HOMEWORK 11 Due: next class 3/10

1. For the following reports identify (i) the population, (ii) the population parameter of interest, (iii) the sample, and (iv) the sample statistic.
   a. A company packaging snack foods maintains quality control by randomly selecting 10 cases from each day's production and weighing the bags, and then inspecting the contents. The weight of a case should be 2 lbs. One day they found that the weight of the 10 cases was 20.5 lbs.

      Population: All cases of the snack food bags
      Parameter: The mean weight of ALL cases of snack food bags
      Sample: The 10 cases of snack food bags
      Statistic: The mean weight of the snack food bags in the sample (2.05 lbs)

   b. State police set up a roadblock to estimate the percentage of cars with up-to-date registration and insurance. They found problems with 10% of the cars they stopped.

      Population: All the cars in the state
      Parameter: The proportion of ALL the cars in the state with up-to-date registration and insurance
      Sample: The cars stopped at the roadblock
      Statistic: The proportion of the stopped cars with up-to-date registration and insurance (90%)

   c. The Environmental Protection Agency took soil samples at 20 locations near a former industrial waste dump and checked each for evidence of toxic chemicals. They found no elevated levels of any harmful substances.

      Population: All the soil near the former industrial waste dump
      Parameter: The mean level of toxic chemicals in the soil near the former industrial waste dump
      Sample: The 20 soil samples
      Statistic: The mean level of toxic chemicals in the 20 soil samples

   d. A magazine asked all subscribers whether they had used alternative medical treatments and, if so, whether they had benefited from them. For almost all of the treatments, approximately 20% of those responding reported cures or substantial improvement in their condition.

      Population: All the magazine subscribers
      Parameter: The proportion of ALL the magazine subscribers who had used alternative medical treatments and benefited from them
      Sample: The subscribers who answered the survey
      Statistic: The proportion of the subscribers who answer the survey who had used alternative medical treatments and benefited from them.

2. For each of the following indicate whether what is described is a *parameter* or a *statistic*:

   a. The fraction of all Americans who have never seen an ocean in person. Parameter
   b. The mean number of spots in a sample of 100 ladybugs have. Statistic

c. The proportion of 100 randomly chosen single-family houses in Orange County with a swimming pool Statistic
d. The percent of all defective iPods made by Apple. Parameter
e. The mean height of all kindergarten kids in California. Parameter

3. For each of the following, indicate whether what is described is a *parameter* or a *population*:

a. All four-inch ham sandwiches sold at Quizno's. Population
b. The average weight in ounces of all four-inch ham sandwiches sold at Quizno's. Parameter
c. The proportion of registered drivers in California who had an accident in 2008. Parameter
d. All apartment units in New York that are larger than 2000 square feet. Population
e. The percentage of dogs and cats in Los Angeles that have been spayed or neutered. Parameter
f. All 100 members of the United States Senate. Population

3. A poll is administered to a random sample of 250 students at a certain university to determine the percentage that favor a new fee that will go towards enhancing the campus Recreation Center. Only 24% of those polled are in favor of the fee. The standard deviation of the sampling distribution for such polls is 2.7%.

a. Give an interval estimate of the proportion of the entire student body that supports the fee.

$24\% \pm 2(2.7\%) = 24\% \pm 5.4\% = (18.6\%,\ 29.5\%)$

b. What is the population here? What is the parameter?

Population: All the students at that University
Parameter: The proportion of ALL students at that University who favor the new fee

c. Give the value of the statistic.

p-hat = 24%

d. Does the size of the university student population play a role in the accuracy of estimation?

No. The population size does not play a role in the accuracy of estimation, only the sample size.

4. Explain why sampling distributions are important in statistical inference.

The central concept in classical statistical inference is the notion of a sampling distribution, which describes how sample results behave if we draw repeated samples of a particular size n from a larger population. Of course, in any real application of statistical inference, we draw only *one* sample of size n, but the sampling distribution provides the conceptual foundation for deciding how informative our sample is about the population.

5. A simple random sample of 1000 Americans found that 61% were satisfied with the service provided by the dealer from whom they bought their car. A simple random sample of 1000 Canadians found that 58% were satisfied with the service provided by the dealer from whom they bought their car. The sampling variability associated with these statistics:

a. is about the same
b. is smaller for the sample of Canadians since the population of Canada is smaller than that of the United States, hence the sample is a larger proportion of the population
c. is smaller for the sample of Canadians since the percentage satisfied was smaller than that for the Americans
d. is larger for the Canadians, since Canadian citizens are more widely dispersed throughout the country than in the United States, hence have more variable views

6. Suppose that studies were made to estimate the mean number of televisions owned by families in various California cities. Indicate which of the following would be likely to give the most accurate estimate of the city's mean, and which would probably give the least accurate estimate:

a. A random sample of 500 families from Bakersfield (population 330,000)
b. A random sample of 500 families from San Diego (population 1,350,000)
c. A survey form distributed in various locations (shopping malls, libraries, post offices, etc.) of Santa Barbara (population 95,000), with 7,285 responses received

a and b are the most accurate ones (the sample sizes are the same, and both are random samples—the size of the population does not matter), and c is the least accurate because it's not a random sample.