Exploring the Central Limit Theorem

1. Go to the page [Sampling Distribution Simulator https://istats.shinyapps.io/sampdist_cont/

2. Select on of the real population datasets. Sketch the population distribution you are shown. What are the mean and standard deviation (label appropriately)?

3. Adjust the sample size to 5 and draw 1,000 samples. Sketch the sampling distribution. Repeat this 5 times (reset in between) sketching the sampling distribution. Record the mean and standard deviation of the sampling distribution each time. What do you observe about the sampling distribution?

4. Adjust the sample size to 10 and draw 1,000 samples. Sketch the sampling distribution. Repeat this 5 times (reset in between) sketching the sampling distribution. Record the mean and standard deviation of the sampling distribution each time. What do you observe about the sampling distribution?

5. Adjust the sample size to 20 and draw 1,000 samples. Sketch the sampling distribution. Repeat this 5 times (reset in between) sketching the sampling distribution. Record the mean and standard deviation of the sampling distribution each time. What do you observe about the sampling distribution?

6. Adjust the sample size to 20 and draw 1,000 samples. Sketch the sampling distribution. Repeat this 5 times (reset in between) sketching the sampling distribution. Record the mean and standard deviation of the sampling distribution each time. What do you observe about the sampling distribution?

7. Adjust the sample size to 100 and draw 1,000 samples. Sketch the sampling distribution. Repeat this 5 times (reset in between) sketching the sampling distribution. Record the mean and standard deviation of the sampling distribution each time. What do you observe about the sampling distribution?

8. As you increase the sample size, what do you observe about the shape of the sampling distribution?

9. Go back and change the population distribution from "Real Population Data" to "Skewed." Sketch the population distribution. Next construct four separate sampling distributions of samples of size 5, 10, 20 and 50. Sketch each and label the center and spread in each. What happens as the sample size increases?

10. Repeat the previous, but beginning with a bimodal distribution.

11. Repeat the previous, but beginning with a bell curve.

12. In the three previous examples, which sampling distributions look "Normal" for the smallest sample sizes? Rank the three population distributions skewed, bimodal, and bell curve, with respect to which has sampling distributions approaching Normal for the smallest sample sizes.

13. How large of a sample size would you expect a uniform population distribution to need before the sampling distribution appears very close to Normal?

Conclusions

1. In general, how would you describe the relationship between the mean of the sampling distribution and the population mean?

2. As the sample size increases, what happens to the sampling distribution (be sure to describe the shape, center and spread)?

3. What formula relates the standard deviation of the sampling distribution to the population standard deviation?