

Homework # 15

Stat 202

3.52 What kind of sample? In each of the following situations, describe the sample as an SRS, a stratified random sample, a multistage sample, or a voluntary response sample. Explain your answers.

- (a) There are seven sections of an introductory statistics course. A random sample of three sections is chosen and then random samples of 8 students from each of these sections are chosen.
- (b) A student organization has 55 members. A table of random numbers is used to select a sample of 5.
- (c) An online poll asks people who visit this site to choose their favorite television show.
- (d) Separate random samples of male and female first-year college students in an introductory psychology are selected to receive a one-week alternate instructional method.

3.53 What's wrong? Explain what is wrong in each of the following scenarios.

- (a) The population consists of all individuals selected in a simple random sample.
- (b) In a poll of an SRS of residents in a local community, respondents are asked to indicate the level of their concern about the dangers of dihydrogen monoxide, a substance that is a major component of acid rain and in its gaseous state can cause severe burns. (*Hint: Ask a friend who is majoring in chemistry about this substance or search the Internet for information about it.*)
- (c) Students in a class are asked to raise their hands if they have cheated on an exam one or more times within the past year.

3.54 What's wrong? Explain what is wrong with each of the following random selection procedures and explain how you would do the randomization correctly.

(a) To determine the reading level of an introductory statistics text, you evaluate all the written material in the third chapter.

(b) You want to sample student opinions about a proposed change in procedures for changing majors. You hand out questionnaires to 100 students as they arrive for class at 7:30 A.M.

(c) A population of subjects is put in alphabetical order and a simple random sample of size 10 is taken by selecting the first 10 subjects in the list.

3.55 Importance of students as customers. A committee on community relations in a college town plans to survey local businesses about the importance of students as customers. From telephone book listings, the committee chooses 150 businesses at random. Of these, 73 return the questionnaire mailed by the committee. What is the population for this sample survey? What is the sample? What is the rate (percent) of nonresponse?

3.60 Using GIS to identify mint field conditions. A Geographic Information System (GIS) is to be used to distinguish different conditions in mint fields. Ground observations will be used to classify regions of each field as either healthy mint, diseased mint, or weed-infested mint. The GIS divides mint-growing areas into regions called pixels. An experimental area contains 200 pixels. For a random sample of 25 pixels, ground measurements will be made to determine the status of the mint, and these observations will be compared with information obtained by the GIS. Select the random sample. If you use Table B, start at line 112 and choose only the first 5 pixels in the sample.

Solutions

3.50. To use Table B, number the list from 0 to 9 and choose two single digits. (One can also assign labels 01–10, but that would require two-digit numbers, and we would almost certainly end up skipping over many pairs of digits before we found two in the desired range.)

It is worth noting that choosing an SRS is often described as “pulling names out of a hat.” For long lists, it is often impractical to do this literally, but with such a small list, one really could write each ringtone on a slip of paper and choose two slips at random.

3.51. See the solution to the previous exercise; for this problem, we need to choose three items instead of two, but it is otherwise the same.

3.52. (a) This is a multistage sample: We first sample three of the seven course sections, then eight from each chosen section. (b) This is an SRS: Each student has the same chance ($5/55$) of being selected. (c) This is a voluntary response sample: Only those who visit the site can participate (if they choose to). (d) This is a stratified random sample: Males and females (the strata) are sampled separately.

3.53. (a) This statement confuses the ideas of population and sample. (If the entire population is found in our sample, we have a *census* rather than a sample.) (b) “Dihydrogen monoxide” is H_2O . Any concern about the dangers posed by water most likely means that the respondent did not know what dihydrogen monoxide was, and was too embarrassed to admit it. (Conceivably, the respondent knew the question was about water and had concerns arising from a bad experience of flood damage or near-drowning. But misunderstanding seems to be more likely.) (c) Honest answers to such questions are difficult to obtain even in an anonymous survey; in a public setting like this, it would be surprising if there were any raised hands (even though there are likely to be at least a few cheaters in the room).

3.54. (a) The content of a single chapter is not random; choose random words from random pages. (b) Students who are registered for an early-morning class might have different characteristics from those who avoid such classes. (c) Alphabetic order is not random. One problem is that the sample might include people with the same last name (siblings, spouses, etc.). Additionally, some last names tend to be more common in some ethnic groups.

3.55. The population is (all) local businesses. The sample is the 73 businesses that return the questionnaire, or the 150 businesses selected. The nonresponse rate is $51.3\% = \frac{77}{150}$.

Note: *The definition of “sample” makes it somewhat unclear whether the sample includes all the businesses selected or only those that responded. My inclination is toward the latter (the smaller group), which is consistent with the idea that the sample is “a part of the population that we actually examine.”*

3.60. Assign labels 001 to 200. To use Table B, take three digits at a time beginning on line 112; the first five pixels are 089, 064, 032, 117, and 003.