CHAPTER 1

1. Name one way that you have used statistics in your own life.
   ANSWER: ANY REASONABLE ANSWER OK. EXAMPLES: TO DECIDE WHAT BRAND
   OF COMPUTER TO BUY, I CONSULTED STATISTICS FROM CONSUMER REPORTS;
   TO DECIDE WHICH APARTMENT TO RENT, I LOOKED AT THE RECENT CRIME
   STATISTICS FROM THE POLICE DEPARTMENT.

2. While you can learn a lot about the world just by observing it, you can learn even more by
   conducting a carefully controlled experiment involving statistics. Explain why.
   ANSWER: A CONTROLLED EXPERIMENT ALLOWS YOU TO MAKE CAREFUL
   COMPARISONS TO FIND OUT IF DIFFERENCES REALLY DO EXIST, AND IF SO, TO
   ATTRIBUTE A CAUSE FOR THE DIFFERENCE.

3. Which of these does not apply to the word ‘statistics’?
   a. Statistics are numbers measured for some purpose.
   b. Statistics is a collection of procedures for collecting and analyzing data.
   c. Statistics is a tool to help you make decisions when faced with uncertainty.
   d. All of the above apply to the word ‘statistics’.
   ANSWER: D

4. Which of the following is not true about the subject of statistics?
   a. Statistics only represents numbers that are used for a specific purpose.
   b. Statistics is a collection of procedures and principles for dealing with information.
   c. Statistics appears in your every day life.
   d. Statistics has a great deal to do with decision making in the face of uncertainty.
   ANSWER: A

5. _______ is a collection of procedures and principles for gaining and analyzing information in
   order to help people make decisions when faced with uncertainty.
   ANSWER: STATISTICS

6. Explain the difference between the statistical terms ‘population’ and ‘sample’.
   ANSWER: THE POPULATION IS THE ENTIRE GROUP FOR WHICH YOU PLAN TO
   DRAW CONCLUSIONS. THE SAMPLE IS THE GROUP THAT IS ACTUALLY STUDIED,
   AND IS CHOSEN FROM THE POPULATION.

7. Suppose you want to determine whether taking vitamins every day helps people lose weight. You
   survey 200 people who had been on a weight loss program for six months, and ask them whether or
   not they take vitamins every day, and how much weight they lost. Suppose you found that the people
   who lost the most weight were more likely to have taken vitamins every day. Does this mean
   vitamins caused the additional weight loss? Explain why or why not.
   ANSWER: NO; THIS WAS AN OBSERVATIONAL STUDY, NOT A CONTROLLED
   EXPERIMENT. OTHER FACTORS COULD EXPLAIN THE WEIGHT LOSS, SUCH AS A
   HEALTHY LIFESTYLE (PEOPLE WHO ARE HEALTH CONSCIOUS MAY BE MORE
   LIKELY TO TAKE VITAMINS).

8. Suppose you participate in an ‘instant poll’ on an Internet website which asks, “What is your favorite
   network TV program at 8 pm (Eastern time) on Thursday night?” After answering the question, you
   look at the results of the entire poll, and find that 6,423 people have responded to it. Should the
   results of this poll be a good indicator of what the most popular network TV program is on Thursday
   nights at 8pm (Eastern time)? Explain why or why not.
   ANSWER: NO. THE SAMPLE OF 6,423 PEOPLE IS A CONVENIENCE SAMPLE, AND IS
   NOT A REPRESENTATIVE SAMPLE OF THE POPULATION OF ALL TV WATCHERS.
9. Suppose researchers who conduct a vitamin study conclude in an evening news sound byte that “Daily vitamin use is good for everyone.” You get a copy of the study they referred to, and find that the participants were all healthy young males who exercised regularly. Explain why the headline is misleading from a statistical standpoint.

**ANSWER:** THE CONCLUSION IN THE HEADLINE SHOULD NOT REFER TO EVERYONE. THE RESULTS ONLY APPLY TO HEALTHY YOUNG MALES WHO EXERCISE REGULARLY.

Narrative: Babysitting
Suppose a recent study of 1,000 teenagers in the U.S. found that 33% of them do babysitting to earn extra money.

10. Which of the following describes the population for this example?
   a. All teenagers in the U.S.
   b. The 1,000 teenagers who participated in the study.
   c. All teenagers in the U.S. who do babysitting for extra money.
   d. The 33% of teenagers who do babysitting to earn extra money.

   **ANSWER:** A

11. Which of the following describes the sample for this example?
   a. All teenagers in the U.S.
   b. The 1,000 teenagers who participated in the study.
   c. All teenagers in the U.S. who do babysitting for extra money.
   d. The 33% of teenagers who do babysitting to earn extra money.

   **ANSWER:** B

12. Which of the following statements is true?
   a. The more variable the groups within a population are, the larger the sample needs to be to detect any real difference between the groups.
   b. The more variable the groups within a population are, the smaller the sample needs to be to detect any real difference between the groups.
   c. No matter how variable the groups within a population are, the size of the sample needed to detect a real difference between the groups is the same.
   d. None of the above statements are true.

   **ANSWER:** A

13. Which of the following is necessary to conduct a study properly?
   a. Get a representative sample.
   b. Get a large enough sample.
   c. Decide whether or not the study should be an observational study or a randomized (controlled) experiment.
   d. All of the above.

   **ANSWER:** D

14. To conduct a good statistical study, you have to be sure that your _________ is representative and large enough.

   **ANSWER:** SAMPLE

15. Most statistical studies fall into one of two types, either an observational study or a randomized

   **ANSWER:** EXPERIMENT
16. Explain why you cannot make causal connections with an observational study.
   **ANSWER:** AN OBSERVATIONAL STUDY DOES NOT CONTROL FOR OTHER
   VARIABLES THAT MAY INFLUENCE THE OUTCOME. THAT MEANS THERE MAY
   BE OTHER FACTORS THAT THE RESEARCHERS DID NOT MEASURE THAT COULD
   ACCOUNT FOR ANY CONNECTIONS FOUND.

Narrative: Marijuana and brain
Researchers at the University of Iowa College of Medicine reported that a test showed those who smoked
seven or more marijuana joints per week had lower math scores than non-marijuana users. A related
headline says “New study confirms too much pot impairs brain”.

17. Explain why these results must have been based on an
   observational study, and not an experiment.
   **ANSWER:** PEOPLE CANNOT BE RANDOMLY ASSIGNED TO EITHER SMOKE
   MARIJUANA OR NOT.

18. Explain why the headline is misleading.
   **ANSWER:** IT IMPLIES THAT THERE IS A CAUSAL CONNECTION BETWEEN
   SMOKING MARIJUANA AND BRAIN FUNCTION. IT COULD BE THE CASE THAT
   PEOPLE WHO CHOOSE TO SMOKE MARIJUANA ARE THOSE WHO WOULD SCORE
   LOWER ON THE TESTS ANYWAY.

19. Suppose you are conducting an experiment that involves assigning each of 100 participants to one of
two groups: Group A or Group B. Which of the following would not be considered to be a random
assignment of participants to groups?
   a. For each participant, flip a coin. If the coin lands heads up, assign him/her to Group A. If
   the coin lands tails up, assign him/her to Group B.
   b. Put all 100 names in a hat and mix them up thoroughly. Draw 50 names from the hat and
   assign them to Group A. Everyone else is assigned to Group B.
   c. As the participants show up for the study, assign the first 50 of them to Group A, and the
   last 50 to Group B.
   d. All of the above methods are considered to be random assignments of participants to
   groups.
   **ANSWER:** C

20. Suppose you want to conduct a survey to determine who is most likely to win the next presidential
election. Which of the following would be considered to be a representative (unbiased) sample?
   a. 1,000 likely voters who called in to a local radio talk show.
   b. 1,000 likely voters who returned surveys sent to everyone on a Democrat or Republican
   newsletter mailing list.
   c. 1,000 likely voters who replied to an Internet website survey.
   d. None of these would be considered to be representative samples.
   **ANSWER:** D

21. Suppose you want to determine how Americans feel about reality TV. Which of the following
samples contains the least amount of bias?
   a. All the people who phone in their opinion on reality TV to a CBS Evening News call-in
   poll.
   b. All those who were randomly selected to receive a reality TV survey in the mail.
   c. People who call the networks during reality TV programs to voice their opinion.
   d. People who respond to an Internet survey at [www.realitytv.com](http://www.realitytv.com).
   **ANSWER:** B
22. The conclusions that can be drawn from an observational study are not as strong as the conclusions that can be drawn from a(n) __________.
   
   ANSWER: RANDOMIZED (OR CONTROLLED) EXPERIMENT

23. Suppose you wanted to find out what percentage of all Americans approve of the job the president is doing and you mailed questionnaires to 2,000 readers of The Wall Street Journal and compiled the results. This is a(n) __________ sample of all American voters.

   ANSWER: BIASED (NONRANDOM OR NONREPRESENTATIVE)