

WELCOME

HAVE OUT...

- notes
- pen/pencil
- colors

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THINK ABOUT IT...

A researcher wants to know how long it takes to master roller skating, and if there are differences due to age and gender. Comment on the following proposals:

- a. Find 10 women in their 20's and 10 men in their 50's, all of whom have never tried roller skating. They are all taught how to do it, and time to mastery of the sport is recorded.
- b. Find people roller skating in a park, ask them how long it took to learn, how old they were at the time, and their gender.
- c. Find several women and several men in different age groups, all of whom are interested in learning roller skating. Each person is allowed to choose the way they learn: on their own, with friends, or through a class. Time to mastery is recorded.
- d. Find several women and several men in different age groups, all of whom have never tried roller skating. Have them all taught by the same person, in the same setting. Time to mastery is recorded.

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Section 4.2

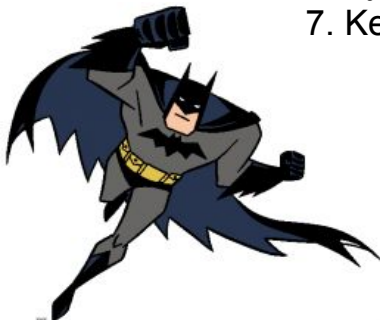
What are Good Ways and Poor Ways to Sample?



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LEARNING OBJECTIVES

1. Sampling Frame & Sampling Design
2. Simple Random Sample (SRS)
3. Random number table
4. Margin of Error
5. Convenience Samples
6. Types of Bias in Sample Surveys
7. Key Parts of a Sample Survey



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SAMPLING FRAME & SAMPLING DESIGN

Once you know your population, how can you begin to pick people at random? You need to know everyone in the population...

One way is through use of a *sampling frame*.



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SAMPLING FRAME & SAMPLING DESIGN

The sampling frame is the list of subjects in the population from which the sample is taken, ideally it lists the entire population of interest

The sampling design determines how the sample is selected. Ideally, it should give each subject an equal chance of being selected to be in the sample



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SIMPLE RANDOM SAMPLING (SRS)

Random Sampling is the best way to obtain a sample that is representative of the population

A *simple random sample* of 'n' subjects from a population is one in which each possible sample of that size has the same chance of being selected



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SIMPLE RANDOM SAMPLING (SRS) Group activity!

What do you think random is? How do we achieve randomness?

Phone Book Page

Come up with a way of randomly selecting 10 people on the phonebook page



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SRS TABLE OF RANDOM NUMBERS

TABLE 4.1 A Portion of a Table of Random Numbers								
Line/ Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	10480	15011	01536	02011	81647	91646	69179	14194
2	22368	46573	25595	85393	30995	89198	27982	53402
3	24130	48360	22527	97265	76393	64809	15179	24830
4	42167	93093	06243	61680	07856	16376	39440	53537
5	37570	39975	81837	16656	06121	91782	60468	81305

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TO SELECT A SRS...

1. Number the subjects in the sampling frame using numbers of the same length (number of digits)
2. Select numbers of that length from a table of random numbers or using a random number generator
3. Include in the sample those subjects having numbers equal to the random numbers selected



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Practice - Number of Digits

If we have a sampling frame of....

- a. 10 people
- b. 340 people
- c. 40 people

How many digits do we number?



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YOU TRY- Number of Digits

If we have a sampling frame of....

- a. 8 people
- b. 56 people
- c. 150 people

How many digits do we number?



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Example

If we have a class of 32 people, randomly select the first 5 people that we will choose.

**start at line 1, column 1*

- | | | | |
|-------------|---------------|---------------|--------------|
| 01- Hannah | 09 - Brad | 17 - Maddie | 25 - Josh |
| 02 - Taylor | 10 - Anais | 18 - Griffin | 26 - Bodie |
| 03 - Jordan | 11 - Dallas | 19 - Kiersten | 27 - Matt |
| 04 - Wyatt | 12 - Calvin | 20 - Mandy | 28 - Joe |
| 05 - Ryan | 13 - Ashleigh | 21 - Juliana | 29 - Trent |
| 06 - Alivia | 14 - Tiger | 22 - Abby | 30 - Sam |
| 07 - Marina | 15 - Cody | 23 - Angela | 31 - Carly |
| 08 - Amy | 16 - Tyler | 24 - Alex | 32 - Brandon |

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3	24130	48360	22527	97265	76393	64809	15179	24830
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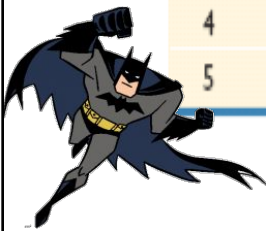
22 36 84 65 73 25 59 58 53 93 30 99 58 91 98 27 98 25 34 02

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What if I had 100 people in a list and I need two of them. Who would I choose now?

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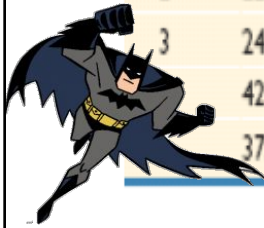
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TRY ONE LAST PROBLEM!

There are 350 people at my dance studio. I need to sample 50 of them for a project. Tell me the first 10 I would speak with. Start at line 3.

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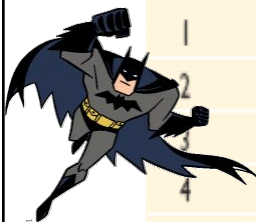
BELLWORK

1. What is the difference between an experiment and an observation?

2. Using the SRS table, find the first 5 people I would pick in a group of 90. Start at Line 1, Column 1.

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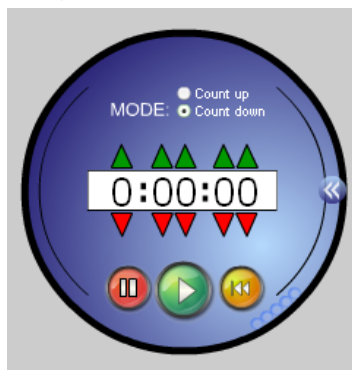
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Any 4.1 Homework Questions?



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Quiz Time!



When you finish...

1. turn in tray
2. take out; notes, colors, calc



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PLEASE HAVE OUT:

- notes
- pen/pencil
- colors

*we are continuing 4.2 notes



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RECAP

GOOD ways to get data

- Simple RANDOM sample (every subject has equally likely chance of being selected)
- Taking names out of a hat
- Usually done with calc, or comp.

BAD ways to get data

- convenience sample
- volunteer sample



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Convenience Sample

a type of survey sample that is easy to obtain

- Unlikely to be representative of the population
- Often severe biases result from such a sample
- Results apply ONLY to the observed subjects



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Volunteer Sample

most common form of convenience sample

- Subjects volunteer for the sample
- Volunteers do not tend to be representative of the entire population



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Margin of Error

Sample surveys are commonly used to estimate population percentages

These estimates include a *margin of error* which tells us how well the sample estimate predicts the population percentage

When a SRS of 'n' subjects is used, the margin of error is approximately:

$$\frac{1}{\sqrt{n}} \times 100\%$$



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We Do Example HURRICANE KATRINA

A Gallop poll found that among 609 adults questioned in telephone interviews, 42% believed that the city of New Orleans will completely recover from the effects of Hurricane Katrina. 56% believe that the city will not recover, and 2% had no opinion.

What is the margin of error for these results?

$$1/\sqrt{609} = \pm 4\%$$

Interpret: 38% - 46% of population believe NO will recover
52% - 60% of population believe NO will not recover
0% - 6% of population have no opinion

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Practice Example

ELECTION

A Gallop poll found that among 835 adults questioned, 20% believe that Obama won the first debate, while 72% believe that Romney won the first debate.

What is the margin of error for these results?

Interpret:



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Bias

tendency to systematically favor certain parts of the population over others



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Types of Bias

Sampling Bias: bias resulting from the sampling method such as using nonrandom samples or having **undercoverage**

Undercoverage: Not representing all groups equally

Nonresponse bias: occurs when some sampled subjects cannot be reached, refuse to participate, or fail to answer some questions

Response bias: occurs when the subject gives an incorrect response or the question is misleading



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What do you think would happen?

Do you believe guns should be banned, given the fact that Americans use firearms to prevent crimes approximately 1 to 1.5 million times per year?

Do you believe guns should be banned, given the fact that, last year, 1,134 people in America - many of them children - were killed accidentally or unintentionally by firearms?



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Practice Example

Name the type of bias that is present

1. You want to find who is a better driver between males and females. You survey 100 males, but only 50 females.

undercoverage

2. You ask a group of people if they like to eat fast food given that it is bad for your health.

response

3. You send out an e-mail to 1000 people to ask who they think will win for president. Only 300 people reply to you.

nonresponse



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NOTE...

A LARGE SAMPLE DOES NOT GUARANTEE AN UNBIASED SAMPLE!

We're almost better off with a simple random sample of 100 people than with a volunteer sample of thousands of people.



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VIDEO CLIP...



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pg. 170 in book, #22 (hw)

- Sampling Bias
- Nonresponse Bias
- Response Bias - wording of question

- #22 - **Bias due to perceived race** - A political scientist at the University of Chicago studied the effect of the race of the interviewer. Following a phone interview, respondents were asked whether they thought the interviewer was black or white (all were actually black).



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Key parts of a sample survey

- Identify the population of all subjects of interest
- Construct a sampling frame which attempts to list all subjects in the population
- Use a random sampling design to select n subjects from the sampling frame
- Be cautious of sampling bias due to nonrandom samples

We can make inferences about the population of interest when sample surveys that use random sampling are employed.



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Homework

pg. 173 # 18, 21 - 26, 31



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Attachments

little_angel_holding_a_big_red_heart_0521-1002-1012-0153_SMU.webloc

cartoon_138.webloc