## Lesson #15 · Topic 1H · Practice

Name _____

1. Consider the three types of experiments: completely randomized design, randomized block design, and matched-pairs design.

   a. What is the main difference between a completely randomized design and a randomized block design?

   b. A matched-pairs design is a special case of a randomized block design. What element of a matched-pairs design classifies it as a randomized block design?

2. The Governor of Alaska recently proposed a plan to give teachers bonuses to try to increase retention rates (the likelihood that a teacher stays a teacher from one year to the next). Suppose that one of the school districts in Alaska wants to conduct an experiment to determine if giving teachers monthly bonuses of $200 will increase retention rates. The school district has 300 teachers.

   a. Describe a completely randomized design to compare the effectiveness of monthly bonuses on retention rates.

   b. The researchers believe the level of school (elementary, middle, or high school) may be a confounding variable in this study. Why might this be the case?

   c. Describe an experiment that would account for the different levels of school.

   d. Suppose there are 100 elementary school teachers, 100 middle school teachers, and 100 high school teachers in this district. Describe a process for randomly assigning the treatments to the subjects in each group.

3. The athletic trainer for the high school soccer team is planning a study to investigate the comfortability of a new shin guard compared to the standard shin guard. There are 20 students on the soccer team willing to participate in the study. After wearing the shin guards for 3 full practice sessions, the players will rate the comfortability on a scale from 1 to 10.

   a. Identify the experimental units, treatments, and the response variable.

   b. The athletic trainer plans to have each player use both shin guards at the same time, with one on the left shin and one on the right shin. What is the name for this experimental design? Explain.

   c. Describe a process for randomly assigning the new shin guard and the standard shin guard to each player in the study.

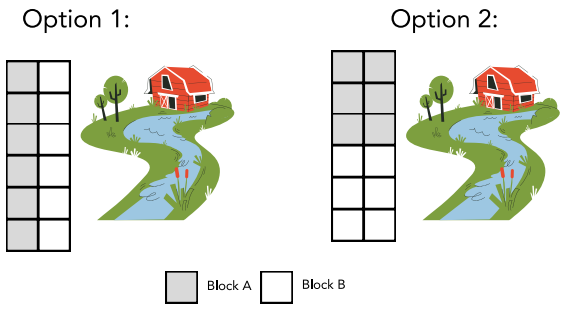
   d. What is one advantage of this experimental design over a completely randomized design?

4. A physical therapist plans to conduct an experiment using a randomized block design with patients from her clinic to determine the effectiveness of two different exercises on reducing joint pain and increasing mobility. She is considering two variables to create the blocks: age of the patients (under 50 years old and 50 or more years old) and time of appointment (morning and afternoon).

   a. Which variable should be chosen to create the blocks? Why?

   b. What is one advantage of using a randomized block design compared to a completely randomized design.

5. A farmer wants to investigate the effectiveness of two types of irrigation for increasing the growth of his crops. He has 12 plots of land available for the study. Some plots border a stream that runs from the farmhouse to the southern edge of the property. He plans to use a randomized block design to randomly assign half of the plots to one irrigation type and the other half of the plots to the other irrigation type. Two options for blocking are shown in the diagram. For each option, one block is identified by the gray shaded region and the other block is identified by the white shaded region.




a. Which blocking plan, Option 1 or Option 2, will better determine the effectiveness of the two types of irrigation? Explain.

b. Draw an outline of the randomized block design for this experiment.

c. What is the purpose of randomly assigning within each block?

6. Corrigan Airlines conducted a well-designed experiment using a randomized block design to determine if jet lag disorder could be minimized by varying the internal light levels on trans-Atlantic flights. One block was Eastbound trans-Atlantic flights and one block was Westbound trans-Atlantic flights. Which of the following must be true about the design of this experiment?

A) The number of flights in each block is equal to the number of treatments.

B) The light treatments are randomly assigned to the flights within each block.

C) Passengers on Eastbound flights are paired with similar passengers on Westbound flights.

D) Passengers on Eastbound flights receive the light treatment and passengers on Westbound flights receive no light treatment.

7. A U.S. Air Force Academy psychologist investigated the effects of different breakfast conditions on the cognitive function of pilots. The pilots, all volunteers, consumed a low carbohydrate or high carbohydrate breakfast drink – randomly assigned – on the first day of the study. After breakfast, the pilots were tested on various flight performance indicators in a flight simulator. After a three-day washout, period the pilots were given the other treatment and tested again. Which of the following is the best description of the study?

A) An observational study using a simple random sample

B) An observational study using a stratified random sample

C) An experiment using a matched-pairs design

D) An experiment using a completely randomized design