1. Suppose that in a certain community an opinion poll was conducted to determine public sentiment toward a bond issue in an upcoming election. The objective of the survey was to estimate the proportion of voters in the community who favored the bond issue.

    a. Identify the target population.
    b. Suppose the individual voter is specified as the sampling unit. Identify a sampling frame that might be used, and clearly identify the study population.
    c. Suppose that the household is specified as the sampling unit. Identify a sampling frame that might be used, and clearly identify the study population.
    d. Suppose you want to obtain a stratified random sample. What variable(s) would you use to create strata? Explain your reasoning.

2. A researcher wishes to estimate the average income of employees in a large firm. Records have the employees listed by seniority, and generally speaking, salary increases with seniority. Discuss the relative merits of both simple random sampling and stratified random sampling in this case. Which would you recommend, and how would you set up the sampling scheme?

3. A simple random sample of 300 employees is selected from a company list containing the names of 5,000 full-time employees in order to evaluate job satisfaction. A survey will be administered to these 300 employees.

    a. Give an example of possible coverage error.
    b. What could you do to protect against the error discussed in part a?
    c. Give an example of possible non-response error.
    d. Give an example of possible sampling error.
    e. Give an example of possible measurement error.

4. The General Education Requirement at Winona State University requires that students graduating from WSU complete 2 credit hours of courses in physical development and wellness. Suppose the faculty senate wanted to know what proportion of WSU students thought this was a necessary requirement. Suppose a professor on the faculty senate offered to conduct a survey study, and she did so by selecting a simple random sample of students who were majoring in her department. She sent them an email asking for them to respond to an online survey question.

    a. Discuss the extent to which coverage error is likely to occur in this study.
    b. Discuss the extent to which non-response error is likely to occur in this study.
    c. Which of the above errors do you think will be more serious?
    d. How should this professor have selected respondents for this study? Propose an improved sampling plan.

5. Suppose a state has 10 universities, 25 four-year colleges, and 50 community colleges, each of which offers multiple sections of an introductory statistics class each year. Researchers want to conduct a survey of students taking introductory statistics in the state. Describe a method for collecting each of the following types of samples.

   a. A stratified sample.
   b. A cluster sample.
   c. A simple random sample.
   d. Give one advantage of each of the sampling methods listed in parts a-c in the context of the problem.

6. One night years ago, the ABC program Nightline asked viewers whether the United Nations should continue to be located in the United States. Of more than 186,000 callers, 67% said they wanted the United Nations out of the United States. At about the same time, a polling company contacted a random sample of about 500 respondents and found that 28% of them wanted the United Nations out of the United States. Suppose that a correspondent for Nightline argues that their estimate is more trustworthy because it was based on a much larger sample size. Do you agree or disagree with this statement? Explain your reasoning.

7. Suppose a survey question will be asked to determine how Winona State students feel about whether or not there should be stricter gun control laws in the United States.

   a. Write a version of the question that is as neutral and unbiased as possible.
   b. Write a version of the question that is likely to get more people to respond that there should be stricter gun control laws in the United States.
   c. Write a version of the question that is likely to get more people to respond that there should *not* be stricter gun control laws in the United States.

8. Consider the following implementation of the randomized response survey technique. A random sample of college students was asked the following question: *Have you ever cheated on an exam?*

   Each respondent rolled a single die (in private) and then proceeded as follows.

   - If the die landed on {1,2,3,4}, the respondent simply answered "yes."
   - If the die landed on {5,6}, the respondent answered the question truthfully.

   Suppose this survey was conducted with n = 60 persons; 46 persons answered "yes" and 14 answered "no." Use these data to estimate the true proportion of college students who have ever cheated on an exam. You must show your work to receive full credit.