**Section 1.3 Simple Random Sampling**

1. **Random sampling** is the process of using chance to select individuals from a population to be included in the sample.

For the results of a survey to be reliable, the characteristics of the individuals in the sample must be representative of the characteristics of the individuals in the population. The key to obtaining a sample representative of a population is to let *chance* or *randomness,* rather than convenience, play a role in dictating which individuals are in the sample. **If convenience is used to obtain a sample, the results of the survey are meaningless.**

1. Clearly, the individuals in the sample do not accurately reflect the makeup of the entire population, CONVENIENCE.
2. The convenient sample is not representative of the population, which means that any results reported from your survey are misleading. Does your class mirror the gender, grade, or day/ evening of the entire campus, probably not.
3. Simple random sampling
4. Stratified sampling
5. Systematic sampling
6. Cluster sampling
7. A sample of size n from a population of size N is obtained through **simple random sampling** if every possible sample of size n has an equal chance of occurring. The sample is then called a **simple random sample.**

The number of individuals in the sample is always less than the number of individuals in the population. That is, n<N.

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Example 1

Sophie has four tickets to a concert. Six of her friends, Yolanda, Michael, Kevin, Marissa, Annie, and Katie, have all expressed an interest in going to the concert. Sophie decides to randomly select three of her six friends to attend the concert.

1. List all possible samples of size *n* = 3 from the population of size *N* = 6. Once an individual is chosen, he/she cannot be chosen again.

1,2,3 1,2,4 1,2,5 1,2,6 1,3,4 1,3,5 1,3,6 1,4,5 1,4,6 1,5,6 2,3,4 2,3,5 2,3,6 2,4,5 2,4,6 2,5,6 3,4,5 3,4,6 3,5,6 4,5,6

Comment on the likelihood of the sample containing Michael, Kevin, and Marissa.

1/20 percent chance of containing these three friends.

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How do we select the individuals in a simple random sample?

Typically, each individual in the population is assigned a unique number between 1 and *N*, where *N* is the size of the population. Then *n* distinct random numbers are selected, where *n* is the size of the sample. To number the individuals in the population, we need a frame**–** a list of all the individuals within the population.

Question 2.

1.EPR 674, Educational Research Planning and Interpretation

2.EPR 691, Nonparametric Statistics

3. EPR 644, Interpretive Methods in Educational Research

4. EPR 625, Fieldwork Methods in Educational Research

5. EPR 663, Theory of Measurement

1,2 1,3 1,4 1,5 2,3 2,4 2,5 3,4 3,5 4,5

674, 691 done f

674, 644 done e

674, 625 not

674, 663 done b

691, 644 done g

691,625 done c

691,663 done H

644 625 Done j

644 663 done a

The results of Example 1 leave one question unanswered:

***How do we select the individuals in a simple random sample?***

We could write the names of the individuals in the population on different pieces of paper and then select names from a hat. Often, however, the size of the population is so large that performing simple random sampling in this fashion is not practical.

Typically, each individual in the population is assigned a unique number between 1 and N, where N is the size of the population. Then n distinct random numbers are selected, where n is the size of the sample.

To number the individuals in the population, we need a **frame**—a list of all the individuals within the population.

Suppose Professor Cummings wishes

to estimate the average travel time to school for his class.

Rather than surveying each of the 33 students enrolled,

he decides to obtain a simple random sample of 5 students.

Professor Cummings already has a frame.

Remember, a "frame" is a list of all the individuals

in the population of interest.

In this case, the frame is the list

of students enrolled in the class.

To obtain a simple random sample,

Professor Cummings first assigns a unique number

to each student in the class.

So the first student in the class

is assigned number 1, the second student is assigned the number

2, and so on until we reach the last student who

is assigned the number 33.

5 different numbers will be randomly selected.

The students corresponding to these numbers

are the individuals in the sample.

This is sampling without replacement,

which means that an individual who is selected to be

in the sample from the population cannot be selected

again.

On the screen, we have our 33 students--

numbered 1 through 33.

To get the random numbers used to generate

our simple random sample, we could draw the numbers out

of an urn.

We select "Sample Students," and we draw our 5 numbers.

So the students that are in our sample

are student 8, student 24, student 14, student 15,

and student 32.

Student 8, student 24, student 14, student 15, and student 32.

We find that the average time of their commute is 25 minutes.

Let's obtain a second random sample of size 5

from our student population.

The procedure is the same.

We're going to randomly select 5 unique numbers from an urn.

The individuals corresponding to the numbers are in the sample.

Student 15, student 29, student 1, student 17, and student 6.

We then ask these students to report their travel time

to school.

19 minutes, 18 minutes, 4 minutes, 3 minutes,

and 10 minutes.

We get an average travel time to school of 10.8 minutes.

Notice that the individuals in our first sample

are different from the individuals

in the second sample.

Our first sample had Megan, Uri, Adam, Suman, and Keith.

Our second sample had Alizandro, Matt, Adam, Crystal, and Megan.

For this reason, each sample results

in different descriptive statistics.

The first sample had an average commute time of 25 minutes.

The second sample had an average commute time of 10.8 minutes.

Therefore, any inference based on each sample

may result in different conclusions regarding

the population.

This is the very nature of statistics.

Inferences based on samples will vary

because the individuals in the samples vary.

The individuals differ from sample to sample

because chance is used to select the individuals.

Of course, for large populations--

such as all the students enrolled

in a particular college or university--

the approach just taken in using an urn

would be difficult to use.

Imagine a school with 15,000 students.

It would be quite a large urn that

would require 15,000 balls.

Instead, in practice, random number generators--

such as those found on TI graphing calculators

or StatCrunch-- are used to obtain the individuals

in the simple random sample.

00:01>> In this example, we'll learn to obtain a simple random sample

using the TI-84 calculator.

The accounting firm of Senisi and Associates has grown.

To make sure their clients are still

satisfied with the services they are receiving,

the company decides to send a survey out

to a simple random sample of 5 of its 30 clients.

Here's a list of the clients.

Let's go ahead and open the calculator

to select the sample.

OK, here we are with the TI calculator.

We're going to press the Math button.

Move to the right until you reach the Prob menu.

And we're going to select option 8, randIntNoRep,

which means we're going to select

random integers without repeating.

The lowest number we have was 1.

The upper value was 30.

And we want to take a sample of size 5.

So we'll let n be 5.

Scroll down to highlight Paste and press Enter.

And now that we're back on the main screen, press Enter again.

And we'll have our sample.

So the 5 clients will be number 29, number 7, number 12,

number 1, and number 4.

So the 5 clients in the sample are

number 29, Walker Insurance; number 7, Dynojump;

number 12, Hains Hauling; number 1, AVC Electric; and number 4,

Casey's Glass House.

Let's go over the steps for the TI-84.

Press the Math button, and from the Problem menu

select option 8, randIntNoRep.

Press Enter.

Type values for the lowest value possible,

the highest value possible, and your sample size n.

Highlight Paste, press Enter.

And then press Enter again when you're on the home screen

and you'll have your sample.