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

**Chapter 5 Test**

**Section 1: Multiple Choice**

Take your time and read **ALL** the choices before making a decision. Put the capital letter corresponding to the best answer on the **answer sheet** provided.

1. A researcher selected a random sample of 100 students at a university. He asked them two questions. First, he asked each of the students if they regularly take vitamins. He also asked them how many colds they had in the last six months. He then compared the number of colds the group of students who take vitamins had to the number of colds the group of students who don’t take vitamins had. What type of study is this?

a. Observational study b. Experiment

1. A medical doctor has forty patients with high cholesterol issues. She wants to compare the effectiveness of two high cholesterol treatments. To make her comparison, she randomly assigns 20 patients to receive treatment #1. She gives the remaining 20 patients treatment #2. What type of study design is this?

1. Observational study b. Experiment
2. Suppose you are assigned to read about a study in which researchers asked people how many hours of sleep they typically get each night. The results showed that people who sleep less than five hours a night are twice as likely to have a premature death, that is to die earlier, than people who sleep seven or eight hours a night. Can you conclude that sleeping less than five hours a night causes a higher risk of premature death?
3. Yes, because the result was clearly based on a randomized experiment.
4. Yes, because the result was clearly based on an observational study.
5. No, because the result was clearly based on a randomized experiment.
6. No, because the result was clearly based on an observational study.
7. In an observational study, which of the following is true about sampling from the population?
8. Everyone in the population must also be in the sample.
9. The population is a subset of the sample.
10. Data from people in the sample are used to gain information about the population.
11. Data from people in the population are used to gain information about the sample.

**Items 5 and 6 refer to the following situation:** You are designing a clinical trial to see whether adding vitamin D to the diets of adults with MS will reduce their symptoms of the disease. You plan to add vitamin D to the diets of one group of MS patients and then see whether their reported symptoms is lower after six weeks.

1. If neither the subjects, in the study, nor the doctors who work with them, know who was given vitamin D, this is called:
2. informed consent
3. random assignment
4. a confounding variable
5. the double-blind technique
6. If during the experiment you gave a sugar pill that did not actually contain any vitamin D to one of the groups and their reported symptoms still decreased, this would be an example of:
7. lack of confidentiality
8. the double-blind effect
9. the placebo effect
10. voluntary response

**Items 7 - 9 refer to the following situation:** In a sleep study, a researcher randomly assigned adults into two groups: one watched TV before bedtime and the other group did not. The researcher wanted to see if adults who watched TV before bedtime tended to go to sleep later than those who engaged in non-screen sedentary activities before bed.

1. In this study, an adult’s bedtime is an example of:
2. An explanatory variable
3. A response variable
4. A confounding variable
5. In this study, watching TV before bedtime is an example of:
	1. An explanatory variable
	2. A response variable
	3. A confounding variable
6. Which of the following is the main advantage of randomly assigning participants to one of the two programs (TV or no TV before bed) rather than allowing them to choose? If the participants are randomly assigned to one of the two programs:
7. The participants in the TV before bed would be more likely to sleep-in later.
8. This would create similar treatment groups.
9. Both treatment groups will then have exactly the same number of participants.
10. Then you could generalize these results to all adults who watch TV before bed.
11. A study was designed to estimate the proportion of people who intend to vote in the next presidential election. The researchers want to generalize the results to all voters in the next presidential election. To do this, they take a random sample of 100 adults exiting a major league baseball game. Think about the variable of interest. Will this sample be representative of the population? Why or why not?
12. Yes, what’s more American than attending a baseball game? Surely, these adults are potential voters.
13. No, the sample size is not large enough.
14. Yes, they took a random sample.
15. No, this sampling method is biased. It favors adults that attend baseball games over all those that do not.
16. Suppose the food service company for Valencia wants to estimate the proportion of **all** students at Valencia who think the prices are too high at the cafeteria.

**Which of the sampling plans will produce the most reliable results?**

1. Select 100 students at random from the college records.
2. Select 1000 students at random from the college records, since larger samples will result in more accurate estimates.
3. Select 1000 students by randomly choosing students as they exit the cafeteria.
4. Both b and c since both are equally representative of the student population at the college because they are random samples.
5. In January 2007 *Consumer Reports* published their study of bacterial contamination of chicken sold in the US. They purchased 535 broiler chickens from randomly chosen stores all across the country and tested them for bacteria that cause food-borne illness. Lab results showed that 83% of the chickens were infected with such bacteria.

A spokesperson for the US Department of Agriculture was critical of the report because only 535 chickens were sampled. He pointed out that 9 billion chickens were slaughtered a year.

**Is his criticism valid?**

1. No, because he was a spokesperson for the US Department of Agriculture, so he is biased.
2. No, because, the size of the population doesn’t matter. While a larger sample would give more accurate results, the sample of 535 was randomly selected and should give a reasonable estimate.
3. Yes, because it is impossible for the results from a sample of only 535 chickens to be representative of all 9 billion chickens. Because the population is so large we need a larger sample.
4. Which of the following statements is **NOT** true?
	1. We can use results from an observational study to test a claim about a population.
	2. When an observational study has a large sample and follows people for many years, we can use the results to establish a cause-and-effect relationship between two variables.
	3. We can use results from an observational study to establish an association between two variables.
	4. A well-designed experiment is the only legitimate way to establish a cause-and-effect relationship between two variables.

**Items 14 - 16 refer to the following situation:** Coffee stations in offices often just ask users to leave money in a tray to pay for their coffee, but many people cheat. Researchers placed a picture of staring eyes on the wall behind 50 randomly selected coffee stations. They found that the average contribution increased significantly above the well-established standard when people felt they were being watched, even though the eyes were not real.

1. What type of question is being asked in this study?
	1. Making an estimate about a population
	2. Testing a claim about a population
	3. Comparing two populations
	4. Cause-and-effect relationship between two variables
2. What is the population of interest in this study?
	1. Increased average contribution.
	2. 50 randomly selected coffee stations.
	3. All office workers buying coffee at a coffee station.
	4. It is impossible to tell.
3. Which of the features below were used in the design of this experiment?
	1. A placebo
	2. Blinding
	3. A control group
	4. None of the above, this was not an experiment.

**PLEASE CONTINUE ON TO THE FREE RESPONSE SECTION.**

**Section II: Free Response**

Remember it is best to put something down for each question rather than to leave it blank.

1. In 2002 the journal *Science* reported that a study of women in Finland indicated that having sons shortened the lifespans of mothers by about 34 weeks per son. The data came from randomly selected church records from the period 1640-1870.
	1. Is the study described an observational study or an experiment? Explain your answer.

Observational study since the researchers are observing the lifespans from the records and not imposing any kind of change to one group.

* 1. Did the study use random selection from some population or random assignment to experimental groups?

Random selected church records

* 1. Is the conclusion “having a son causes decrease lifespan” appropriate given the study description? Explain your answer.

No, we cannot make statements about causality in an observational study.

* 1. Is it reasonable to generalize conclusions from this study to some larger population? If so, what population?

Yes, since there was random selection of the sample. We can generalize the results to all women in Finland from 1640-1870.

1. Some people claim they can get relief from migraine headache pain by drinking a large glass of ice water. Researchers drew names from a hat to assign volunteers who suffer from migraines to one of four groups. When a participant experiences a migraine headache, he or she will take a standard pain reliever or a “fake pill”. Participants do not know whether they are taking the pain reliever or the “fake pill” as they look identical in size, color, and shape. Half of each group will take the pill only, while half will also drink ice water. Participants will then report the level of pain relief they experience. The researcher recording participant’s level of pain relief does not know which participant was assigned to which group.

For each of the terms listed below, **write the phrase or sentence from the paragraph above** that identifies how it was used in the experimental design described above.

* 1. *use of a placebo*

“fake pill”

* 1. *random assignment*

Researchers drew names from a hat to assign volunteers who suffer from migraines to one of four groups.

* 1. *use of a control group*

Half will take a standard pain reliever or a “fake pill”.

* 1. *blinding*

The researcher recording participant’s level of pain relief does not know which participant was assigned to which group.

1. Evaluate the design of the following experiment. Consider the features: **use of a placebo, random assignment, use of a control group and blinding**. For each of the features a-d listed below, say whether or not the experimental design used this feature appropriately and, if it did not, explain in detail how the researchers could change the design of that feature in order to improve the reliability of the results of the experiment.

A dog food company wants to compare a new lower calorie food with their standard dog food to see if it is effective in helping inactive dogs maintain a healthy weight. They have found several dog owners willing to participate in the trial. The dogs have been classified as small, medium, or large breeds, and the company will supply some owners of each size of dog with one of the two foods. The owners have agreed not to feed their dogs anything else for a period of 6 months, after which the dogs’ weights will be checked.

1. *random assignment*

Does not specify. The researcher should randomly assign half of each size breed (small, medium, large) to one of the two foods.

1. *use of a control group*

Yes, the control group is the standard dog food. Use of a placebo is not possible in this case since you cannot feed a dog “fake food”.

1. *blinding*

Does not specify. Both the researcher checking the dog’s weights and the owners should not know which of the two foods the dog is receiving.

Answer Sheet for **Multiple Choice Section** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. A

2. B

3. D

4. C

5. D

6. C

7. B

8. A

9. B

10. D

11. B

12. B

13. B

14. D

15. C

16. C