

1. Can pleasant aromas help a student learn better? Two researchers believed that the presence of a floral scent could improve a person's learning ability in certain situations. They had 22 people work through a pencil-and-paper maze six times, three times while wearing a floral-scented mask and three times wearing an unscented mask. The three trials for each mask closely followed one another. Testers measured the length of time it took subjects to complete each of the six trials. They reported that, on average, subjects wearing the floral-scented mask completed the maze more quickly than those wearing the unscented mask, although the difference was not statistically significant. This study is
 - A) a convenience sample
 - B) an observational study, not an experiment
 - C) an experiment, but not a double-blind experiment
 - D) a double-blind experiment
2. A marketing research firm wishes to determine if the adult men in Laramie, Wyoming, would be interested in a new upscale men's clothing store. From a list of all residential addresses in Laramie, the firm selects a simple random sample of 100 and mails a brief questionnaire to each. The population of interest is
 - A) all adult men in Laramie, Wyoming
 - B) all residential addresses in Laramie, Wyoming
 - C) the members of the marketing firm that actually conducted the survey
 - D) the 100 addresses to which the survey was mailed

Twelve people, who suffer from chronic fatigue syndrome, volunteer to take part in an experiment to see if, shark fin extract will increase one's energy level. 8 of the volunteers are men and 4 are women. Half of the volunteers are to be given shark extract twice a day and the other half a placebo twice a day. We wish to make sure that 4 men and 2 women are assigned each of the treatments, so we decide to use a block design with the men forming one block and the women the other.

3. Referring to the information above, a block design is appropriate in this experiment if
 - A) we believe men and women will respond differently to treatments
 - B) gender equity is an important legal consideration in this study
 - C) we want the conclusions to apply equally to men and women
 - D) all of the above
4. Referring to the information above, suppose one of the researchers is responsible for determining if a subject displays an increase in energy level. In this case, we should probably
 - A) use two placebos
 - B) use stratified sampling to assign subjects to treatments
 - C) use fewer subjects but observe them more frequently
 - D) conduct the study as a double-blind experiment

A study of human development showed two types of movies to groups of children. Crackers were available in a bowl, and the investigators compared the number of crackers eaten by children watching the different kinds of movies. One kind of movie was shown at 8 AM (right after the children had breakfast) and another at 11 AM (right before the children had lunch). It was found that during the movie shown at 11 AM, more crackers were eaten than during the movie shown at 8 AM. The investigators concluded that the different types of movies had an effect on appetite. .

5. The results cannot be trusted because
 - A) the study was not double-blind. Neither the investigators, nor the children should have been aware of Which movie was being shown
 - B) the investigators were biased. They knew beforehand what they hoped the study would show
 - C) the investigators should have used several bowls, with crackers randomly placed in each
 - D) the time the movie was shown is a confounding variable. .
6. The response variable in this experiment is
 - A) the number of crackers eaten
 - B) the different kinds of movies
 - C) the time the movie was shown
 - D) the bowls

7. In order to select a sample of undergraduate students in the United States, I select a simple random sample of four states. From each of these states, I select a simple random sample of two colleges or universities. Finally, from each of these eight colleges or universities, I select a simple random sample of 20 undergraduates. My final sample consists of 160 undergraduates. This is an example of
- A) simple random sampling
 - B) stratified random sampling
 - C) multistage sampling
 - D) convenience sampling

8. A study of the effects of running on personality involved 231 male runners who each ran about 20 miles a week. A news report (New York Times, Feb. 15, 1988) stated, "The researchers found statistically significant personality differences between the runners and the 30-year-old male population as a whole." A headline on the article said, "Research has shown that running can alter one's moods." Which of the following statements about the study is true?
- A) It was not a designed experiment
 - B) It was an experiment, but not a double-blind experiment
 - C) It was a double-blind experiment, but not a randomized
 - D) It was a randomized, double-blind experiment

One hundred volunteers who suffer from severe depression are available for a study. Fifty are selected at random and are given a new drug that is thought to be particularly effective in treating severe depression. The other 50 are given an existing drug for treating severe depression. A psychiatrist evaluates the symptoms of all volunteers after four weeks in order to determine if there has been substantial improvement in the severity of the depression.

9. The factor in the study above is
- A) which treatment the volunteers receive
 - B) the use of randomization and the fact that this was a comparative study
 - C) the extent to which the depression was reduced
 - D) the use of a psychiatrist to evaluate the severity of depression
10. The study described above would be double-blind if
- A) neither drug had any identifying marks on it
 - B) all volunteers were not allowed to see the psychiatrist nor the psychiatrist allowed to see the volunteers during the session during which the psychiatrist evaluated the severity of the depression
 - C) neither the volunteers nor the psychiatrist knew which treatment any person had received
 - D) all of the above
11. Referring to the study described above, suppose volunteers were first divided into men and women, and then half of the men were randomly assigned to the new drug and half of the women were assigned to the new drug. The remaining volunteers received the other drug. This would be an example of
- A) Replication
 - B) confounding. The effects of gender will be mixed up with the effects of the drugs
 - C) a block design
 - D) a matched-pairs design
12. Will a fluoride mouthwash used after brushing reduce cavities? Twenty sets of twins were used to investigate this question. One member of each set of twins used the mouthwash after each brushing; the other did not. After six months, the difference in the number of cavities of those using the mouthwash was compared with the number of cavities of those who did not use the mouthwash. This experiment uses
- A) random placebos
 - B) double-blinding
 - C) double replication
 - D) a matched-pairs design
13. A stratified random sample corresponds to which of the following experimental designs?
- A) a block design
 - B) a double-blind experiment
 - C) an experiment with a placebo
 - D) a confounded, nonrandomized study

14. For one kindergarten class in his district, a researcher determines which children already can read simple words and which children cannot upon entering kindergarten. The children are followed until third grade, at which point they are tested to determine the grade level at which they are reading. Those children who were reading simple words on entering kindergarten are found to be reading at a higher level than those who could not read simple words on entering kindergarten. The researcher
- A) can conclude that children should be taught to read in preschool, as there are clear benefits to reading early
 - B) cannot conclude that being able to read before entering kindergarten is beneficial, as there may be lurking variables in this study
 - C) needs to have taken a SRS of kindergarten students instead of one class to conclude a cause-and-effect relationship
 - D) needs to retest in sixth grade or no conclusions can be reached

Choose a simple random sample of size three from the following employees of a small company.

- | | | |
|--------------|------------|-----------|
| 1. Bechhofer | 4. Kesten | 7. Taylor |
| 2. Brown | 5. Kiefer | 8. Wald |
| 3. Ito | 6. Spitzer | 9. Weiss |

Use the numerical labels attached to the names above and the list of random digits below. Read the list of random digits from left to right, starting at the beginning of the list.

11793 20495 05907 11384 44982 20751 27498 12009 45287 71753 98236 66419 84533

15. Referring to the information above, the simple random sample is
- A) 117
 - B) Bechhofer, then Bechhofer again, then Taylor
 - C) Bechhofer, Taylor, Weiss
 - D) Kesten, Kiefer, Taylor
16. Referring to the information above, which of the following statements is true?
- A) If we used another list of random digits to select the sample, we would get the same result that we obtained with the list used here.
 - B) If we used another list of random digits to select the sample, we would get a completely different sample than that obtained with the list used here.
 - C) If we used another list of random digits to select the sample, we would get at most one name in common with the sample obtained here.
 - D) If we used another list of random digits to select the sample, it would be just as likely that the sample that we obtained here would be selected as any other set of three names.
17. A simple random sample of 1200 adult Americans is selected, and each person is asked the following question: *In light of the huge national deficit, should the government at this time spend additional money to establish a national system of health insurance?* Only 39% of those responding answered yes. This survey
- A) is reasonably accurate since it used a large, simple random sample
 - B) probably overstates the percentage of people that favor a system of national health insurance
 - C) probably understates the percentage of people that favor a system of national health insurance
 - D) is very inaccurate, but neither understates nor overstates the percentage of people that favor a system of national health insurance. Since simple random sampling was used, it is unbiased
18. A news release for a diet products company reports: "There's good news for the 65 million Americans currently on a diet." Its study showed that people who lose weight could keep it off. The sample was 20 graduates of the company's program who endorse it in commercials. The results of the sample are probably
- A) biased, overstating the effectiveness of the diet
 - B) biased, understating the effectiveness of the diet
 - C) unbiased since these are nationally recognized individuals
 - D) unbiased, but they could be more accurate. A larger sample size should be used
19. A public opinion poll in Ohio wants to determine whether registered voters in the state approve of a measure to ban smoking in all public areas. They select a simple random sample of 50 registered voters from each county in the state and ask whether they approve or disapprove of the measure. This is an example of a
- A) systematic county sample
 - B) stratified sample
 - C) multistage sample
 - D) simple random sample

20. A marketing research firm wishes to determine if the adult men in Laramie, Wyoming, would be interested in a new upscale men's clothing store. From a list of all residential addresses in Laramie, the firm selects a simple random sample of 100 and mails a brief questionnaire to each. The chance that all 100 homes in a particular neighborhood in Laramie end up being the sample of residential addresses selected is
- the same as for any other set of 100 residential addresses
 - exactly 0. Simple random samples will spread out the addresses selected
 - reasonably large due to the "cluster" effect
 - 100 divided by the size of the population of Laramie
21. The number of undergraduates at Johns Hopkins University is approximately 2000, while the number at Ohio State University is approximately 40,000. At both schools a simple random sample of about 3% of the undergraduates is taken. We conclude that
- the sample from Johns Hopkins is more accurate than the sample from Ohio State
 - the sample from Johns Hopkins is less accurate than the sample from Ohio State
 - the sample from Johns Hopkins has the same accuracy as the sample from Ohio State
 - it is impossible to make any statements about the accuracies of the two samples since the students surveyed were different . .
22. You are testing a new medication for relief of depression. You are going to give the new medication to subjects suffering from depression and see if their symptoms have lessened after a month. You have eight subjects available. Half of the subjects are to be given the new medication and the other half a placebo. The names of the eight subjects are given below.
- | | | | |
|---------------|-------------|--------------|---------|
| 1. Blumenthal | 2. Costello | 3. Duvall | 4. Fan |
| 5. House | 6. Long | 7. Pavlicova | 8. Tang |
- Using the list of random digits 81507 27102 56027 55892 33063 41842 81868 71035 09001 43367 49497 starting at the beginning of this list and using single-digit labels, you assign the first four subjects selected to receive the new medication, while the remainder receive the placebo. The subjects assigned to the placebo are
- Blumenthal, Costello, Duvall, and Fan
 - Blumenthal, House, Pavlicova, and Tang
 - House, Long, Pavlicova, and Tang
 - Costello, Duvall, Fan, and Long
23. An amateur gardener decides to change varieties of tomatoes for this year to see if the yield is improved. He put in 6 plants the previous year and 6 plants this year using the same part of the garden. The average yield per plant was 11.3 pounds per plant in the previous year and 14.5 pounds per plant using the new variety. This is an example of
- an experiment
 - an observational study, not an experiment
 - the elimination of all confounding variables by design, since the gardener used the same part of the garden in both years
 - a multistage design, since two years were involved

A television station is interested in predicting whether voters in its viewing area are in favor of federal funding for abortions. It asks its viewers to phone in and indicate whether they support/are in favor of or are opposed to this. Of the 2241 viewers who phoned in, 1574 (70.24%) were opposed to federal funding for abortions.

24. Referring to the information above, the viewers who phoned in are
- a voluntary response sample
 - a convenience sample
 - a probability sample
 - a population
25. Referring to the information above, the sample obtained is
- a simple random sample
 - a single-stage sample
 - a census
 - probably biased
26. In order to assess the opinion of students at the University of Minnesota on campus snow removal, a reporter for the student newspaper interviews the first 12 students he meets who are willing to express their opinion. The method of sampling used is
- simple random sampling
 - convenience sampling
 - voluntary response
 - a census

27. In order to take a sample of 90 members of a local gym, I first divide the members into men and women, and then take a simple random sample of 45 men and a separate simple random sample of 45 women. This is an example of
- A) a block design
 - B) a stratified random sample
 - C) a double-blind simple random sample
 - D) a randomized comparative experiment.
28. A 1992 Roper poll found that 22% of Americans say that the Holocaust may not have happened. The actual question asked in the poll was: Does it seem possible or impossible to you that the Nazi extermination of the Jews never happened? Twenty-two percent responded "possible." The results of this poll cannot be trusted because
- A) undercoverage is present. Obviously those people who did not survive the Holocaust could not be in the poll
 - B) the question is worded in a confusing manner
 - C) we do not know who conducted the poll or who paid for the results
 - D) nonresponse is present. Many people will refuse to participate and those that do will be biased in their opinions
29. A researcher is interested in the cholesterol levels of adults in the city in which she lives. A free cholesterol screening program is set up in the downtown area during the lunch hour. Individuals can walk in and have their cholesterol levels determined for free. One hundred and seventy three people use the service, and their average cholesterol is 217.8. The sample obtained is an example of
- A) a SRS, since the experimenter did not know beforehand which individuals would come to the screening
 - B) a stratified sample of high and low cholesterol individuals
 - C) a sample probably containing bias and undercoverage
 - D) a multistage sample of varying cholesterol levels
30. A basketball player makes $\frac{2}{3}$ of his free throws. To simulate a single free throw, which of the following assignments of digits to making a free throw are appropriate?
- A) 0 and 1 correspond to making the free throw and 2 corresponds to missing the free throw
 - B) 01, 02, 03, 04, 05, 06, 07, and 08 correspond to making the free throw and 09, 10, 11, and 12 correspond to missing the free throw
 - C) Both (a) and (b) are correct
 - D) Neither (a) nor (b) is correct
31. To simulate a basketball player who makes 75% of his free throws, we use the digits 1, 2, and 3 to correspond to making the free throw and the digit 4 to correspond to missing the free throw. Assume successive shots are independent and we obtain the following sequence of 10 random digits: 19223 95034
Using these digits, the relative frequency of missing a free throw is
- A) $\frac{1}{10}$ B) $\frac{5}{10}$ C) $\frac{1}{6}$ D) $\frac{5}{6}$
32. In order to determine if smoking causes cancer, researchers surveyed a large sample of adults. For each adult they recorded whether the person had smoked regularly at any period in his or her life and whether the person had cancer. They then compared the proportion of cancer cases in those who had smoked regularly at some time with the proportion of cases in those who had never smoked regularly at any point. The researchers found there was a higher proportion of cancer cases among those who had smoked regularly than among those who had never smoked regularly. This is
- A) an observational study
 - B) an experiment, but not a double-blind experiment
 - C) a double-blind experiment
 - D) a block design
33. In order to assess the effects of exercise on reducing cholesterol, a researcher sampled 50 people from a local gym who exercised regularly and 50 people from the surrounding community who did not exercise regularly. They each reported to a clinic to have their cholesterol measured. The subjects were unaware of the purpose of the study, and the technician measuring the cholesterol was not aware of whether subjects exercised regularly or not. This is
- A) an observational study
 - B) an experiment, but not a double-blind experiment
 - C) a double-blind experiment
 - D) a matched-pairs experiment

34. In order to investigate whether women are more likely than men to prefer Democratic candidates, a political scientist selects a large sample of registered voters, both men and women. She asks every voter whether they voted for the Republican or the Democratic candidate in the last election. This is
- A) an observational study
 - B) a multistage sample
 - C) A double-blind experiment
 - D) a block design
35. In order to assess the opinion of students at the University of Minnesota on campus snow removal, a reporter for the student newspaper interviews the first 12 students he meets who are willing to express their opinion. In this case, the sample is
- A) all those students favoring prompt snow removal
 - B) all students at universities receiving substantial snow
 - C) the 12 students interviewed
 - D) all students at the University of Minnesota
36. A market research company wishes to find out whether the population of students at a university prefers brand A or brand B of instant coffee. A random sample of students is selected, and each student is asked first to try brand A and then to try brand B, or vice versa (with the order determined at random). They then indicate which brand they prefer. This is an example of
- A) an experiment
 - B) an observational study, not an experiment
 - C) stratified sampling design
 - D) block design
37. A call-in poll conducted by USA Today concluded that Americans love Donald Trump. USA Today later reported that 5640 of the 7800 calls for the poll came from the offices owned by one man, Cincinnati financier Carl Lindner, who is a friend of Donald Trump. The results of this poll are probably
- A) surprising, but reliable since it was conducted by a nationally recognized organization
 - B) biased, but only slightly since the sample size was quite large
 - C) biased understating the popularity of Donald Trump
 - D) biased overstating the popularity of Donald Trump
38. A sociologist wants to study the attitudes of American male college students toward marriage and husband-wife relations. She gives a questionnaire to 25 of the men enrolled in Sociology 101 at her college. All 25 complete and return the questionnaire. The sample in this situation is
- A) all men taking a comparable sociology class
 - B) the 25 men who received and returned the questionnaire
 - C) all the men in the Sociology 101 class
 - D) all married men in the Sociology 101 class
39. Sickle-cell disease is a painful disorder of the red blood cells that affects mostly blacks in the United States. To investigate whether the drug hydroxyurea can reduce the pain associated with sickle-cell disease, a study by the National Institute of Health gave the drug to 150 sickle-cell sufferers and a placebo to another 150. The researchers then counted the number of episodes of pain reported by each subject. The response is
- A) the drug hydroxyurea
 - B) the number of episodes of pain
 - C) the presence of sickle-cell disease
 - D) the number of red blood cells

A group of college students believes that herbal tea has remarkable restorative powers. To test their theory they make weekly visits to a local nursing home, visiting with residents, talking with them, and serving them herbal tea. After several months, many of the residents are more cheerful and healthy.

40. The explanatory variable in this experiment is the
- A) emotional state of the residents
 - B) herbal tea
 - C) fact that this is a local nursing home
 - D) college students

41. The confounding variable in this experiment is the
- A) emotional state of the residents
 - B) herbal tea
 - C) fact that this is a local nursing home
 - D) visits of college students
42. A study to determine whether or not a football filled with helium traveled farther when kicked than one filled with air found that, while the football filled with helium went, on average, farther than the one filled with air, the difference was not statistically significant. The response
- A) is the gas, air or helium, with which the football is filled
 - B) does not exist without statistical significance
 - C) is the number of kickers
 - D) is the distance the football traveled

New varieties of corn with altered amino acid patterns may have higher nutritive value than standard corn, which is low in the amino acid lysine. An experiment compares two new varieties, called opaque-2 and floury-2, with normal corn. Corn- soybean meal diets using each type of corn: are prepared at three different protein levels, 12%, 16%, and 20%, giving nine diets in all. Researchers assign 10 one-day-old male chicks to each diet and record their weight gains after 21 days. The weight gain of the chicks is a measure of the nutritive value of their diet.

43. Referring to the information above, the experimental units in this experiment are
- A) variety and protein level
 - B) the weight gains
 - C) the 90 one-day-old male chicks
 - D) opaque-2 and floury-2
44. Referring to the information above, the factors are
- A) variety and protein level
 - B) the three levels of protein
 - C) the 90 one-day-old male chicks
 - D) opaque-2 and floury-2 varieties of corn
45. Which of the following is not a major principle of experimental design?
- A) comparative experimentation
 - B) replication
 - C) randomization
 - D) segmentation
46. Two variables in a study are said to be confounded if
- A) one cannot separate their effects on a response variable
 - B) they are highly correlated
 - C) they do not have a normal distribution
 - D) one of them is a placebo

Researchers wish to determine if a new experimental medication will reduce the symptoms of allergy sufferers without the side effect of drowsiness. To investigate this question, the researchers give the new medication to 50 adult volunteers who suffer from allergies. 44 of these volunteers report a significant reduction in their allergy symptoms without any drowsiness.

47. Referring to the information above, this study could be improved by
- A) including people who do not suffer from allergies in the study in order to represent a more diverse population
 - B) repeating the study with only the 44 volunteers who reported a significant reduction in their allergy symptoms without any drowsiness, and giving them a higher dosage this time
 - C) using a control group
 - D) all of the above
48. Referring to the information above, the experimental units are
- A) the researchers
 - B) the 50 adult volunteers
 - C) the 44 volunteers who reported a significant reduction in their allergy symptoms without any drowsiness.
 - D) the six volunteers who did not report a significant reduction in their allergy symptoms without any drowsiness.