AP Statistics   Chapter 4 Review

1. Which of the following are true statements?
   I. In an experiment some treatment is intentionally forced upon on one group to note the response.
   II. In an observational study information is gathered on an already existing situation.
   III. Sample surveys are experiments.
a) I only   b) II only   c) III only   d) I and II   e) II and III

2. In one study on the effect of niacin on cholesterol level, 100 subjects who acknowledged being long-time niacin takers had their cholesterol levels compared with those of 100 people who had never taken niacin. In a second study, 50 subjects were randomly chosen to receive niacin and 50 were chosen to receive a placebo.
a) The first study was a controlled experiment, while the second was an observational study.
b) The first was an observational study, while the second was a controlled experiment.
c) Both studies were controlled experiments.
d) Both studies were observational studies.
e) Each study was part controlled experiment and part observational study.

3. Suppose you wish to compare the average class size of mathematics classes to the average class size of English classes in your high school. Which is the most appropriate technique for gathering the needed data?
a) Census   b) Sample survey   c) Experiment   d) Observational study
e) None of these methods is appropriate.

4. Ann Landers, who wrote a daily advice column appearing in newspapers across the country, once asked her readers, "If you had to do it over again, would you have children?" Of the more than 10,000 readers who responded, 70% said no. What does this show?
a) The survey is meaningless because of voluntary response bias.
b) No meaningful conclusion is possible without knowing something more about the characteristics of her readers.
c) The survey would have been more meaningful if she had picked a random sample of 10,000 readers who responded.
d) The survey would have been more meaningful if she had a control group.
e) This was a legitimate sample, randomly chosen from her readers and of sufficient size to allow the conclusion that most of her readers who are parents would have second thoughts about having children.

5. Which of the following are true statements?
   I. Voluntary response samples often underrepresent people with strong opinions.
   II. Convenience samples often lead to undercoverage bias.
   III. Questionnaires with nonneutral wording are likely to have response bias.
a) I and II   b) I and III   c) II and III   d) I, II, and III   e) None of the above

6. Each of the 30 NBA teams has 12 players. A sample of 60 players is to be chosen as follows. Each team will be asked to place 12 cards with their player's names into a hat and randomly draw out two names. The two names from each team will be combined to make up the sample. Will this method result in a simple random sample of the 360 basketball players?
a) Yes, because each player has the same chance of being selected.
b) Yes, because each team is equally represented.
c) Yes, because this is an example of stratified sampling, which is a special case of simple random sampling.
d) No, because the teams are not chosen randomly.
e) No, because not each group of 60 players has the same chance of being selected.

7. Which of the following are true statements about sampling error?
   I. Sampling error can be eliminated only if a survey is both extremely well designed and extremely well conducted.
   II. Sampling error concerns natural variation between samples, is always present, and can be described using probability.
   III. Sampling error is generally smaller when the sample size is larger.
a) I and II   b) I and III   c) II and III   d) I, II, and III   e) None of the above

8. What do all of these sampling designs have in common?
   I. The Wall Street Journal plans to make a prediction for a presidential election based on a survey of its readers.
   II. A radio talk show asks people to phone in their views on whether the United States should pay off its huge debt to the United Nations.
   III. A police detective, interested in determining the extent of drug use by teenagers, randomly picks a sample of high school students and interviews each one about illegal drug use by the student during the past year.
a) All the designs make improper use of stratification.
b) All the designs have errors that can lead to strong bias.
c) All the designs confuse association with cause and effect.
d) None of the designs satisfactorily controls for sampling error.
e) None of the designs makes use of chance in selecting a sample.

9. Consider the following three events:
> I. Although 18% of the student body are minorities, in a random sample of 20 students, 5 are minorities.
> II. In a survey about sexual habits, an embarrassed student deliberately gives the wrong answers.
> III. A surveyor mistakenly records answers to one question in the wrong space.

a) I, sampling error; II, response bias; III, human mistake.
b) I, sampling error; II, nonresponse bias; III, hidden error
c) I, hidden bias; II, voluntary sample bias; III, sampling error
d) I, undercoverage error; II, voluntary error; III, unintentional error
e) I, small sample error; II, deliberate error; III, mistaken error

10. To obtain a sample of 25 students from among the 500 students present in school one day, a surveyor decides to pick every twentieth student waiting on line to attend a required assembly in the gym.
a) Explain why this procedure will not result in a simple random sample of the students present that day.
b) Describe a procedure that will result in a simple random sample of the students present that day.

11. In a 1927-32 Western Electric Company study on the effect of lighting on worker productivity, productivity increased with each increase in lighting but then also increased with every decrease in lighting. If it is assumed that the workers knew a study was in progress, this is an example of
a) the effect of a treatment unit   b) the placebo effect   c) the control group effect
d) sampling error   e) voluntary response bias

12. In designing an experiment, blocking is used
a) to reduce bias   b) to reduce variation   c) as a substitute for a control group
d) as a first step in randomization   e) to control the level of the experiment

13. Which of the following are true statements about blocking?
> I. Blocking is to experiment design as stratification is to sampling design.
> II. By controlling certain variables, blocking can make conclusions more specific.
> III. The paired comparison design is a special case of blocking.

a) I and II   b) I and III   c) II and III   d) I, II, and III   e) None of the above

14. Consider the following studies being run by three different nursing home establishments.
> I. One nursing home has pets brought in for an hour every day to see if patient morale is improved.
> II. One nursing home allows visits every day by kindergarten children to see if patient morale is improved.
> III. One nursing home administers antidepressants to all patients to see of patient morale is improved.

a) None of these studies uses randomization.
b) None of these studies uses control groups.
c) None of these studies uses blinding.
d) Important information can be obtained from all these studies, but none will be able to establish causal relationships.
e) All of the above.

15. Which of the following are important in the design of experiments?
> I. Control of confounding variables
> II. Randomization in assigning subjects to different treatments
> III. Replication of the experiment using sufficient number of subjects

a) I and II   b) I and III   c) II and III   d) I, II, and III   e) None of the above

16. Which of the following are true about the design of matched-pair experiments?
> I. Each subject might receive both treatments
> II. Each pair of subjects receives the identical treatment, and differences in their responses are noted.
> III. Blocking is one form of matched-pair design

a) I only   b) II only   c) III only   d) I and III   e) II and III

17. Some researchers believe that too much iron in the blood can raise the level of cholesterol. The iron level in the blood can be lowered by making periodic blood donations. A study is performed by randomly selecting half of a group of volunteers to give periodic blood donations while the rest do not. Is this an experiment or an observational study?
a) An experiment with control group and blinding
b) An experiment with blocking
c) An observational study with comparison and randomization
d) An observational study with little if any bias
e) None of the above

18. Data were collected in 20 cities on the percentage of women in the workforce. Data were collected in 1990 and again in 1994. Gains, or losses, in the percentage were the measurement upon which the studies conclusions were to be based. What kind of design was this?

      I. A matched pairs design
      II. An observational study
      III. An experiment using blocking design

a) I only   b) II only   c) III only   d) I and III only   e) I and II only

19. Your company has developed a new treatment for acne. You think men and women might react differently to the medication, so you separate them into two groups. Then the men are randomly assigned to two groups and the women are randomly assigned to two groups. One of the two groups is given the medication and the other is given a placebo. The basic design of this study is
a) completely randomized
b) comparative randomized, stratified by gender
c) comparative randomized, blocked by gender
d) randomized, blocked by gender and type of medication
e) a matched pairs design

FRQs

20. You want to determine how students in your school feel about a new dress code for school dances. One faction in the student council, call them group A, wants to word the question, "As one way to help improve student behavior at school sponsored events, do you feel that there should be a dress code for school dances?" Another group, group B, prefers, "Should the school administration be allowed to restrict student rights by imposing a dress code for school dances?" Which group do you think favors a dress code and which opposes it? Why? What kind of bias is present? How would you pose the question for the survey to avoid bias?

21. Various claims are often made for surveys. **Why** is each of the following claims not correct?
a) It is always better to take a census than to draw a sample.
b) Stopping students on their way out of the cafeteria is a good way to sample if we want to know about the quality of the food there.
c) We drew a sample of 100 from the 3000 students in a school. To get the same level of precision for a town of 30,000 residents, we will need a sample of 1000.
d) A poll taken at our favorite Web site (www.statsisfun,org) garnered 12,357 responses. The majority said they enjoy doing statistics homework. With a sample size that large, we can be pretty sure that most Statistics students feel this way, too.
e) The true percentage of all Statistics students who enjoy the homework is called a "population statistic."

22. In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. Listed below are some of the ideas proposed for gathering data. For each, indicate what kind of sampling strategy is involved and what (if any) biases might result.
a) Put a big ad in the newspaper asking people to log their opinions on the PTA Web site.
b) Randomly select one of the elementary schools and contact every parent by phone.
c) Send a survey home with every student, and ask parents to fill it out and return it the next day.
d) Randomly select 20 parents from each elementary school. Send them a survey, and follow up with a phone call if they do not return the survey within a week.

23. Here's the opening of a press release from June 2004: "Starbucks Corp. on Monday said it would roll out a line of blended coffee drinks intended to tap into the growing popularity of reduced-calorie and reduced-fat menu choices for Americans." You wonder if Starbucks customers like the new "Mocha Frappuccino Light" as well as the regular version of this coffee.
a) Describe a completely randomized design using 40 Starbucks customers that would help answer this question. Be sure to discuss blinding.
b) A friend of yours in AP Statistics says no, that adults and teenagers have different tastes and suggests that a better way of designing an experimental study is to use a blocking design. Describe that type of experiment.
c) But later in the day, a Stats teacher poked you and said that he thought a matched pairs design was the best method. How would design this experiment?

24. Read the following brief article about aspirin and alcohol.

Aspirin may enhance impairment by alcohol

Aspirin, a long time antidote for the side effects of drinking, may actually enhance alcohol's effect, researchers at the Bronx Veterans' Affairs Medical Center say. In a report on a study published in the *Journal of the American Medical Association*, the researchers said they found that aspirin significantly lowered the body's ability to break down alcohol in the stomach. As a result, five volunteers who had a standard breakfast and two extra-strength aspirin tablets an hour before drinking had blood alcohol levels 30 percent higher than each had when they drank alcohol alone. Each volunteer consumed the equivalent of a glass and a half of wine.

That 30 percent could make the difference between sobriety and impairment, said Dr. Charles S. Lieber, medical director of the Alcohol Research and Treatment Center at the Bronx center, who was co-author of the report with Dr. Risto Roine.

(a) Explain why this is an experiment and not an observational study.

(b) Identify the explanatory and response variables.

(c) Identify the experimental design used in this study. Justify your answer.

(d) In the second sentence above is the phrase, "…researchers said they found that aspirin significantly lowered the body's ability to break down alcohol…" What is the statistical meaning of the word "significantly" in the context of this study?

(e) This was a controlled experiment. Describe how it was controlled and explain the purpose of doing so.