

## Practice Problems Section 1D

Ruler Experiment Directions: *Divide class into groups of three or four. Each group will need a ruler and their cell phones. It is best to stand up during this activity. Procedure: Student A will hold the cell phone in their dominant hand and then hold their non-dominant hand straight out in front of them with their hand curved. The fingers should not be very close or very far away from the thumb. While student A is texting, student B holds the bottom of the ruler up inside of student A's non-dominant hand. Student B should hold the ruler from below student A's hand. The top of student A's hand should be about 5 inches on the ruler. Student B releases the ruler and student A tries to catch it. Student C records the number of inches on the top of the ruler before caught. Student C will take the catch length, subtract off the 5 inches, and then record the difference. If student A misses the ruler all together, then student C will just put "drop". Each student should attempt to catch the ruler while texting three times.*

*Then repeat the process, but this time the students will attempt to catch the ruler with their non-dominant hand without a cell phone. Continue until all students have done the experiment three times without the cell phone and three times with the cell phones. Alternate the person releasing the ruler and the time before released. Collect the data for the "with phone" catches and drops in one column. In another column, collect the data for the "no phone" catches. When done, give the data to the instructor. Put the without cell phone/with cell phone data up on the board without names. The instructor or a student will collate the following results for the whole class: the mean average catch length with the cell, the mean average catch length without the cell, the total number of drops with the cell, the total number of drops without the cell.*

Use your class data to answer the following questions as group. If you were absent on the day your class did the ruler experiment use the following data.

Ruler Experiment Data (Previous Class)

	With Phone	No Phone
Mean Average Catch (inches)	10.3 inches	8.2 inches
Number of Drops	41 drops	7 drops

1. What is the explanatory (treatment) variable? What was the response variable?
2. Why did we bother to have the person catch the yardstick without the phone?  
Wouldn't it of been quicker to just record the catching with the cell phone?
3. What were the two groups of people in the experiment? Were they alike?  
Why didn't we randomly assign the groups?
4. What are some of the confounding variables in this experiment?  
What are some steps that we took to control these variables?
5. Was this experiment blind, double blind, or neither? How do you know?
6. What did the class data show? Does texting cause slow reflexes?  
How do you think this experiment might apply to driving while texting?

(#7-16) Define the following terms.

7. Observational Study
8. Experiment
9. Explanatory Variable
10. Response Variable
11. Confounding Variables



12. Random Assignment
13. Placebo
14. Placebo Effect
15. Single Blind
16. Double Blind

(#17-21) Directions: Determine if each of the following studies are an observational study or an experiment. Explain why. Can the study prove cause and effect or just a relationship? Why? If the study is an experiment, list some confounding variables that need to be controlled.

17. Dramamine is a common medication used in preventing and treating nausea, vomiting and dizziness caused by motion sickness. This medication has become a staple for thousands of people who travel by boat, car or plane. We need to prove that Dramamine is effective in preventing and treating the symptoms of motion sickness. Volunteers were randomly assigned into two groups. One group received Dramamine and the other received a placebo. The amount of motion was the same for all of the people. They were then asked to rank their motion sickness on a scale of 1 to 10.

18. Unemployment has become a very important topic in the United States and worldwide. We wish to understand how unemployment may be related to the tax rate. To shed light on this issue, we took a random sample of countries around the world and compared the average tax rate to the unemployment rate.

19. Tuberculosis (TB) is a disease that affects millions of people worldwide. TB is a contagious bacterial infection that affects the lungs. Doctors have long speculated that the percentage of people with Tuberculosis is higher in low income, crowded cities. A medical study was done to see if there is a relationship between low income, crowded cities and a high percentage of people with Tuberculosis. They took a random sample of cities and collected data about the size and the number of people. They then compared it to the number of cases of tuberculosis.

20. College students in the United States have long claimed that listening to music while studying causes them to retain information at a higher rate. We want to prove that this is not true. Listening to music while studying does not cause a person to retain information at a higher rate. We took a group of volunteer college students and randomly put them into three groups. The people in each group had to memorize the same information. They were ranked as high retention or low retention. One group had to listen to their favorite music, another group had to listen to a music they hated, and the third group had no music at all. The volume of music was the same for all of the people.

21. A study was done to determine if there is an association between obesity and diabetes. Obesity and diabetes data was taken from a random sample of adults.

#### Social Justice Questions

(#22-27) An experiment was done on labor market racial discrimination. Statisticians created fictitious resumes to help-wanted ads in Boston and Chicago newspapers. Resumes were randomly assigned to either have a very black sounding name or a very white sounding name. The results that the percentage of callbacks for resumes with white names was significantly higher than for black sounding names.

22. Was random assignment used in the experiment?
23. List as many confounding variables as you can for this experiment?
24. What is the explanatory variable (cause) and the response variable (effect) in this experiment?
25. Describe the treatment group and the control group. Were they alike in the confounding variables?
26. Describe how the confounding variables were controlled.



27. Does this experiment show that there is racial discrimination against black applicants when applying for jobs in Boston and Chicago? Why or why not?

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