Chapter 4 Outline

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Hour\_\_\_\_\_

Chapter 4: Designing Studies

Key Vocabulary:

* sample
* population
* sample survey
* voluntary response sample
* confounded
* design
* convenience sampling
* biased
* simple random sample
* table of random digits
* probability sample
* stratified random sample
* cluster sampling
* inference
* margin of error
* strata
* undercoverage
* nonresponse
* response bias
* sampling frame
* systematic random sample
* observational study
* experimental
* confounding
* lurking variable
* experimental units
* subjects
* random assignment
* treatment
* factor
* level
* placebo effect
* single blind experiment
* control group
* completely randomized experiment
* randomized block design
* matched pair design
* statistically significant
* replication
* hidden bias
* double-blind experiment
* block design
* data ethics

4.1 Sampling and Surveys (pp.206-224)

1. Explain the difference between a *population* and a *sample*.

1. What is involved in planning a *sample survey*?
2. Why might *convenience sampling* be unreliable?
3. What is a *biased* study?
4. Why are *voluntary response samples* unreliable?
5. Define *simple random sample (SRS)*.
6. What two properties of a *table of random digits* make it a good choice for creating a simple random sample?
7. State the two steps in *choosing an SRS*:
8. What is the difference between sampling *with* replacement and sampling *without* replacement?
9. How can you account for this difference *with and without replacement* when using a table of random digits or other random number generator?
10. How do you select a *stratified random sample*?
11. What is *cluster sampling*?
12. What is *inference*?
13. What is a *margin of error*?
14. What is the benefit of a *larger* sample size?
15. A *sampling frame* is…
16. Give an example of *undercoverage* in a sample.
17. Give an example of *nonresponse bias* in a sample.
18. Give an example of *response bias* in a sample.
19. How can the wording of questions cause *bias* in a sample?
20. Answer the two questions for the *Check Your Understanding* on page 224.

4.2 Experiments (pp.231-251)

1. Explain the differences between *observational study* and *experiment.*
2. A *lurking variable* is…
3. What problems can lurking variables cause?
4. *Confounding* occurs when…
5. Answer the four questions for the *Check Your Understanding* on page 233.
6. Explain the difference between *experimental* *units* and *subjects*.
7. Define *treatment*.
8. By studying the TV Advertising example on page 235, identify the *factors* and *levels* in the experiment.
9. Explain why the example, *Which Works Better: Online or In-Class SAT Preparation,* is a bad experiment.
10. What is *random assignment*?
11. What is a *comparative* experimental design?
12. In a *completely randomized design*…
13. Does using chance to assign treatments in an experiment guarantee a completely randomized design? Explain.
14. What is the significance of using a *control group*?
15. The basic *principles of statistical design* experiments are:
16. Define *control*, *random assignment* and *replication* in experimental design.
17. Describe the *placebo effect*.
18. What are the differences between a *double-blind* and *single-blind* experiement?
19. Define *statistically significant*.
20. What is a *block*?
21. What is a *randomized block design*?
22. When does *randomization* take place in a block design, and how does this differ to a completely randomized design?
23. What is the goal of a *matched pairs design*?
24. When is it beneficial to use a blocked/paired design? How should we choose which variables to block for?

4.3 Using Studies Wisely (pp.261-267)

1. Name the two *types of inferences* that can be identified based on the design of a study.

1. Name the *challenges* of establishing causation.
2. What are the four criteria for *establishing causation* when we can’t do an experiment?
3. Briefly describe the basics of *data ethics*.