

Chapter 11-12-13 Review

1. Using the random number table below, run a simulation to show which calculator is received by the first 20 students at registration. How many received a TI-83? A TI-84?

48983 20690 08695 24999
15657 75434 38189 94411

11 odd

9 even

Even TI 83

Odd TI 84

9 - TI 83's

11 - TI 84's

Neither current drug therapies nor neuroprotective methods provide sufficient help to Parkinson's disease patients. A promising new treatment for Parkinson's disease involves injecting fetal tissue into the patient to replace damaged brain cells and compensate for the loss of essential nerve cell groups. A clinical trial was recently set up in Colorado to determine the effectiveness of this treatment. The trial involved 40 Parkinson's patients. Twenty were given fetal tissue, twenty were not.

2. Describe a basic design for this experiment.

- 40 patients are assigned a 2 digit number.
- Using random number table, read off 2 digits at a time ignoring numbers 41 and over, and ignoring repeats.
- The first 20 two digit numbers selected become to fetal tissue group. Everyone else does NOT receive treatment.

3. Suppose the group who received the fetal tissue implant begin to feel more "positive" and "healthier" on subsequent patient follow-up questionnaires. Would you be willing to conclude that this response could be attributed solely to the injection of cells? Explain.

No. The injection is invasive and the patients know they are receiving treatment. To compensate for pain and inconvenience the patients will want to feel better regardless if they really do.

4. Suppose the researchers were concerned that this procedure would produce more positive results in women than in men. How could the researchers redesign the experiment to block for gender?

- First divide the forty subjects into men and women, say 22m + 18women.
- Then I assign each person a 2 digit number ignoring those numbers larger than 22 (or 18). I read number off table until I get 11 fetal tissue subjects for men, I go to different spot in random number table and do same until I get 9 women.

The very fact that subjects in the treatment group realize that they are being given something that researchers expect will improve their condition may affect their responses differently than those subjects who are not given any treatment. This phenomenon has been detected in many circumstances, especially medical studies, and is known as the PLACEBO EFFECT. Experimenters control for this confounding variable by administering a placebo (referring to the sugar pill in medical studies) to those in the control group. This method of control is called BLINDNESS, since subjects are not told whether or not they are receiving the real treatment or the placebo.

Medical researchers know from long experience that roughly 1/3 of patients feel better with only a sugar pill. The placebo effect appears to be especially strong with Parkinson's patients.

5. In the Colorado study, the twenty patients in the control group were given a surgical procedure that only involved cutting two holes in the skull WITHOUT injecting fetal tissue. Were the patients blind as to whether they were in the control group or the treatment group? Explain the benefits of this approach.

Yes, subjects were blind as to whether they had "real" surgery because both had holes cut in skull. This eliminated positive feeling the surgery group "must have felt better" to go through the pain.

6. The Colorado study caused a bit of controversy in the medical world. A leading medical ethicist stated, "Not only is it ethical to do it this way, it is probably unethical to do it any other way." Do you believe that the knowledge gained from this type of comparative experiment is worth the potential dangers of fake surgery?

This is personal.... but, for any experiment (medical ethics aside) a blind or double-blind experiment allows researchers to draw stronger conclusions.

7. Explain why it would be important for the person evaluating the health of the patient also to be blind to which treatment group the patient received.

This means the evaluator is also "blind" for a double blind experiment. Then the evaluator won't create or influence patient responses w/ body language word choice, etc. This eliminates a source of bias.

8. Which of the following is an example of a census?
- A) Every fifth person leaving a supermarket is asked to name his or her favorite brand of peanut butter.
 - B) Each employee in a corporation fills out a questionnaire for a management survey.
 - C) All the students who are at a school on a particular day rate the food in the cafeteria.
 - D) A telephone political poll selects ten names from every page of a city directory.
 - E) All the commuters who are dissatisfied with the service of their commuter train company are asked to write a letter of complaint.
9. Which of the following statements about experiments is true?
- A) All experiments must have a control group.
 - B) Blocking is employed to reduce variation.
 - C) Random assignment is only critical for treatment groups, as opposed to control groups.
 - D) Matching can be used in any experiment to eliminate lurking variables.
 - E) None of these is true.

- B 10. Non-overlapping subpopulations of a population are called
- A) samples
 - B) strata
 - C) clusters
 - D) simple random samples

#11-14. A consumer group conducts an experiment to compare the effectiveness of two different brands of laundry detergent. 10 loads of white cotton, 10 loads of colored cotton, and 10 loads of synthetics will be washed in each detergent. After washing, each load will be assigned a brightness score.

- C 11. The response variable is the
- A) dirtiness of laundry
 - B) brand of detergent
 - C) brightness score
 - D) number of loads of wash
 - E) type of fabric, ie. Cotton or synthetic

- B 12. The experimental factor is the
- A) dirtiness of laundry
 - B) brand of detergent
 - C) brightness score
 - D) number of loads of wash
 - E) type of fabric, ie. Cotton or synthetic

- AC 13. Which of the following is **TRUE** with respect to blocking in this experiment? Bubble in **ALL** that apply.
- A) You could improve results by blocking on dirtiness of laundry
 - B) You could improve results by blocking on brand of detergent
 - C) You are already blocking on type of fabric (white cotton, colored cotton, synthetic)

- B 14. A variable that is related to both group membership and the response variable is a
- A) extraneous variable
 - B) confounded variable
 - C) response variable
 - D) experimental factor

B

15. The goal in an observational study is to
- A) obtain a large sample at a minimum expense
 - B) draw conclusions about the population of interest
 - C) determine the effect of the study on the response variable
 - D) obtain a sample that is representative of the population of interest

D

16. The two major types of studies are....

- I. Variability
- II. Descriptive
- III. Inferential
- IV. Experimental
- V. Observational

- A) I and II B) II and III C) III and IV D) IV and V E) II and V

C

17. Which of the following concepts are used in an effort to filter out the effects of an extraneous factor?

- I. blocking
- II. randomization
- III. direct control
- IV. convenience sampling

- A) I and II B) II and III C) I, II, and III D) all are used to filter out extraneous factors

A

18. What are the four key concepts in experimental design?

- A) Randomization, blocking, direct control, and replication
- B) Randomization, blocking, stratification, and direct control
- C) Simple random sampling, blocking, stratification, elimination of extraneous variables
- D) Simple random sampling, blocking, elimination of extraneous variables, and replication
- E) Simple random sampling, treatment, control, response

Use the following for questions 19-23.

A personnel director for a large corporation studied the eating habits of its employees. She watched the movements of a selected group of employees at lunchtime. The purpose of the study was to determine the proportion of employees who buy lunch in the cafeteria, bring their own lunch, or go out to lunch.

- C 19. The study would best be categorized as
- A) a census
 - B) a survey sample
 - C) an observational study
 - D) a designed experiment
 - E) None of these.
- C 20. If the personnel director includes only the accountants in the study, she is performing a
- A) simple random sample
 - B) stratified sample
 - C) convenience sample
 - D) multi-stage cluster sample
 - E) census
- A 21. If the director selects 50 employees at random from throughout the company and categorizes their lunchtime practice by gender, she is:
- A) blocking for gender
 - B) testing for a lurking variable to see if it impacts on lunchtime practice
 - C) testing for bias
 - D) creating a cluster sample
 - E) attempting to set up a control group
- D 22. If the director selects three departments and studies everyone in these departments, she is performing a
- A) simple random sample
 - B) stratified sample
 - C) convenience sample
 - D) cluster sample
 - E) census
- A 23. If the director selects a random sample of employees from all employees on the payroll, she is performing a
- A) simple random sample
 - B) stratified sample
 - C) convenience sample
 - D) cluster sample
 - E) census

Simulation: McDonalds has a loyalty game in which consumers collect little tickets for properties on a regular Monopoly game. For example, if you collect *Board Walk* and *Park Place* you win a new car. If you collect *Reading Railroad* you win a free soft drink. McDonald headquarters published information stating that 20% of tickets say *Illinois*, 20% say *Indiana*, but only 5% say *Kentucky*. All the other tickets are random other non-winning properties. You need to collect one of each: *Illinois*, *Indiana*, and *Kentucky*, to win a Big Mac.

Perform a simulation below showing how many tickets you need to collect at McDonalds until you are likely to win a Big Mac. Perform the simulation three times, once for each row in the table.

IN	IN IL IN IL	IN IN IL IL	IL	IL IN IN	IN IL IL KT					
62207	96845	33122 61147	93253 60200	85048	61922 37863 20812 44707	26				
IN	IL IN IN IL KT									
91294	71538 27054	33696	24444	70998	51609	69031	36872	55220	24707	8
IL IL	IL IL IN	IN	IN	IL IN	IN	IL			KT	
02148	31711 35563 05855	53337	21329	52329	77117	73675	24077	62728		24

00-19 = Illinois
 20-39 = Indiana
 40-44 = Kentucky
 45-99 = other

I will circle each ^{2 digit} number between 00-44 and mark which property. once I have one of each I stop. I will then count how many 2 digit tickets it took to win a Big Mac.

- How many tickets did it take to win on round #1? 26
- How many tickets did it take to win on round #2? 8
- How many tickets did it take to win on round #3? 24

What is the expected number of tickets to purchase to win a Big Mac?

$$E(x) = \frac{26+8+24}{3} = 19.3 \text{ tickets on average b/f win BigMac}$$

mean