Assignment

derekogle.com/NCMTH107/modules/CE/SamplingDist_CE1.html

Construct Sampling Distributions

In this exercise, you will construct actual sampling distributions for different size samples from a very simple population. The very simple population use here is five individuals with the following values – 12, 14, 16, 18, 20. Perform the bulleted steps below and then answer the questions further below.

Compute the center and dispersion (to three decimals) of this population. Write results in table further below.

```
> popn <- c(12,14,16,18,20)      # creates population
> Summarize(popn,digits=3)       # population summaries
```

Identify all possible samples of n=2 from this population. [*Look at these to make sure that they make sense to you.*]

```
> ( nums2 <- combn(popn,2) )     # all combos of n=2 from popn (look at verticals)
```

Compute the mean for each sample. [*Look at these to make sure that they make sense to you.*]

```
> ( mns2 <- combn(popn,2,mean) ) # mean of all combos of n=2
```

Compute the mean and standard deviation of all 10 sample means. Write the results in the table further below.

```
> Summarize(mns2,digits=3)       # summarized mean/sd of means
```

- Repeat the previous four calculations for samples of n=3. [*Copy-and-paste your code for n=2 but change the names to* `num2` *and* `mns2` .]
- Repeat the previous calculations for samples of n=4. [*Copy-and-paste and use* `num3` *and* `mns3` .]

	Mean	St. Dev.
POPN		
n=2		
n=3		
n=4		

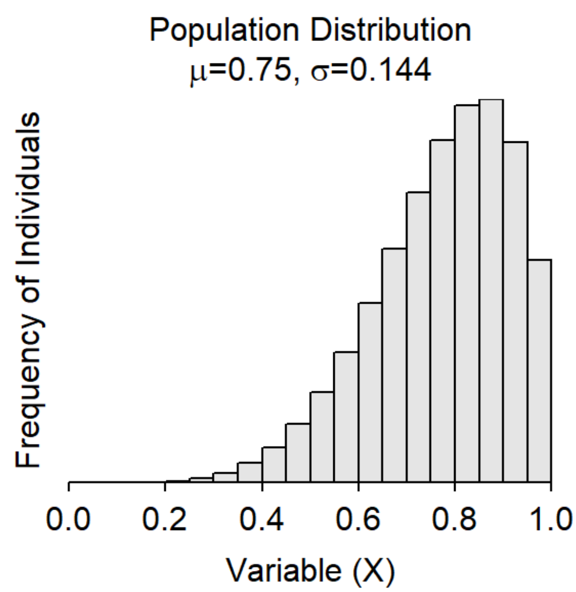
1. What symbols should be placed on the mean and standard deviation of the population shown in the fist row of your table.
2. How did the means of the sample means change with increasing n?
3. How did the three means of sample means (i.e., from n=2, 3, and 4) compare to the population mean?
4. What should the standard deviation of the sample means calculated above be called?
5. How did the three standard deviations of sample means compare to the population standard deviation?
6. How did the standard deviations of the sample means change with increasing n?

Assignment

derekogle.com/NCMTH107/modules/CE/SamplingDist_CE2.html

Explore Central Limit Theorem

The Central Limit Theorem (CLT), the specifics of which in your module preparation notes, provides a mechanism for understanding what the sampling distribution of the sample means looks like. In this exercise, you will first identify what the CLT says the shape, center, and dispersion of the sampling distribution of sample means should look like for different sample sizes (n) from the known population shown below.

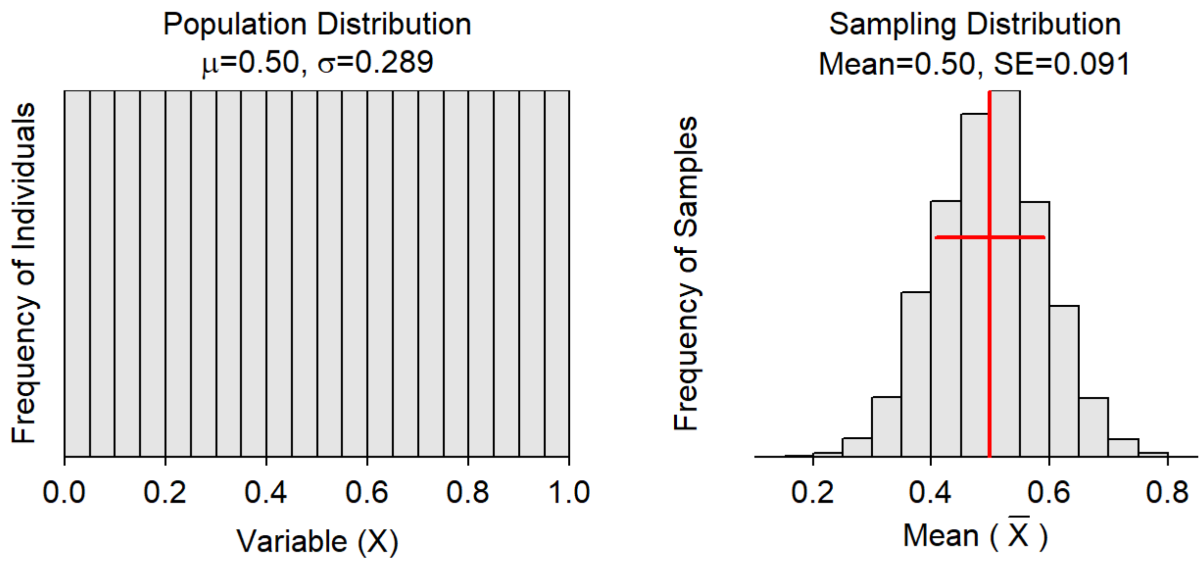


1. What is the shape (normal or not), center (a specific value), and dispersion (a specific value) of the population shown in the plot above? [Note: Put specific symbols on the values for center and disperions.]

2. Now record (in the table below) what would you expect, based on the CLT, the sampling distribution of the sample means to look like for samples of n=10, 25, and 50 taken from this population.

	Expected from CLT		
	Normal?	**Center**	**Dispersion**
n=10			
n=25			
n=50			

The sampling distribution of the sample means can be simulated by computing the means from many repeated samples from a population. The `cltSim()` function (with no arguments) efficiently computes sample means from many samples taken from a known population. The plots below were created with `cltSim()`. The histogram on the left below is the known population distribution (with μ & &sigma as shown). The histogram on the right is the distribution of sample means from 5000 samples of size n from the known population (i.e., a simulated sampling distribution).



In RStudio, a gear icon will be in the upper-left corner of this plot that will open a dialog box that allows you to change two shape parameters to alter the known population distribution and to modify n. The population shown above uses `shape1=6` and `shape2=2` . You should set those two sliders to those values and make sure that the population distribution (left plot) matches the population further above.

3. Record what you observed about the sampling distribution of sample means (right plot) for each of n=10, 25, and 50 in the appropriate cells of the table below.

	Observed from `cltSim()`		
	Normal?	**Center**	**Dispersion**
n=10			
n=25			
n=50			

Evidence to support (or not) the CLT can be obtained by comparing what you expected to see (based on the CLT) for the sampling distribution of sample means to what you actually observed in the simulated disributions.

4. Did each of your observations (second table) match your expectations (first table)?

5. Do your observations on this exercise give you confidence in the CLT? Why or why not?

Assignment

derekogle.com/NCMTH107/modules/CE/SamplingDist_CE3.html

Accuracy and Precision

Answer the questions below assuming that a population is known to have a mean of 60. [*This review exercise may be helpful.*]

1. Construct a hypothetical series of four numbers (that could represent sample means) that would be considered both precise and accurate.
2. Construct a hypothetical series of four numbers that would be considered imprecise but accurate.
3. Construct a hypothetical series of four numbers that would be considered precise but inaccurate.
4. Construct a hypothetical series of four numbers that would be considered imprecise and inaccurate.