AP STATISTICS HW #2 – Sampling Procedures Practice

Write out your responses to these problems on SEPARATE PAPER.

- 1. Identify the type of sampling procedure (simple random, stratified, cluster, or systematic) used in each of the following scenarios.
 - a) An ad agency gathers information about the habits of Texas consumers who live in very small towns (less than 100 adults). They randomly select 12 of these small towns and then interview all of the adults in each of these towns.
 - b) At the start of each shift, randomly select a number from 1 to 10, choose that person as they arrive and then test every 10th person after that who arrives for work.
 - c) There are four employee classifications: doctors, medical staff (nurses, techs, etc), office staff, support staff (custodians, etc). Randomly select 10 employees from each category.
 - d) Ms. Hodge is curious about the number of hours that seniors spend writing their college essays. She numbers every senior and uses a random number table to randomly select 50 seniors and gives those seniors a survey to complete.
 - e) A business wants to know what its customers think of a new product and they think that men and women may view the product differently. A random sample of 45 men and 50 women is selected to complete a survey on the product.
 - f) The Podunk school district wishes to give a survey to some of its middle school students regarding the quality of the school lunches served in the cafeteria. From the fifteen middle schools in the district, three of the schools are randomly selected. The survey is then sent home to all of the students at those three selected schools.
- 2. The administration at a Central Podunk High School (CPHS) is trying to determine the mean number of minutes spent on math homework by students at their school each week. The administration randomly selects 2 students from each of the 50 math classes on campus, to obtain a sample of 100 students. The mean number of minutes spent on math homework by these 100 students is reported to be 81 minutes.
 - a) Identify the population of interest.
 - b) Identify the parameter of interest that the school administrators are trying to estimate.
 - c) Identify the sampling frame.
 - d) The mean amount of time was reported as 81 minutes. Is this value a **parameter** or a **statistic**?
- 3. Management at a high tech firm wishes to obtain an estimate for the proportion of its thousands of employees who use mass transit to commute to/from work. On a typical workday, from the first 500 employees who arrive at work, the company randomly selects a sample of 75 employees. 29.33% of those 75 employees report that they use mass transit to commute to/from work. Suppose among ALL of the company's employees, 30.1% use mass transit to commute to/from work.
 - a) Identify the population of interest.
 - b) Identify the parameter of interest.
 - c) Identify the sampling frame.
 - d) Is this value "29.33%" a parameter or a statistic?
 - e) Is this value "30.1%" a **parameter** or a **statistic**?

For the problems on this page, please keep in mind that when asked to describe a random sampling procedure, your description must be clear enough for another person to follow without confusion.

- 4. **IPHONES** Suppose 1,000 iPhones are produced at a factory today. Management would like to ensure that the phones' display screens meet their quality standards before shipping them to retail stores. Since it takes about 10 minutes to inspect an individual phone's display screen, managers decide to inspect a sample of 20 phones from the day's production.
 - a) An eager employee suggests that it would be easy to inspect the last 20 iPhones that were produced today. Why isn't this a good idea?
 - b) Another employee recommends inspecting every 50th iPhone that is produced, starting with a randomly selected phone among the first 50. What type of sampling procedure is this?
 - c) The defining characteristic of a simple random sample (SRS) is that in this context every possible combination/sample of 20 phones must each have an <u>equal</u> probability of being selected. Explain why this would not be true with the sampling technique mentioned in part (b).
- 5. **GENDER DISCRIMINATION** A corporation employs 250 engineers 200 of whom are male, 50 of whom are female. In response to allegations of gender-discrimination in the workplace, the human resources department wishes to select a random sample of 25 employees to participate in a "workplace environment" survey. They decide to select a **stratified random sample** of 20 males and 5 females to participate in the survey.
 - a) Carefully describe a process for randomly selecting such a sample.
 - b) Again, the defining characteristic of a simple random sample (SRS) is that in this context every possible combination/sample of 25 employees must have an equal probability of being selected. Give at least one example of a sample that could occur with a simple random sample that has no chance of occurring with the stratified sampling technique in part (a).
 - c) One acceptable method of carrying out a **simple random sample** would be as follows:
 - Assign each of the 250 employees a unique number from 1 250
 - Write each number on a separate slip of paper (of roughly equal size), and put all 250 slips of paper into a really large hat.
 - Stir the slips of paper around to mix them thoroughly.
 - Without looking, draw out 50 slips (without replacing any of them). The 50 employees that have their numbers drawn will be asked to participate in the survey.

Name one statistical advantage of using a **stratified random sample** (as you described in part "a") over using a **simple random sample**. Explain **why** this is an advantage in the context of this situation.

- 6. **HIGH-SPEED INTERNET** Laying fiber-optic cable for high-speed internet is an expensive process. Cable companies want to make sure that, if they extend their lines out to less dense suburban or rural areas, there will be sufficient demand and the work will be cost-effective. In the rural town of Podunk, the local cable company decides to conduct a survey to determine the proportion of households in a local subdivision that would buy their internet service. The subdivision has 24 blocks, and each block has exactly 10 households, for a total of 240 households.
 - a) Carefully describe a method of randomly selecting 50 households by using a **simple random sample (SRS)**.
 - b) For convenience, the cable company may opt to use a cluster sampling method, in which each of the 24 blocks in the subdivision is treated as a cluster. Describe a process for randomly selecting 50 households using a **cluster sampling method**.