1. Which of the following is a key distinction between well designed experiments and observational studies?

(A) More subjects are available for experiments than for observational studies.
(B) Ethical constraints prevent large-scale observational studies.
(C) Experiments are less costly to conduct than observational studies.
(D) An experiment can show a direct cause-and-effect relationship, whereas an observational study cannot.
(E) Tests of significance cannot be used on data collected from an observational study.

9. A volunteer for a mayoral candidate' s campaign periodically conducts polls to estimate the proportion of people in the city who are planning to vote for this candidate in the upcoming election. Two weeks before the election, the volunteer plans to double the sample size in the polls. The main purpose of this is to

(A) reduce nonresponse bias
(B) reduce the effects of confounding variables
(C) reduce bias due to the interviewer effect
(D) decrease the variability in the population
(E) decrease the standard deviation of the sampling distribution of the sample proportion

15. A high school statistics class wants to conduct a survey to determine what percentage of students in the school would be willing to pay a fee for participating in after school activities. Twenty students are randomly selected from each of the freshman, sophomore, junior, and senior classes to complete the survey. This plan is an example of which type of sampling?

(A) Cluster
(B) Convenience
(C) Simple random
(D) Stratified random
(E) Systematic

16. Jason wants to determine how age and gender are related to political party preference in his town. Voter registration lists are stratified by gender and age-group. Jason selects a simple random sample of 50 men from the 20 to 29 age-group and records their age, gender, and party registration (Democratic, Republican, neither). He also selects an independent simple random sample of 60 women from the 40 to 49 age-group and records the same information. Of the following, which is the most important observation about Jason's plan?

(A) The plan is well conceived and should serve the intended purpose.
(B) His samples are too small.
(C) He should have used equal sample sizes.
(D) He should have randomly selected the two age groups instead of choosing them nonrandomly.
(E) He will be unable to tell whether a difference in party affiliation is related to differences in age or to the difference in gender

25. A new medication has been developed to treat sleep-onset insomnia (difficulty in falling asleep). Researchers want to compare this drag to a drug that has been used in the past by comparing the length of time it lakes subjects to fall asleep. Of the following, which is the best method for obtaining this information?

(A) Have subjects choose which drug they are willing to use, then compare the results.
(B) Assign the two drugs to the subjects on the basis of their past sleep history without randomization, then compare the results.
(C) Give the new drug to all subjects on the first night. Give the old drug to all subjects on the second night. Compare the results.
(D) Randomly assign the subjects to two groups, giving the new drug to one group and no drug to the other group, then compare the results.
(E) Randomly assign the subjects to two groups, giving the new drug to one group and the old drug to the other group, then compare the results.

2. In which of the following situations would it be most difficult to use a census?

(A) To determine what proportion of licensed bicycles on a university campus have lights
(B) To determine what proportion of students in a high school support wearing uniforms
(C) To determine what proportion of registered students enrolled in a college are employed more than 20 hours each week
(D) To determine what proportion of single-family dwellings in a small town have two-car garages
(E) To determine what proportion of fish in Lake Michigan are bass

9. A television news editor would like to know how local registered voters would respond to the question, "Are you in favor of the school bond measure that will be voted on in an upcoming special election?" A television survey is conducted during a break in the evening news by listing two telephone numbers side by side on the screen, one for viewers to call if they approve of the bond measure, and the other to call if they disapprove. This survey method could produce biased results for a number of reasons. Which one of the following is the most obvious reason?

(A) It uses a stratified sample rather than a simple random sample.
(B) People who feel strongly about the issue are more likely to respond.
(C) Viewers should be told about the issues before the survey is conducted.
(D) Some registered voters who call might not vote in the election.
(E) The wording of the question is biased.

14. A researcher wishes to test a new drug developed to treat hypertension (high blood pressure). A group of 40 hypertensive men and 60 hypertensive women is to be used. The experimenter randomly assigns 20 of the men and 30 of the women to the placebo and assigns the rest to the treatment. The major reason for separate assignment for men and women is that

(A) it is a large study with 100 subjects
(B) the new drug may affect men and women differently
(C) the new drug may affect hypertensive and nonhypertensive people differently
(D) this design uses matched pairs to detect the new-drug effect
(E) there must be an equal number of subjects in both the placebo group and the treatment group.

20. Which of the following is NOT a characteristic of stratified random sampling?

(A) Random sampling is part of the sampling procedure.
(B) The population is divided into groups of units that are similar on some characteristic.
(C) The strata are based on facts known before the sample is selected.
(D) Each individual unit in the population belongs to one and only one of the strata.
(E) Every possible subset of the population, of the desired sample size, has an equal chance of being selected.

31. Automobile brake pads are either metallic or nonmetallic. An experiment is to be conducted to determine whether the stopping distance is the same for both types of brake pads. In previous studies, it was determined that car size (small, medium, large) is associated with stopping distance, but car type (sedan, wagon, coupe) is not associated with stopping distance. The experiment would be best done

(A) by blocking on car size
(B) by blocking on car type
(C) by blocking on stopping distance
(D) by blocking on brake pad type
(E) without blocking

35. A group of students has 60 houseflies in a large container and needs to assign 20 to each of the three groups labeled A, B, and C for an experiment. They can capture the flies one at a time when the flies enter a side chamber in the container that is baited with food. Which of the following methods will be most likely to result in three comparable groups of 20 houseflies each?

(A) Label the first 20 flies caught as Group A, the second 20 caught as group B, and the third 20 caught as group C.
(B) Write the letters A, B, and C on separate slips of paper. Randomly pick one of the slips of paper and assign the first 20 flies caught to that group. Pick another slip and assign the next 20 flies caught to that group. Assign the remaining flies to the remaining group.
(C) When each fly is caught, roll a die. If the die shows an even number, the fly is labeled A. If the die shows an odd number, the fly is labeled B. When 20 flies have been labeled A and 20 have been labeled B, the remaining flies are then labeled C.
(D) Place each fly in its own numbered container (numbered from 1 to 60) in the order that it was caught. Write the numbers from 1 to 60 on slips of paper, put the slips in a jar, and mix them well. Pick 20 numbers out of the jar. Assign the flies in the containers with those numbers to group A. Pick 20 more numbers and assign the flies in the containers with those numbers to group B. Assign the remaining 20 flies to group C.
(E) When each fly is caught, roll a die. If the die shows a 1 or 2, the fly is labeled A. If the die shows a 3 or 4, the fly is labeled B. If the die shows a 5 or 6, the fly is labeled C. Repeat this process for all 60 flies.