

Name _____

AP Statistics

Date _____

Period _____

Unit 5 Review

- 1) Which of the following is not an example of a *probability sample*?
- (a) You are going to sample 10% of a group of students. You randomly select one of the first 10 students on an alphabetical list and then select every 10th student after that on the list.
 - (b) You are a sports-talk radio host interested in opinions about whether or not Pete Rose should be elected to the Baseball Hall of Fame, even though he has admitted to betting on his own teams. You ask listeners to call in and vote.
 - (c) A random sample of drivers is selected to receive a questionnaire about the manners of Department of Motor Vehicle employees.
 - (d) In order to determine attitudes about the Medicare Drug Plan, a random sample is drawn so that each age group (65–70, 70–75, 75–80, 80–85) is represented in proportion to its percentage in the population.
 - (e) In choosing respondents for a survey about a proposed recycling program in a large city, interviewers choose homes to survey based on rolling a die. If the die shows a 1, the house is selected. If the die shows a 2–6, the interviewer moves to the next house.
- 2) 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) blocked by gender
 - (c) completely randomized, blocked by gender
 - (d) randomized, blocked by gender and type of medication
 - (e) a matched pairs design
- 3) Which of the following situations is a cluster sample?
- (a) Survey five friends concerning their opinions of the local hockey team.
 - (b) Take a random sample of five voting precincts in a large metropolitan area and do an exit poll at each voting site.
 - (c) Measure the length of time each fifth person entering a restaurant has to wait to be seated.
 - (d) From a list of all students in your school, randomly select 20 to answer a survey about Internet use.
 - (e) Identify four different ethnic groups at your school. From each group, choose enough respondents so that the final sample contains roughly the same proportion of each group as the school population.

4) Which of the following is true of an experiment but not of an observational study?

- (a) A cause-and-effect relationship can be more easily inferred.
- (b) The cost of conducting it is excessive.
- (c) More advanced statistics are needed for analysis after the data are gathered.
- (d) By law, the subjects need to be informed that they are part of a study.
- (e) Possible confounding variables are more difficult to control.

5) Which of the following would be considered observational studies?

- I. A researcher wants to determine whether taking vitamin E supplements can lower blood pressure. The blood pressure of each of 150 randomly selected subjects is measured. A vitamin E supplement is given to each subject. Six months later, the blood pressure of each subject is measured again and compared with the first measurement.
- II. A researcher wants to determine whether taking vitamin E supplements can lower blood pressure. The blood pressure of each of 150 randomly selected subjects is measured. Three groups of 50 subjects each are formed. One group is given a certain daily dose of vitamin E. The second group is given twice the daily dosage of the first group. The third is given a pill that contains no vitamin E. Six months later, the blood pressure of each subject is measured again and compared with the first measurement.
- III. A researcher wants to determine whether taking vitamin E supplements can lower blood pressure. The blood pressure of each of 150 randomly selected subjects is measured. Each subject is asked whether they take a daily dose of vitamin E supplements. The subjects are placed into two groups depending on whether or not they took vitamin E supplements. Results are tabulated.

- A. I only
- B. II only
- C. III only
- D. I and II
- E. I, II, and III

6) A researcher wants to determine whether drinking red wine is better at reducing blood pressure than drinking white wine. Two studies are designed. In the first study, 200 people who have not had wine for 6 months are randomly selected. The blood pressures of the 200 subjects are taken. Half of the subjects are asked to drink 1 glass of red wine daily for 6 months, and the other half of the subjects were asked to drink 1 glass of white wine daily for 6 months. The blood pressures of the 200 subjects were taken again after the 6-month study. In a second study, 100 subjects who only drink red wine and 100 subjects who only drink white wine are selected. The blood pressures of the 200 subjects are taken. Results are tabulated. Which of the following is true about these two studies?

- A. The first study is an experiment, and the second study is an observational study.
- B. The first study is an observational study, and the second study in an experiment.
- C. Both studies are experiments.
- D. Both studies are observational studies.
- E. The second study in more likely to show a cause-and-effect relationship than the first study.

7) You want to assess the ice cream flavor preferences of students at your school. You decide to randomly select 100 female juniors and administer a questionnaire. Which of the following statements are true?

- I. By choosing only female juniors, you will have a limited experiment.
- II. By choosing only female juniors, your sample is flawed, and the results of the study are suspect.
- III. By choosing only female juniors, you have created a limited observational study.

- A. I only
- B. III only
- C. I and II
- D. II and III
- E. None of the preceding is a true statement.

8) As a researcher, you are interested in the effectiveness of traffic school for those people who get tickets for running red lights. You are interested to see whether traffic school is more effective for females than males. You divide traffic school attendees into two groups, males and females, and observe their driving records for the next 3 years. This situation can best be described as which of the following?

- A. A census
- B. An experiment
- C. An observational study
- D. A sample survey
- E. A double-blind study

9) A statistics class is made up of 20 female and 16 male students. A committee of 8 students needs to be selected. Each student is given a number from 1 to 36. A random number table is used to repeatedly select two-digit numbers until eight different numbers in the range of 1 to 36 are generated, thus forming a committee of 8 students. After the committee was formed, it was discovered that all 8 of the students were male. One of the female students in the class complained that this could not be random since only male students were selected. Which of the following statements is true?

- A. A sample of size eight is not large enough to produce random results.
- B. The method used did produce a random sample, even though only males were selected.
- C. It is so unlikely to have all eight students be male that it is not a random sample.
- D. Since the results do not reflect the composition of the class, it is not representative; therefore, it is not random.
- E. A random number table cannot be used in this type of selection.

10) A political questionnaire is sent out to all 220,000 residents in a congressional district. Only 15,500 are returned. Of those 15,500 returned questionnaires, only 165 said that the congressman was doing a poor job in representing them. What kind of sample does this represent?

- A. A cluster sample
- B. A systematic sample
- C. A representative sample
- D. A stratified random sample
- E. A self-selected sample

11) A survey is taken of students who finished Professor Toohard's math class. They were asked whether they would take the same professor again for a different class. Of the 85 students who responded, 67 said they would not take the professor for another class. Which of the following statements is true?

- A. The size of the survey is not large enough to produce meaningful results.
- B. Choosing a random sample of these 85 responses would improve the reliability of the survey.
- C. Response bias is evident in this survey.
- D. The survey suffers from undercoverage bias since some of the students did not reply.
- E. This is a valid survey, and the results are meaningful.

12) The manufacturer of a new toothpaste claims that the new product helps whiten teeth. Sixty subjects were randomly selected and had the whiteness of their teeth measured during an examination. Each subject used the new toothpaste for four months. The whiteness of their teeth was again measured, and the results of the two measurements were compared. Which of the following is true?

- A. This is not an experiment since no control group was used.
- B. This is not an experiment since the study was not blind.
- C. This is an experiment using a matched pair design with each subject acting as their own control.
- D. This is an experiment using a completely randomized design.
- E. This is an observational study using a completely randomized design.

- 13) A survey of expectant mothers was taken at the office of an OB-GYN. The survey question was, "Since smoking while pregnant has been shown to increase the risk of birth defects, do you feel that an OB-GYN should advise his patients not to smoke while pregnant?" This survey suffers from which of the following types of bias?
- I. Wording bias
 - II. Sampling bias
 - III. Response bias
- A. II only
 - B. III only
 - C. I and II
 - D. II and III
 - E. I, II, and III
- 14) Jack and Jill have been asked to conduct a survey of the membership of a club in which they are members. Using a systematic sample, they want to survey 5% of the membership. They obtain an alphabetized roster of the club membership. Jill wants to make sure that she is included in the survey. Her name is the 17th one on the list, so they start there and choose every 20th name after that. Which of the following statements are true about this survey?
- I. An alphabetized roster should not be used.
 - II. This is not a systematic random sample.
 - III. Response bias is guaranteed by including Jill in the survey.
- A. I only
 - B. III only
 - C. I and II
 - D. II and III
 - E. I, II, and III
- 15) Tom wants to survey customers of a local bank. He stands at the door of the bank and talks to every 50th customer leaving the bank. Which of the following are true?
- I. This is a simple random sample.
 - II. This is a systematic random sample.
 - III. This is a stratified random sample.
- A. I only
 - B. II only
 - C. III only
 - D. I and II
 - E. I and III
- 16) You are designing an experiment to test the effectiveness of two new medications. You know that males and females respond differently to the medications. You randomly assign the 120 male subjects to one of three groups. One group is given a placebo, and the other two groups each receive one of the two medications. You randomly assign the 120 female subjects to one of three groups. One group is given a placebo, and the other two groups each receive one of the two medications. Neither the subjects nor the researchers know into which group each subject is placed. This represents what kind of experimental design?
- A. A double-blind three block design
 - B. A double-blind matched pairs with control group design
 - C. A block design with randomization
 - D. A completely randomized design
 - E. A control block design

17) You have decided to use an online retailer to buy a specific book on organic gardening. On the website are 24 reader reviews for the book you were thinking of buying, and most of the reviewers were not happy with their purchase. Based on these reviews, you decide to choose another book. Which of the following statements are true about these reviews?

- I. They suffer from undercoverage bias.
 - II. They suffer from response bias.
 - III. They suffer from selection bias.
- A. I and II
 - B. I and III
 - C. II and III
 - D. I, II, and III
 - E. There is no bias since the reviews were voluntary.

18) In the design of experiments, _____ is used to control known variables, and _____ is used to control unknown variables.

- A. Blinding, randomization
- B. Pairing, blocking
- C. Randomization, blocking
- D. Blocking, randomization
- E. Randomization, pairing

19) Which of the following samples does not suffer from undercoverage bias?

- A. A sample of college students drawn from calculus classes
- B. A survey of 300 respondents to bulk email
- C. A sample of homeowners drawn from county property tax records
- D. A sample of doctors taken from membership rosters of the American Medical Association (AMA)
- E. A survey of motorists at a local traffic school

20) Before and after experiments, those that use the same subjects for pre-testing and post-testing a treatment, use what type of design?

- A. Double-blind design
- B. Blocking with control design
- C. Completely randomized design
- D. Blocking without control design
- E. Matched pair design

21) An experiment is being designed to determine the effectiveness of three different cat food supplements. Since data existed for diets without supplements, no control was used in the experiment. The researcher has decided to block for three different species of cat and also for gender. How many groups of cats will be needed for the experiment?

- A. 8
- B. 10
- C. 12
- D. 18
- E. 24

Part II - Free Response

- 1) A survey of physicians found that some doctors gave a placebo rather than an actual medication to patients who experience pain symptoms for which no physical reason can be found. If the pain symptoms were reduced, the doctors concluded that there was no real physical basis for the complaints. Do the doctors understand *the placebo effect*? Explain.
- 2) Twenty-four containers, arranged in four rows of six containers each, are on a counter near a window. The rows are parallel to the window. Twenty-four plants, 8 each of 3 varieties, will be grown to test a new fertilizer. You want to feed half of the plants the new fertilizer (treatment group) and half the old fertilizer (control group). You are concerned that proximity to the window might be a confounding variable. Design a procedure for determining how to select which plants should be placed in each container and which ones receive each treatment.
- 3) You are going to study the effectiveness of three different SAT preparation courses. You obtain 60 high school juniors as volunteers to participate in your study. You want to assign each of the 60 students, at random, to one of the three programs. Describe a procedure for assigning students to the programs if
- you want there to be an equal number of students taking each course.
 - you want each student to be assigned independently to a group. That is, each student should have the same probability of being in any of the three groups.

4) As a restaurant owner, you are interested in determining whether people who order a drink before dinner spend more on their meal (excluding the drinks) than people who do not order a drink. Over a period of two weeks, you record data on 320 customers who ordered drinks before their meals and 460 customers who did not order a drink before their meals. After tabulating the results, you find that the drinkers spent considerably more than the non-drinkers. Is this an experiment or an observational study? Explain.

5) A researcher wants to determine whether performance in statistics classes can be influenced by the expectation of success. A statistics teacher will be teaching 15 sections of statistics over a two-year period. He wants to tell the students in some sections that "females perform better in statistics than males." In some other sections he wants to say "males perform better in statistics than females." Design an experiment that uses treatment groups and control groups and blocks for the difference between day and evening sections.

6) A researcher wants to obtain a sample of 100 teachers who teach in high schools at various economic levels and has access to a list of teachers in several schools for each of the levels. She has identified four such economic levels (A, B, C, and D) that comprise 10%, 15%, 45%, and 30% of the schools in which the teachers work. Describe what is meant by a *stratified random sample* in this situation and discuss how she might obtain it.

7) Subjects in an experiment have been selected to receive one of two different treatments or a placebo. Two different measurements are periodically taken with respect to each subject, one of which is objective and one is subjective. Discuss why this experiment should be double-blind.

8) Design an experiment that employs a *completely randomized design* to study the question of whether or not taking large doses of vitamin C is effective in reducing the number of colds.