# Sampling 100 Integers: An Overview of Sampling Distributions

THE POPULATION

The population of interest in this activity is the 100 integers from 1 to 100, inclusive. We are interested in seeing what happens in repeated samples of a given size from this population.

Use your calculator to enter the command $\text{seq}(X,X,1,100)\rightarrow L_1$. This should put our population in list 1.   Make a histogram of the population with your calculator in the window [0.5, 100.5, 10, -4, 14, 5] and record it on the axes below. For this population, find each of the following *parameters* and record them below.

Population Shape	
Population Mean	
Population Maximum	
Population Median	
Population Proportion of "Large Values" (X > 60)	
Population Standard Deviation	
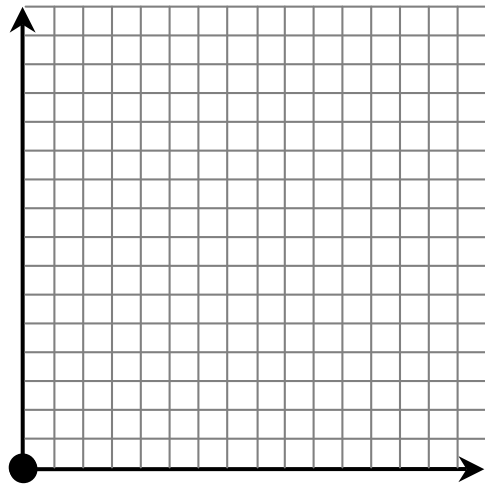
THE SAMPLES

You may need to clear some memory for the following activity. Now enter the command $\text{randInt}(1,100,200)\rightarrow L_1$. Repeat this command for list 2 through list 5.

Look at your data editor and think of each row as a sample of size 5. That is, the samples are as follows:

- $\{L_1(1), L_2(1), L_3(1), L_4(1), L_5(1)\}$
- $\{L_1(2), L_2(2), L_3(2), L_4(2), L_5(2)\}$
- and so on until you get your 200th sample
- $\{L_1(200), L_2(200), L_3(200), L_4(200), L_5(200)\}$

We are going to calculate various *statistics* for each of these samples. Thus, in repeated sampling, you will have many different statistics. We are interested in the distribution (shape, center, spread) of these statistics from these many different samples.

THE DISTRIBUTION OF SAMPLE MEANS

1. Compute the sample mean $\bar{x}$ for each of those 200 samples by entering the command $(L_1+L_2+L_3+L_4+L_5)/5 \rightarrow L_6$. Look at list 6 in your data editor. Write a sentence or two that describes what group of numbers is represented in list 6.

2. Make a histogram of L_6 with your calculator in the window [0.5, 100.5, 10, -4, 70, 5] and record it on the axes on the back. Describe the shape and find the mean and standard deviation, s, of L_6 and record them on the back. Label your horizontal axis and vertical axis carefully. This is a *rough approximation* of the sampling distribution of $\bar{x}$ for samples of size 5.

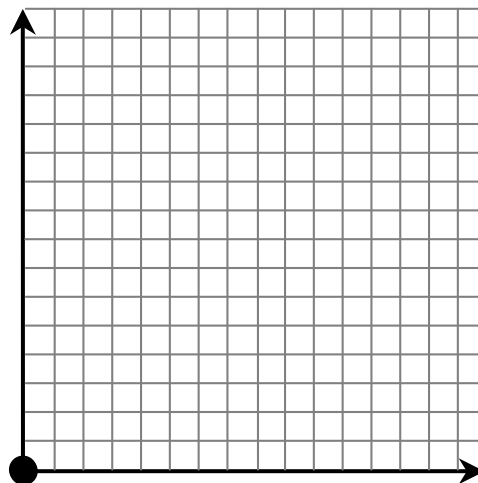|	
Shape Of Means ($n = 5$)	
Mean Of Means ($n = 5$)	
Standard Deviation Of Means ($n = 5$)	
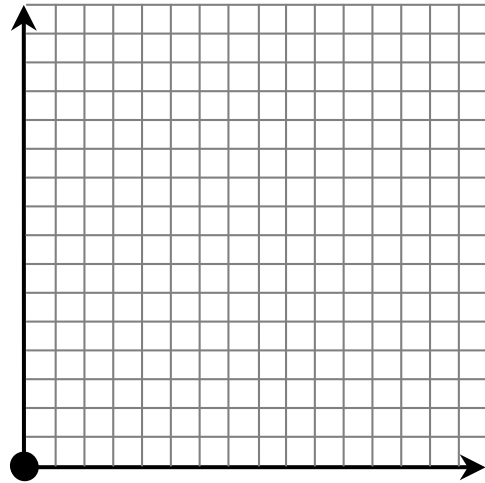
3. Look at the tables and histograms from the population and from question #2. Draw a vertical line at the population mean on your histogram above. What conclusions can you draw about the sampling distribution of *sample means*?

Enrichment: In question #2, I mentioned that L_6 was a rough approximation of the sampling distribution of $\bar{x}$ for samples of size 5. If I wanted to create the entire sampling distribution, how many samples of size 5 would there be if we sampled without replacement (as in an SRS)? With replacement?

THE DISTRIBUTION OF SAMPLE MAXIMUMS

4. Run the program **MAXCALC** from Mr. Tyson. This program will compute the sample maximum for each of those 200 samples and store it in list 6. Look at list 6 in your data editor. Write a sentence or two that describes what group of numbers is represented in list 6.

5. Make a histogram of L_6 with your calculator in the window [0.5, 100.5, 10, -4, 70, 5] and record it on the axes below. Describe the shape and find the mean and standard deviation, *s*, of L_6 and record them below. Label your horizontal axis and vertical axis carefully. This is a *rough approximation* of the sampling distribution of the *sample max* for samples of size 5.

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Shape Of Maximums (*n* = 5)	
Mean Of Maximums (*n* = 5)	
Standard Deviation Of Maxs (*n* = 5)	

6. Look at the tables and histograms from the population and from question #5. Draw a vertical line at the population maximum on your histogram above. What conclusions can you draw about the sampling distribution of *sample maximums*?

7. Run the program **MEDCALC** from Mr. Tyson. This program will compute the sample median for each of those 200 samples and store it in list 6. Look at list 6 in your data editor. Write a sentence or two that describes what group of numbers is represented in list 6.

8. Make a histogram of L_6 with your calculator in the window [0.5, 100.5, 10, -4, 70, 5] and record it on the axes below. Describe the shape and find the mean and standard deviation, *s*, of L_6 and record them below. Label your horizontal axis and vertical axis carefully. This is a *rough approximation* of the sampling distribution of the *sample median* for samples of size 5.

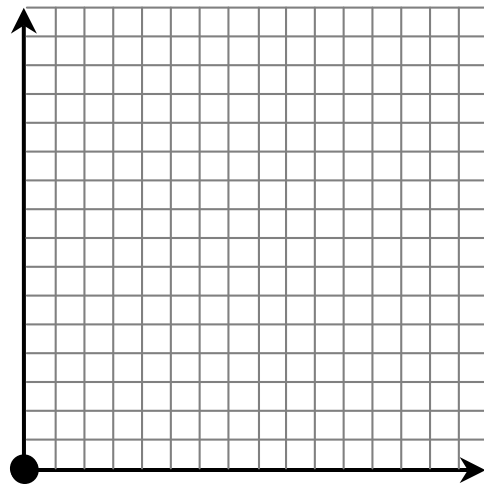|	
Shape Of Medians (*n* = 5)	
Mean Of Medians (*n* = 5)	
Standard Deviation Of Medians (*n* = 5)	
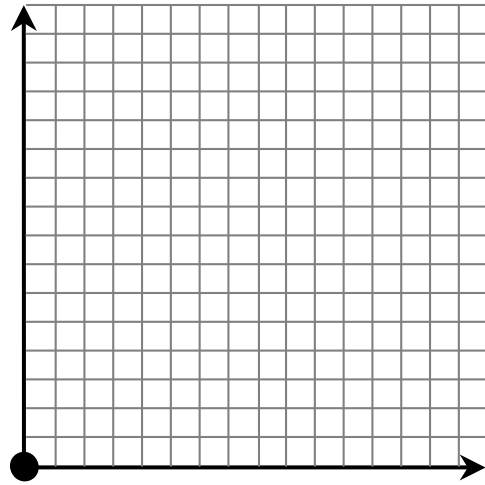
9. Look at the tables and histograms from the population and from question #8. Draw a vertical line at the population median on your histogram above. What conclusions can you draw about the *sampling distribution of sample medians*?

10. Run the program **LGVCALC** from Mr. Tyson. This program will compute the proportion of values that are greater than 60 for each of those 200 samples and store it in list 6. Look at list 6 in your data editor. Write a sentence or two that describes what group of numbers is represented in list 6.

11. Make a histogram of L_6 with your calculator in the window [-0.05, 1.15, 0.2, -4, 100, 5] and record it on the axes below. Describe the shape and find the mean and standard deviation, s, of L_6 and record them below. Label your horizontal axis and vertical axis carefully. This is a *rough approximation* of the sampling distribution of the *sample proportions of large values* for samples of size 5.

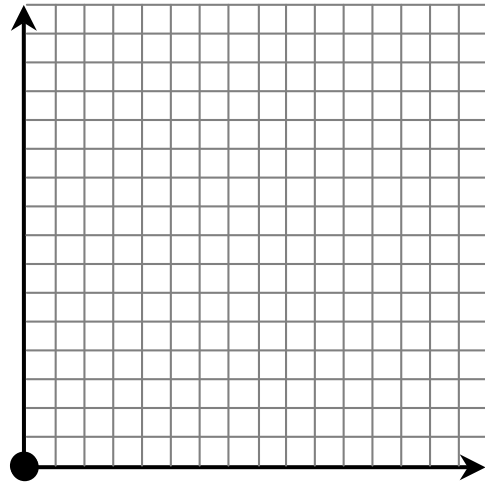|	
Shape Of Proportions ($n = 5$)	
Mean Of Proportions ($n = 5$)	
Standard Deviation Of Props ($n = 5$)	

12. Look at the tables and histograms from the population and from question #11. Draw a vertical line at the population proportion of large values on your histogram above. What conclusions can you draw about the *sampling distribution of sample proportions*?

13. Run the program **SDCALC** from Mr. Tyson. This program will compute the sample standard deviations for each of those 200 samples and store it in list 6. Look at list 6 in your data editor. Write a sentence or two that describes what group of numbers is represented in list 6.

14. Make a histogram of L_6 with your calculator in the window [-0.05, 70.5, 5, -4, 100, 5] and record it on the axes below. Describe the shape and find the mean and standard deviation, *s*, of L_6 and record them below. Label your horizontal axis and vertical axis carefully. This is a *rough approximation* of the sampling distribution of the *sample standard deviations* for samples of size 5.

Shape Of Std Deviations (*n* = 5)	
Mean Of Std Deviations (*n* = 5)	
Standard Deviation Of Std Devs (*n* = 5)	

15. Look at the tables and histograms from the population and from question #14. Draw a vertical line at the population standard deviation on your histogram above. What conclusions can you draw about the *sampling distribution of sample standard deviations*?