...

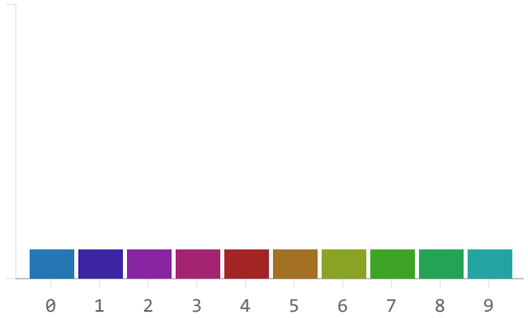
- Have a small sample size vs. a large sample size.
- Draw a discrete distribution that looks roughly Normal.
- Draw a Discrete Uniform distribution.
- Draw a very skewed (asymmetric) distribution.
- Draw a U-shaped distribution, high on the sides and low in the middle.

Distribution

Reset

Switch to slider controls:

Click or drag to draw a custom distribution.



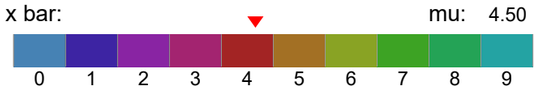
Data Set

Reset

Sample Size: 10

Generate Data | Generate Data 1000 times

x bar: mu: 4.50



Histogram of $\bar{x}_{10}$