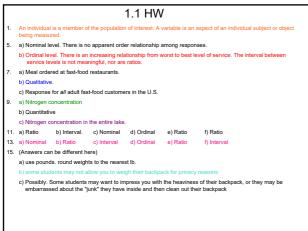
## 1.2 Random Samples with work



#### Sep 7-7:35 AM

# Sep 1-9:23 AM

# A simple random sample (SRS) of *n*

measurements from a population is a subset of the population selected in such a manner that every sample of size *n* from the population has an equal chance of being selected.

Sep 1-9:27 AM

# IMPORTANT FEATURES OF A SIMPLE RANDOM SAMPLE:

1.2 Random Samples

What types of bias/issues can occur?

• Construct a simple random sample using random numbers.

• Describe stratified sampling, cluster sampling, systematic

sampling, multistage sampling, and convenience sampling.

What types of sampling exist?

• Explain the importance of random samples.

**Essential Questions:** 

• Simulate a random process.

Focus Points:

#### For an SRS:

- Every sample of specified size *n* for the population has an equal chance of being selected.
- No researcher bias occurs in the items selected for the
- A random sample may not always reflect the diversity of the population. For instance, from a population of 10 cats and 10 dogs, a random sample of size 6 could consist of all cats.

Sep 1-9:28 AM

## **Example 1**: Simple Random Sample (SRS)

Is open space around metropolitan areas important? Players of the Colorado Lottery might think so, since some of the proceeds of the game go to fund open space and outdoor recreational space. To play the game, you pay \$1 and choose any six different number from the group of numbers 1 through 42. If your group of six numbers matches the winning group of six numbers selected by SRS, then you are a winner of a grand prize of at least \$1.5 million.

a) Is the number 25 as likely to be selected in the winning group of six numbers as the number 5?

YES

b) Could all the winning numbers be even?

NO

c) Your friend always plays the numbers 1, 2, 3, 4, 5, 6. Could she

YES

#### Example 1: Simple Random Sample (SRS)

Is open space around metropolitan areas important? Players of the Colorado Lottery might think so, since some of the proceeds of the game go to fund open space and outdoor recreational space. To play the game, you pay \$1 and choose any six different number from the group of numbers 1 through 42. If your group of six numbers matches the winning group of six numbers selected by SRS, then you are a winner of a grand prize of at least \$1.5 million.

- a) Is the number 25 as likely to be selected in the winning group of six numbers as the number 5? Yes, Because the winning numbers constitute a SRS, each number from 1 - 42 has an equal chance of
- b) Could all the winning numbers be even? Yes, since six even numbers is one of the possible groups of six numbers
- c) Your friend always plays the numbers 1, 2, 3, 4, 5, 6. Could she ever win. Yes. In a SRS, the listed group of 6 numbers is as likely as any of the 5, 245,786 possible groups of 6 numbers to be selected as the

Sep 1-9:32 AM Sep 1-9:32 AM

# 1.2 Random Samples with work

# How do we get random numbers?

- most calculators
- internet has random number generators
- random-number table
- drawing numbers from a "hat"

#### Random Number on Calc

- MATH PRB 5
- (smallest #, biggest #)
- **ENTER**

STEPS:

- 1. number the cars. **00** | 500
- 2. pick a row from the random-number table 3

Random Number Table Practice

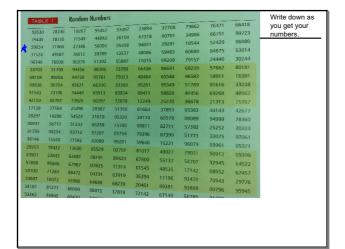
Use a random-number table to pick a random

sample of 30 cars from a population of 500 cars.

3. start picking your numbers until you have your sample of 30 cars randomly selected. 384

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Sep 1-9:39 AM



Sep 1-9:49 AM

A simulation is a numerical facsimile or representation of a real-world phenomenon.

That was a simulation using the random-number table. We also could have done a simulation with... hat, calculator, or computer.

Which is "simple" for a SRS?

Sep 1-9:52 AM

#### Example 2: Simulation

Use a random-number table to simulate the outcomes of tossing a balanced (that is, fair) penny 10 times. 06348

- a) How many outcomes are possible when you toss a coin at 2: Heads Itails
- b) There are several ways to assign numbers to the two outcomes. Because we assume a fair coin, we can assign an even digit to the outcome "heads" and an odd digit to the outcome "tails." Then, starting at block 3 of row 2 in the random-number
- d) If you start in a different block and row of the random-number table, will you get the same sequence of outcomes?

### Example 2: Simulation

Use a random-number table to simulate the outcomes of tossing a balanced (that is, fair) penny 10 times.

- a) How many outcomes are possible when you toss a coin at once?
- b) There are several ways to assign numbers to the two outcomes. Because we assume a fair coin, we can assign an even digit to the outcome "heads" and an odd digit to the outcome "tails." Then, starting at block 3 of row 2 in the randomnumber table, list the first 10 single digits. 7, 1, 5, 4, 9, 4, 4, 8, 4, 3
- c) What are the outcomes associated with the 10 digits?
  - T. T. T. H. T. H. H. H. H. T.
- d) If you start in a different block and row of the random-number table, will you get the same sequence of outcomes? It is possible, but not very likely

Sep 1-9:55 AM Sep 1-9:55 AM

## 1.2 Random Samples with work

Sampling with replacement means that although a number is selected for the sample, it is *not removed* from the population. Therefore, the same number may be selected for the same sample more than once.

Sampling without replacement means that the number is removed for good and cannot be chosen again. This will change the probability of the remaining objects in the population.

#### OTHER SAMPLING TECHNIQUES

dom sampling: Use a simple random sample from the entire population Stratified sampling: Divide the entire population into distinct subgroups called strata. The strata are based on a specific characteristic such as age, income, education level, and so on. All members of a stratum share the specific characteristic. Draw random samples from each stratum.

Systematic sampling: Number all members of the population sequentially. Then, from a starting point selected at random, include every kth member of the popula-

Cluster sampling: Divide the entire population into pre-existing segments or clusters. The clusters are often geographic. Make a random selection of clusters. Include every member of each selected cluster in the sample.

Multistage sampling: Use a variety of sampling methods to create successively smaller groups at each stage. The final sample consists of clusters.

Convenience sampling: Create a sample by using data from population members that are readily available.

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Once you have a sample selected we call the list of individuals from which a sample is actually selected the sampling frame.

#### SAMPLING PROBLEMS

Undercoverage results from omitting population members from the sample frame.

A sampling error is the difference between measurements from a sample and corresponding measurements from the respective population. It is caused by the fact that the sample does not perfectly represent the population.

A nonsampling error is the result of poor sample design, sloppy data collection, faulty measuring instruments, bias in questionnaires, and so HW: pg. 18: 1, 3, 5, 7, 9, 11, 13, 15, 19

Be sure to check your answers in the back of the book. We will go over these tomorrow in class before you place it in your folder.

Sep 1-10:25 AM

Sep 1-10:30 AM