An **Experiment** or an **Observational Study?**

Experiment: An experiment imposes a treatment on individuals to collect data on their responses. Ex: A researcher adds acetone to gasoline to measure its effect on fuel efficiency.	**Controlled experiment: In a controlled experiment, two groups are studied under conditions that are identical except for one variable.**
Randomized comparative experiment: In a randomized comparative experiment, the individuals are assigned to a group at random 1. control group 2. treatment group	**Observational Study: An observational study observes individuals and measures variables without controlling the individuals or their environment in any way.** Ex: A researcher wants to find out if poor nutrition affects eyesight, but it would be unethical to deliberately subject some individuals to poor nutrition.

Ex.3 – A researcher wants to know if a soil additive makes a fern grow more quickly. He grows one specimen in treated soil and one in untreated soil.

The researcher applies a treatment this is an Controlled Experiment

Ex. 4 – To find out whether car accidents are more likely on rainy days, a researcher records the weather conditions during 50 randomly selected accidents for the past year.

The researcher gathers data without controlling the individuals or applying treatment. Observational Study

Ex. 5 – Does using tanning beds at least twice a month affect the likelihood of developing skin disease?

The treatment may affect health, so it is not ethical to assign individuals. Perform Observational Study

Ex. 6 – One hundred arthritis sufferers reported the severity of their symptoms daily for a month. Fifty of the subjects were given Epsom salt to bathe in at least every other day. At the end of the month, 30% of the subjects who used Epsom salt reported a decrease in severity of their symptoms, compared 5% in the other group.

Describe treatment
Bathing in Epsom Salt

Treatment group
The 50 who bathe in the Epsom Salt

Control group
The 50 who did not get Epsom Salt

Ex. 7 – Classify the method: As a survey, experiment, or observational study

Method A:	**Method B:**	**Method C:**
Choose 50 people who have at least one serving of soy a day and 50 who don't, and check their cholesterol levels.	Randomly choose 100 people. Ask how many servings of soy they have a week, and ask if their cholesterol levels are high.	Randomly choose 50 people to eat at least one serving of soy a day, and 50 people not to, and monitor their cholesterol levels.

Observational Study Survey Experiment

Name _____ **Date** _____

Survey:

Types of Samples:	
Self – Selected: members of a population can volunteer to be in the sample. Students who want may write amount of time studied for test on board.	**Random: each member of a population has an equal chance of being selected.** Teacher pick students Randomly to write time studied for test on board.
Systematic: a rule is used to select members of a population, such as selecting every other person.	**Stratified: The population is first divided into groups. Then members are randomly chosen from each group.**
Convenience: easy-to-reach members of a population are selected, such as those in the first row.	**Clustered: The population is first divided into groups. A sample of the groups is randomly chosen. All members of the chosen groups are surveyed.**

Biased vs. Unbiased:

- Biased: over Repeesents or under Represents part of population. (self selected would be biased)
  - more you studied the more likely to volunteer
- Unbiased: Representative of population you want info about. (Random would be unbiased) • The amount you studied would not affect if selected

Convert from a Sample to Population

$\frac{\text{Statistic}}{\text{population size}} = \frac{\text{estimated}}{\text{population}}$

Ex1 Manufactored 6000 cars. Random ✓ 60 & 2 don't work. How many will not work

$\frac{2}{60} = \frac{x}{6000}$ $\quad \frac{60x}{60} = \frac{12000}{60}$ $\quad x = 200$ cars

Ex2 Survey 40 employees & 18 are unhappy with pay. Company employees 180. How many unhappy?

$\frac{18}{40} = \frac{x}{180}$ $\quad \frac{40x}{40} = \frac{3240}{40}$ $\quad x = 81$ people

More vocabulary:

- Variables: Characteristics used to describe individuals.
- Treatment Group: Experiment group that receives treatment.
- Control Group: Experiment group that does not Receive treatment that is used for comparison