

# Simple Random Sampling

## Lecture 7 Section 2.5

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# Outline

Simple  
Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- 1 Homework Review
- 2 Introduction
- 3 Simple Random Samples
- 4 Selecting Samples
  - TI-83
  - Setting the Seed
- 5 Assignment

# Homework Review

Simple  
Random  
Sampling

Robb T.  
Koether

Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Exercise 9, p. 98

In a recent poll, 62% responded “Yes” when asked if they favored an amendment protecting the life of an unborn child. However, when asked whether they favored an amendment prohibiting abortions, 39% said “Yes.” What type of bias is being observed?

# Homework Review

Simple  
Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Solution

- The respondents are giving their answer based on their perception of the question.
- When the question refers to “protecting life,” they are in favor of that, so they are more likely to say “Yes.”
- When the question refers to “prohibiting abortion,” they are opposed that, so they are less likely to say “Yes.”

# Introduction

Simple  
Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- By what methods may we ensure randomness in a sample (without using a calculator)?
- By these methods, do all individuals have equal chances?
- Do all *samples* have equal chances?

# Introduction

Simple  
Random  
Sampling

Robb T.  
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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

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# Introduction

Simple  
Random  
Sampling

Robb T.  
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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- By what methods may we ensure randomness in a sample (without using a calculator)?
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# Simple Random Sample

## Simple Random Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Definition (Simple random sample)

A **simple random sample** of size  $n$  is a random sample that is selected in such a way that all samples of size  $n$  have the same chance of being selected.

# Simple Random Sample

## Simple Random Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- A consequence of this is that all individuals in the population have the same chance of being selected for the sample.
- However, just because a sampling method guarantees that all individuals in the population have the same chance of being in the sample, it does not mean that the sample is a simple random sample.

# Example

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Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Example (Non-simple random sample)

- Suppose I divide the class in half (12 students in each half).
- I toss a coin.
  - Heads, I choose the left half.
  - Tails, I choose the right half.
- Are all individuals equally likely to be chosen?
- Are all samples equally likely to be chosen?

# Simple Random Sample

## Simple Random Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- However, if we select individuals one at a time, with all individuals equally likely at each step, then the sample will be a simple random sample.

# Selecting a Simple Random Sample

## Simple Random Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

T1-83

Setting the Seed

Assignment

- Given a population of size  $N$ ,
  - Number the members from 1 to  $N$ .
  - Use a random number generator (such as on a calculator) to generate  $n$  random integers from 1 to  $N$ .

# Sampling With or Without Replacement

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Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- Sampling may be done with or without replacement.

## Definition (Sampling with replacement)

When we **sample with replacement**, a selected item may be selected again. That is, repetitions are allowed.

## Definition (Sampling without replacement)

When we **sample without replacement**, a selected item may not be selected again. That is, repetitions are not allowed.

# TI-83 - Selecting a Sample

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Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- Suppose that the population size is  $N = 100$ .

## TI-83 Selecting a Sample

- 1 Press MATH.
  - 2 Use the arrow keys to highlight the PRB menu title.
  - 3 Press 5 to select `randInt` (item #5).
  - 4 Enter `randInt(1,100)`.
  - 5 Press ENTER. A random number appears.
  - 6 Press ENTER repeatedly for more random numbers.
- If the sampling is done without replacement, then repetitions should be discarded.

# Example

## Simple Random Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- Let the population be the students in this class.
- Then  $N = 24$ .
- Number the members 1 - 24 in alphabetical order.
- We will choose a sample of size  $n = 6$ .
- What is each individual's chance of being in the sample?

## Practice

- Use `randInt(1, 24)` to select 6 students.

# TI-83 - Getting a Set of Random Numbers

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Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- To get several random integers at once, possibly with repetitions, use `randInt` with a third parameter, representing the sample size.
- For example, to get 6 random integers from 1 to 24, enter `randInt(1, 24, 6)`.

# TI-83 - Setting the Seed

Simple  
Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

- To set the seed in the TI-83, follow this procedure.

## TI-83 Setting the Seed

- 1 Enter the desired seed, say, 48.
- 2 Press **STO**. An arrow appears in the display.
- 3 Press **MATH**, highlight **PRB**, select **rand** (item #1).
- 4 Press **ENTER**. The seed is set to 48.

# Practice

Simple  
Random  
Sampling

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Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Practice

- Set the seed to 48.
- Then select a random sample of size 6 from the population of the students in this class.

# Assignment

Simple  
Random  
Sampling

Robb T.  
Koether

Homework  
Review

Introduction

Simple  
Random  
Samples

Selecting  
Samples

TI-83

Setting the Seed

Assignment

## Homework

- Read Section 2.5, pages 98 - 106.
- Let's Do It! 2.4.
- Page 107, exercises 13, 15 - 18.