

Name: Solutions

Student #: _____

STAT 2220 - Quiz #3

January 26, 2012

1. (7 points) A researcher would like to study the effects of different study habits on student test scores for the provincial math exam. Each student is asked to study either 30, 60, or 90 minutes a night and either eat a light snack before studying or not eat before studying. As the researcher believes males and females might respond differently to different study techniques, they assigned the treatments separately to both genders.

(a) (1 point) This is an example of what type of design?

Randomized ^{complete} block design

(b) (1 point) What is(are) the factor(s)?

Study time, snacking habit

(c) (1 point) What is(are) the factor level(s)?

• 30 min, 60 min, 90 min

• snack or no snack

(d) (1 point) How many treatments are there? $3 \times 2 = 6$

(e) (1 point) What is(are) the experimental unit(s)?

• Students

(f) (1 point) What is the response variable?

Provincial math exam score

(g) (1 point) If there are 48 males and 30 females, and the treatments are applied equally within each gender, how many times is each treatment assigned to the males? To the females?

males: $48/6 = 8$ females: $30/6 = 5$

2. (3 points) A doctor would like to study the effect the amount a person smokes on recovery heart rate. One hundred volunteers are selected for the study that describe themselves as either light, moderate or heavy smokers. They are then asked to perform an exercise task and their heart rate is measured one minute after ceasing the activity.

- (a) (1 point) It would be inappropriate to infer causation from the doctor's results.
Why is that?

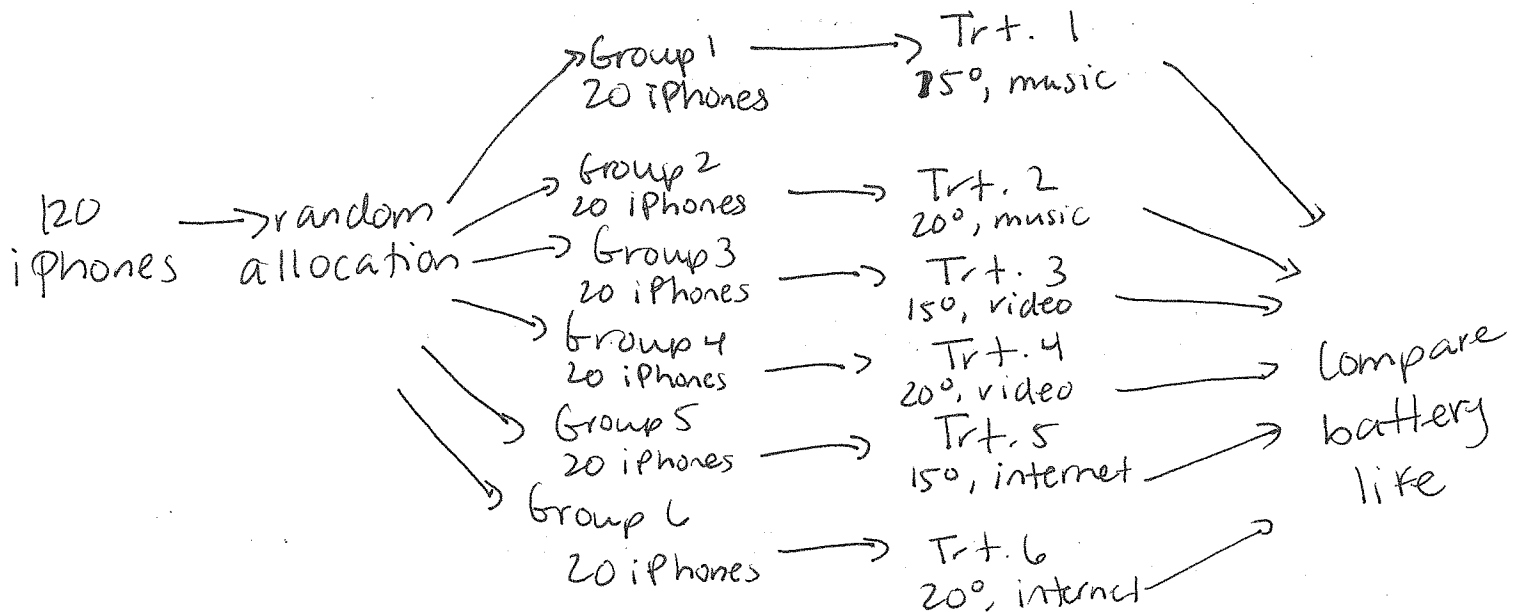
It is an observational study

- (b) (1 point) How could the doctor have conducted this differently if they wished to infer causation? Take nonsmokers then ~~non~~ assign them a routine of light, moderate or heavy smoking. After they've started smoking, perform the test.

- (c) (1 point) For what reason would it be inappropriate to conduct the test under the conditions you described above?

It would be unethical to force people to smoke or make someone smoke more than they already do.

3. (2 points) An experiment was conducted to study the battery life (in hours) of an iPhone. Each iPhone was used continuously to perform one of three tasks: listen to music, watch videos, or surf the internet. Each iPhone was used in an environment heated to either 15 or 20 degrees celcius. If 120 iPhones were tested and each treatment replicated the same number of times, produce a diagram of the experiment, similar to that done in class, to show the randomization, assignment of treatments and comparison of the results.



4. (2 points) What are the four principles of experimental design?

randomization, control, replication, factorial experimentation

5. (1 point) What is the difference between a blocking variable and a factor in an experiment?

A blocking variable separates subjects by a characteristic they already possess that isn't of direct interest but may influence the experiment. A factor has levels you randomly assign to subjects and is of direct interest in the experiment.