Name: _____

1. Identify whether each of the following is an **observational study** or a **designed experiment**. **Explain** how you know.

   (a) 4-H is a youth development program that focuses on equipping young people with life skills they need to be successful. A university wishes to study the effects of being involved in 4-H growing up on college preparedness. Researchers identify 54 college students who are 4-H alumni and 52 college students who are not, then ask each of them whether they felt they had the skills they needed to succeed in college when they began as a freshman.

   (b) A marine biologist wishes to study the effectiveness of two different dolphin training methods. She randomly selects three dolphins at the aquarium to be trained under the first method and three dolphins to be trained under the second. She works with each dolphin using the assigned method and records the length of time required for the dolphin to learn to toss a ball through a hoop at a certain signal.

2. Identify each of the following **variables** described as (1) qualitative or quantitative, (2) discrete, continuous, or neither, and (3) nominal, ordinal, interval, or ratio.

   (a) A stressed-out college student records the amount of sleep he gets per night during a semester.

   (b) A chemist records the temperature (in °C) of a heated solution every 30 seconds as it cools.

   (c) A researcher records whether individuals in a sample of Clemson students purchase their textbooks online or from the campus bookstore.

   (d) A coffee shop owner records the number of caramel macchiatos that are ordered each day by customers.

   (e) An instructor records the responses to a satisfaction evaluation (Very Satisfied, Satisfied, Neutral, Slightly Dissatisfied, Very Dissatisfied).

   (f) A movie enthusiast records the number of villains vanquished by the superheroes while watching *Avengers Endgame.*

   (g) A bargain-hunter records the price of a pair of jeans at each thrift store in a city where she lives.

3. Now it's your turn! Think of an example of a variable with each of the following levels of measurement.

   (a) Interval

   (b) Ratio

   (c) Nominal

   (d) Ordinal

4. Describe an example of each of the following types of variables.

   (a) Qualitative

   (b) Quantitative – Discrete

   (c) Quantitative – Continuous

5. You've been assigned the task of studying people's opinions on the latest full-house showing of *The Sound of Music* at your local theatre. Because you took Statistical Methods, you know that you should generate a random sample to be representative of the opinions of all 240 play attendees. Identify the **sampling method** used in each of the strategies described below.

   (a) The theatre has three equally sized seating sections: left, center, and right. You randomly choose one person from the left section, one person from the center section, and one person from the right section, then repeat until you have selected 24 people.

   (b) You place all of the play attendees' tickets into a box and shuffle them around, then draw 24 numbers from the hat at random.

   (c) You select the first 24 people to leave the theatre.

   (d) Starting with the first seat in the front row, you select every fifth person until you have selected 24 people.

   (e) The theatre has ten rows of 24 seats. You throw a ten-sided die and choose the people in the row indicated by the die to be in your sample.

   (f) Of the above five sampling methods, which are appropriate statistical techniques for an inferential statistical study? Why?

6. In your own words, describe the difference between **random sampling** and **random assignment**. Consider how each one is performed and what each one allows us to argue about the relationship between an explanatory and a response variable.

7. Chantix is a prescription pill used to help smokers who want to quit. However, some doctors are concerned about the potential negative side effects of the drug, including nausea, abnormal dreams, insomnia, and headaches. A study of the safety and effectiveness of Chantix included 1,492 smokers wanting to quit who volunteered to participate in a clinical trial of the drug.

   At the start of the study, smokers were randomly assigned to either take Chantix or a placebo over a 24-week period, resulting in 746 participants in each treatment group. Medical researchers provided participants with the pill they were assigned, and participants were then observed for the occurrence of side effects. At the conclusion of the study, the proportions of participants who experienced serious side effects were compared for the two groups.

   (a) Define the **explanatory** and **response** variables.

   (b) Describe the **control** in this experiment.

   (c) Describe how **replication** was achieved in this experiment.

   (d) Describe how **randomization** is used in this study.

   (e) How would this experiment be conducted as a **double blind**?

   (f) Describe two **confounding variables** that could be present in this study.