Recall two of the teachers from Student Activity Sheet 1 (Question 13) who were interested in the best test format for student achievement. Mrs. Johnson flipped a coin to decide whether a student would take a multiple-choice or fill-in-the blank exam. Mr. McDonald asked students which format they preferred.

1. These teachers chose to study the population of all students in their classes. This approach is called a census. The U.S. government conducts a census every 10 years. List some things you know about the U.S. Census. The census attempts to collect information about every US citizen. This is an impossible goal.

2. Rather than go through the time and expense of a census, researchers usually choose to sample the population. There are a variety of sampling techniques. Define the following common techniques with help from your teacher or by researching other resources.
   a. Simple random sampling
      every sample of size n from the same population has an equal chance of being selected.
   b. Stratified random sampling
      the population is put into groups called strata. A SRS is selected from each strata.
   c. Systematic sampling
      every 11th individual in the population is selected.
   d. Cluster sampling
      the population is separated into groups called clusters. Some groups are randomly selected. Every individual in the selected cluster becomes part of the sample.
   e. Convenience sampling
      only individuals who are easily available are selected.

3. Suppose the school board wished to see whether the age of the student affects test achievement. The testing coordinator separated the roster of high school students into freshmen, sophomores, juniors, and seniors and randomly selected 20 students from each classification. She then flipped a coin to determine which test format each student would receive and then compared the results as follows:
   - freshmen who took the multiple-choice test compared to freshmen who took the fill-in-the blank exam,
   - multiple-choice sophomores compared to fill-in-the-blank sophomores,
   - multiple-choice juniors compared to fill-in-the-blank juniors, and
   - multiple-choice seniors compared to fill-in-the-blank seniors.

Randomization still occurred because the testing coordinator flipped the coin to assign the test format to each student. This approach is an example of what type of sampling technique? Explain your thinking.

The individuals were placed into groups by class (these groups would be strata). Then, individuals in each group were randomly selected. This makes it a Stratified Random Sample.
4. Mr. McDonald expanded his study to the entire school. He collected a student roster from the office and used the random number generator on his calculator to select one of the first 50 students on the list. Mr. McDonald then selected every 50th student on the list after this initial student for his sample. The calculator generated the number 32. Which students on the roster are the first five in his sample? What type of sampling technique is this? Explain your thinking.

32, 82, 132, 182, 232 This is a systematic sample. Every 50th individual was selected.

5. Coach Smith wants to know whether students would pay for the privilege of parking their cars in the lot closest to the school. He surveyed students getting on the buses while he monitored bus loading each afternoon. What type of sampling technique is this? What do you think of his plan? This is a convenience sample. It is likely to be a bias sample. Students who drive to school are not represented in this sample.

6. A large university wants to find out whether it is adequately serving the needs of its students who live off campus. The campus is surrounded by a large number of apartment complexes. The researchers randomly selected three of the complexes that seemed to contain a diverse group of residents who adequately reflect the student body as a whole, and they surveyed these residents about campus services. What type of sampling technique is this? Why do you think the university chose this method? Explain your thinking. This is using the cluster sampling technique. It would be less time consuming than a SRS.

7. Recall the research from Student Activity Sheet 1 (Question 19) in which scientists analyzed the scalp hair samples from 22 participants with epilepsy and 23 participants without epilepsy, checking for differences in levels of copper, iron, zinc, magnesium, and calcium. The scientists were concerned about previous research that showed conflicting results. They speculated that other differences in the study group, besides the presence or absence of epilepsy, could have caused these mixed results. The scientists attempted to control some of these other differences by gathering all participants from the same region of Turkey (indicating similar dietary habits) and separating the participants into the following groups:

- males with epilepsy,
- males without epilepsy,
- females with epilepsy, and
- females without epilepsy.

This is an example of what kind of sampling? Explain your thinking. This is a stratified random sample. The "strata" are males and females.