AP Statistics Practice Test
Unit Four – Statistical Studies: Observation and Experimentation

Name_____Period_____Date_____

Vocabulary: Define each word and give an example

1.   Population

2.   Statistic

3.   Census

4.   Placebo effect

5.   Nonresponse bias

Short Answer:

6.   The Student Council has been asked to determine the attitude of the students at your school toward a new dress code policy. Joe, a member of the council who is taking AP Statistics has decided to take this task on. Joe needs to find out students' opinions.

   (a) Specify the exact population:

   (b) Briefly discuss how Joe can obtain the sampling frame.

   (c) Let's say Joe decides to contact 100 students by sending out a questionnaire. What biases might enter this survey?

   (d) Would it be possible to obtain an SRS? How could we do this?

   (e) Joe knows that there are more freshmen than seniors in the school and that freshmen might feel differently toward the dress code than the seniors. Knowing this, can you suggest another type of sampling, besides an SRS, that might give him more information about how the students at his school will answer this question?

7. Determine the type of sampling used below.

a) A pollster goes to a local shopping mall and asks shoppers how they feel about smoking in public restaurants.

_____

b) A TV news program announced a question and asked viewers to call a telephone number on their screen and answer "yes" or "no.

_____

c) For my sample, I decide to sample every 100th name in the phonebook.

_____

d) Each of the 10 Senior English classes has 30 students. A sample of 60 students will be chosen as follows. Each class will be asked to place all students' names in a hat and the teacher will randomly draw two names. The two names from each class with be combined to make up the sample.

_____

8. Briefly explain the difference between an experiment and an observational study.

9. Name the four basic principles of experimental design.

_____

10. What does it mean when we say that two variables are confounded? (A complete sentence please!)

Multiple-Choice: Please circle the best response.

11. 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.

12. 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.

13. Control groups are used in experiments in order to . . .

    (A) Control the effects of lurking variables such as the placebo effect
    (B) Control the subjects of a study so as to insure all participate equally
    (C) Guarantee that someone other than the investigators, who have a vested interest in the outcome, control how the experiment is conducted
    (D) Achieve a proper and uniform level of randomization

14. Consider an experiment to investigate the efficacy of different insecticides in controlling pests and their effects on subsequent yield. What is the best reason for randomly assigning treatment levels (spraying or not spraying) to the experimental units (farms)?

    (A) Randomization makes the experiment easier to conduct since we can apply the insecticide in any pattern rather than in a systematic fashion.
    (B) Randomization will tend to average out all other uncontrolled factors such as soil fertility so that they are not confounded with the treatment effects.
    (C) Randomization makes the analysis easier since the data can be collected and entered into the computer in any order.
    (D) Randomization is required by statistical consultants before they will help you analyze the experiment.
    (E) Randomization implies that it is not necessary to be careful during the experiment, during data collection, and during data analysis.

Free Response:

15. A researcher wishes to compare the effects of two fertilizers on the yield of a soybean crop. She has 20 plots of land available and she decides to use a matched-pairs design. Explain what she should do in a couple of sentences.

16. Turkeys raised commercially for food are often fed the antibiotic salinomycin to prevent infections from spreading among the birds. However, salinomycin can damage the birds' internal organs, especially the pancreas. A researcher believes that a combination of selenium and vitamin E in the birds' diet may prevent injury. He wants to explore the effects of two different dosages of selenium (call them S1, S2) in combination with any of three different dosages of vitamin E (call them E1, E2, E3) added to the turkeys' diets. There are 48 turkeys available for the study. At the end of the study, the birds will be killed and the condition of their pancreas examined with a microscope.

    a) What are the experimental units and the response variable in this experiment?

    b) How many factors are in this experiment and what are they?

    c) How many treatments are needed in this experiment?   _____

d) Use a diagram or paragraph to describe a completely randomized design for this experiment **and** also make sure to also discuss your randomization.

e) Use the random-digit table below to select the experimental units that will be assigned to the **first** treatment group. Be sure to indicate how you labeled the experimental units.

13349 46328 01856 29935 80563 03742 49470 08578
11232 05087 19994 17238 04121 08523 14125 38872

17. What is the preferred treatment for breast cancer that is detected in its early stages? The most common treatment was once removal of the breast. It is now usual to remove only the tumor and nearby lymph nodes, followed by radiation. To study whether these treatments differ in their effectiveness, a medical team examines the records of 25 large hospitals and compares the survival times after surgery of all women who have had either treatment.

a) What are the explanatory and response variables?

b) Is this an experiment? Answer yes or no and BRIEFLY EXPLAIN WHY.

c) Explain why confounding will prevent this study from discovering which treatment is more effective.

18. What does it mean if we say that the results of our experiment are "statistically significant"?

19. Students are designing an experiment to compare the productivity of two varieties of dwarf fruit trees. The site for the experiment is a field that is bordered by a densely forested area on the west (left) side. The field has been divided into eight plots of approximately the same area. The students have decided that the test plots should be blocked. Four trees, two of each of the two varieties, will be assigned at random to the four plots within each block, with one tree planted in each plot.

The two blocking schemes shown below are under consideration. For each scheme, one block is indicated by the white region and the other block is indicated by the gray region in the figures.

Blocking Scheme A

Forest

Blocking Scheme B

Forest

Key
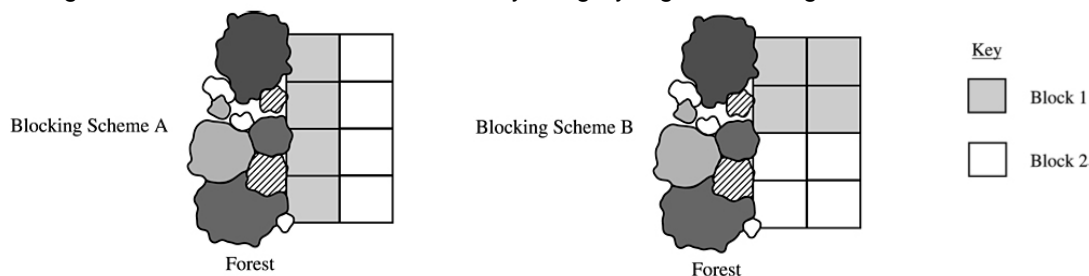
Block 1

Block 2

   a) Which of the blocking schemes, A or B, is better for this experiment? Explain your answer.

   b) Even though the students have decided to block, they must randomly assign the varieties of trees to the plots within each block. What is the purpose of this randomization in the context of this experiment?

Review: Please circle the best response.

20. At a college the scores on the chemistry final exam are approximately normally distributed, with a mean of 75 and a standard deviation of 12. The scores on the calculus final are also approximately normally distributed, with a mean of 80 and a standard deviation of 8. A student scored 81 on the chemistry final and 84 on the calculus final. Relative to the students in each respective class, in which subject did this student do better?

   (A) The student did better in chemistry.
   (B) The student did better in calculus.
   (C) The student did equally well in each course.
   (D) There is no basis for comparison, since the subjects are different from each other and are in different departments.
   (E) There is not enough information for comparison, because the number of students in each class is not known.

21. Suppose that the distribution of a set of scores has a mean of 47 and a standard deviation of 14. If 4 is added to each score, what will be the mean and the standard deviation of the distribution of new scores?

	Mean	Standard Deviation
(A)	51	14
(B)	51	18
(C)	47	14
(D)	47	16
(E)	47	18

22. A study found a correlation of $r = -0.61$ between the gender of a worker and his or her income. We may correctly conclude that

   (A) women earn more than men on the average.
   (B) women earn less than men on the average.
   (C) an arithmetic mistake was made, since correlation must always be positive.
   (D) this result is incorrect, because computing r makes no sense in this situation.
   (E) on average, women earn 61% less than men.