AP Statistics
Review Chapters 11 – 12

Part I: Multiple Choice – Write the letter corresponding to the *best* answer in the blank provided.

__1. The student council of McNeil High School wants to conduct a survey regarding the dress code for school dances. You have advised them that it might be best to conduct a stratified random sample of the student body. Which of the following is **not** a valid ***stratified*** design?

A) Two simple random samples are to be conducted: one of the boys in the student body and the other of the girls in the student body.
B) Four simple random samples are conducted: one in each of the four grade levels.
C) A census is conducted in each of 5 randomly selected Zone classes.
D) Two random samples are conducted: one of students whose GPA's are 2.5 or higher and the other of students whose GPA's are less than 2.5.
E) All of these statements are valid stratified designs.

__2. Hoping to get information that would allow them to negotiate new rates with their advertisers, Natural Health magazine phoned a random sample of 600 subscribers. 64% of those polled said they use nutritional supplements. Which is true?

I. The population of interest is the people who read this magazine.
II. "64%" is not a statistic; it's the parameter.
III. This sampling design should provide the company with a reasonable estimate of the percentage of all subscribers who use supplements.

A) I only B) I and II only C) I and III only D) II and III only E) I, II, and III

__3. Suppose your local school district decides to randomly test high school students for attention deficit disorder (ADD). There are three high schools in the district, each with grades 9 – 12. The school board pools all of the students together and randomly samples 250 students. Is this a simple random sample?

A) Yes, because the students were chosen at random.
B) Yes, because each student is equally likely to be chosen.
C) Yes, because they could have chosen any group of 250 students from throughout the district.
D) No, because we can't guarantee that there are students from each school in the sample.
E) No, because we can't guarantee that there are students from each grade in the sample.

__ 4. Simple random sampling

A) reduces bias resulting from poorly worded questions.
B) offsets bias resulting from undercoverage and nonresponse.
C) reduces bias resulting from the behavior of the interviewer.
D) None of the above.

__ 5. A chemistry professor at Podunk University (known as PU) who teaches a large lecture class surveys his students who attend his class. He wants to get some ideas about how he can make the class more interesting since he notices about 25% of the class is "absent" on any given day. During one class period, he distributes a survey for his students to complete. This survey method suffers from

A) voluntary response B) nonresponse bias C) response bias
D) undercoverage E) None of the these

Part II: Free Response – Please write the solutions for these problems on SEPARATE PAPER.

6. A local radio show wants to know what people in Austin, Round Rock and the surrounding areas think about public education. They ask listeners to call in to answer the question, "Are public school teachers doing a good job teaching our young people?" Of the 724 listeners who responded, 38% said they thought public school teachers were doing a good job.

a) Name the population of interest:
b) Is there a problem with bias in this situation? Explain.

7. Gallup Poll was asked to estimate the true percent of American adults who are concerned about access to healthcare. In November, 2007, Gallup conducted a survey of 1034 randomly selected American adults and found that 30% of American adults at that time felt that *access* to healthcare was the top healthcare concern.

Is "the true percent of American adults in November, 2007, who were concerned about access to healthcare"...
a parameter or statistic (circle answer) What symbol can be used to represent it? _____
Gallup found that the 30% felt that access to healthcare was a top concern. Is this number...
a parameter or statistic (circle answer) What symbol can be used to represent it? _____

8. According to recent census data, the mean number of children per American family is 2.6. In a sample survey of 200 families that were randomly selected from major U.S. cities, the mean number of children per family was 2.83.

Is "2.83" a parameter or statistic ? (circle answer) What symbol can be used to represent it? _____
Is "2.6" a parameter or statistic ? (circle answer) What symbol can be used to represent it? _____

9. Administrators at a hospital are concerned about the possibility of drug abuse by people who work there. They decide to check on the extent of the problem by having a random sample of the employees undergo a drug test. Several plans for choosing the sample are proposed. Name the sampling strategy in each.

a) There are four employee classifications: doctors, medical staff (nurses, techs, etc), office staff, support staff (custodians, etc). Randomly select 10 from each category.
b) Each employee has a 4-digit ID number. Use a random digit table to select 40 numbers.
c) At the start of each shift, randomly select a number from 1 to 10, choose that person as they arrive and then test every 10^{th} person after that who arrives for work.
d) Randomly select a department (like radiology) and test all the people who work in that department – doctors, nurses, technicians, clerks, custodians, etc.

10. In the village of Podunk, a local parents group is concerned that the children in the community are not reading as much as kids in other communities. Thus, they have requested funding from the city for additional after-school reading programs, in hopes that this will encourage school children to read more books in their free time.

The city has agreed to provide funding, but only if a survey of school children shows that the average number of books read per year by a school child in Podunk is less than the average for surrounding communities. If the city's survey shows that Podunk children are NOT reading fewer books per year than in other communities, then they will NOT provide funding for additional reading programs.

The city gets an intern to conduct a survey of 50 school children in Podunk, and based on the data from this survey, the city will make a decision about funding for the requested reading programs.

The intern visits a local bookstore where a children's book club is meeting that afternoon. There are 50 children at this book club meeting, and all of them find tremendous enjoyment in reading books in their free time. Since the intern is not very knowledgeable in statistical theory, he decides to survey these fifty children about how many books they have read in the past year, and this data is taken back to the city.

a) Identify the population of interest in this situation.
b) Identify the parameter of interest in this situation.
c) Identify the obvious flaw in the sampling method described above.
Hint: For this type of question, you should carefully explain any form of bias, as well as the direction and impact of the bias in the context of this situation.

d) After complaints from the parents group, the city decides to fire the intern and hire a high school Statistics student – named Alex – to conduct the survey. In order to get a precise estimate, Alex wishes to use a stratified sampling procedure. He is not sure, however, whether he should stratify his sample by gender, or by ethnicity/race. It is widely thought that – for whatever reason – girls in Podunk tend to read more books than boys. It is also thought that a child's ethnicity/race has very little association with the number of books that a child reads. Based on this information, which variable should Alex choose to stratify by: gender or ethnicity/race? Explain.

11. In response to nutrition concerns raised last year about food served in school cafeterias, the Smallville School District entered into a one-year contract with the Healthy Alternative Meals (HAM) company. Under this contract, the company plans and prepares meals for 2,500 elementary, middle, and high school students, with a focus on good nutrition. The school administration would like to survey the students in the district to estimate the proportion of students who are satisfied with the food under this contract.

Two sampling plans for selecting the students to be surveyed are under consideration by the administration. One plan is to take a simple random sample of students in the district and then survey those students. The other plan is to take a stratified random sample of students in the district and then survey those students.

a) Describe a simple random sampling procedure that the administrators could use to select 200 students from the 2,500 students in the district.

b) The district is considering using a stratified sampling procedure, in order to get a more precise estimate about the proportion of students who are satisfied with their school cafeteria food. The district is planning to stratify by school level (elementary, middle, high school), since they believe that different age levels may have differing opinions about school cafeteria food. Describe one statistical advantage of using a stratified random sample over a simple random sample in the context of this study.