

## Chapter Summary: Designing Studies

① → This chapter is an important one in your study of statistics. After all, we cannot describe or analyze data without collecting it first! Since one of the major goals of statistics is to make inferences that go beyond the data, it is critical that we produce data in a way that will allow for such inferences. Biased data production methods can lead to incorrect inferences. Random sampling allows us to make an inference about the population as a whole. Well-designed experiments in which we randomly assign treatments and control for other variables allow us to make inferences about cause and effect. We will learn how to perform these inferences in later chapters. Your goal in this chapter is to be able to describe good sampling and experimental design techniques and recognize when sampling or experimental design has been done poorly. There is almost always a question about sampling or experimental design on the free-response portion of the AP exam. Be sure to familiarize yourself with all of the vocabulary and concepts from this chapter so you can answer that question with confidence!

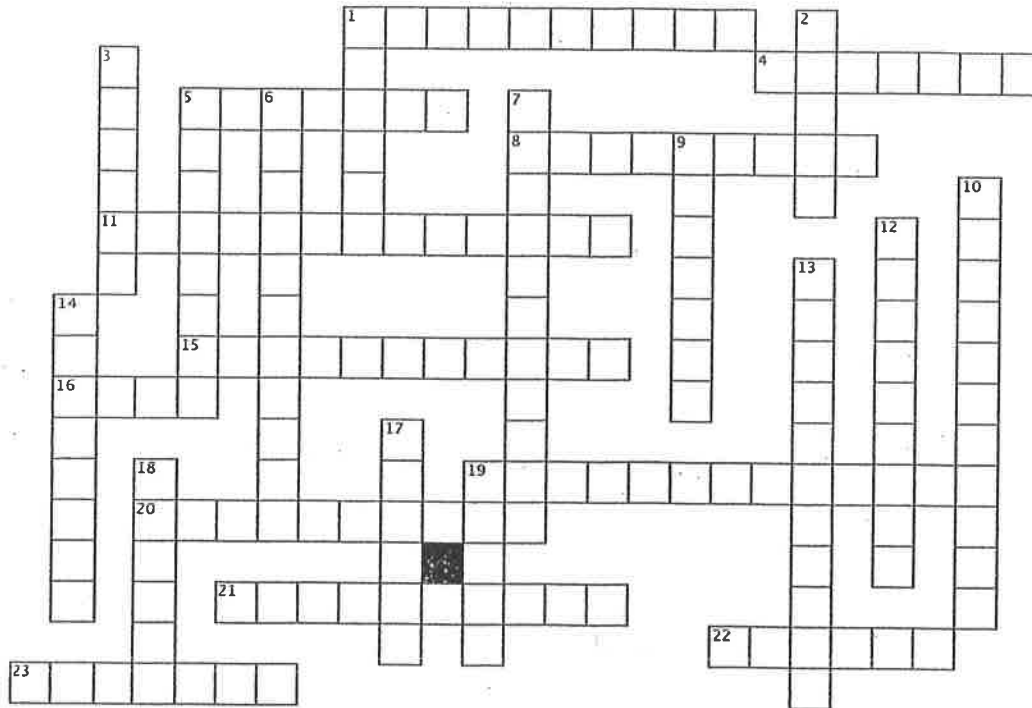
### After You Read: What Have I Learned?

② → Complete the vocabulary puzzle, multiple-choice questions, and FRAPPY. Check your answers and performance on each of the learning targets. Be sure to get extra help on any targets that you identify as needing more work!

Learning Target	Got It!	Almost There	Needs Work
I can identify the population and sample in a statistical study.			
I can identify voluntary response sampling and convenience sampling and explain how these sampling methods can lead to bias.			
I can describe how to select a simple random sample with technology or a table of random digits.			
I can describe how to select a sample using stratified random sampling and cluster sampling, distinguish stratified random sampling from cluster sampling, and give an advantage of each method.			
I can explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias.			
I can explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions.			
I can distinguish between an observational study and an experiment, and identify the explanatory and response variables in each type of study.			
I can identify experimental units and treatments in an experiment.			
I can describe the placebo effect and the purpose of blinding in an experiment.			
I can describe how to randomly assign treatments in an experiment using slips of paper, technology, or a table of random digits.			
I can explain the purpose of comparison, random assignment, control, and replication in an experiment.			
I can describe a completely randomized design for an experiment.			
I can describe a randomized block design and a matched pairs design for an experiment and explain the purpose of blocking in an experiment.			
I can explain the concept of sampling variability when making an inference about a population and how sample size affects sampling variability.			
I can explain the meaning of statistically significant in the context of an experiment and use simulation to determine if the results of an experiment are statistically significant.			
I can identify when it is appropriate to make an inference about a population and when it is appropriate to make an inference about cause and effect.			
I can evaluate if a statistical study has been carried out in an ethical manner.			

④ Do the "Check For Understanding problems if you feel it will help you review (you can do this at a later time.)"  
 ↓ crossword is on the back ↓

### Chapter 4: Designing Studies



**Across**

1. a \_\_\_\_\_ random sample consists of separate simple random samples drawn from groups of similar individuals
4. a "fake" treatment that is sometimes used in experiments
5. the effort to minimize variability in the way experimental units are obtained and treated
8. the process of drawing a conclusion about the population based on a sample
11. this type of student can not be used to establish cause-effect relationships
15. the practice of using enough subjects in an experiment to reduce chance variation
16. a study that systematically favors certain outcomes shows this
19. this occurs when some groups in the population are left out of the process of choosing the sample
20. a study in which a treatment is imposed in order to observe a response
21. the entire group of individuals about which we want information
22. a simple \_\_\_\_\_ sample consists of individuals from the population, each of which has an equally likely chance of being chosen
23. a \_\_\_\_\_ sample consists of a simple random sample of small groups from a population

**Down**

1. groups of similar individuals in a population
2. a group of experimental units that are similar in some way that may affect the response to the treatments
3. the rule used to assign experimental units to treatments is \_\_\_\_\_ assignment
5. smaller groups of individuals who mirror the population
6. this occurs when an individual chosen for the sample can't be contacted or refuses to participate
7. an observed effect that is too large to have occurred by chance alone
9. a lack of \_\_\_\_\_ in an experiment can prevent us from generalizing the results
10. a sample in which we choose individuals who are easiest to reach
12. a \_\_\_\_\_ response sample consists of people who choose themselves by responding to a general appeal
13. neither the subjects nor those measuring the response know which treatment a subject received (two words)
14. when units are humans, they are called \_\_\_\_\_
17. the part of the population from which we actually collect information
18. another name for treatments
19. the individuals on which an experiment is done are experimental \_\_\_\_\_