Math 227S: Statistics

Homework 2: Descriptive Statistics

Due Wednesday, Feb. 28, 2024

Submit in person or online. Work with others and check your solutions.
BONUS: You get a bonus of 20% if you (1) show work, and (2) if submitting online, you submit a single PDF, or if submitting in person, you use lined, loose-leaf paper with no crinkly or torn edges.

Definitions.

- **Population.** The group under consideration in a statistical study. The group for which conclusions will be drawn.
- **Sample.** A subset of a population.
- **Random Sample.** A sample where every member of the population has the same chance of being in the sample.
- **Census** A survey of an entire population.
- **Parameter.** A measurement computed using the members of a population.
- **Statistic.** A measurement computed using the members of a sample.

Problems.

1. Identify the (A) population, (B) sample, (C) parameter, and (D) statistic in each survey. (If a census is being done, there is no sample or statistic.)
   a) Carla is running for governor of California. Her team surveys 100 residents of Los Angeles and finds that 57% will vote for her.
   b) Layla owns a coffee house and posts satisfaction surveys for her customers. Thirty customers completed the survey, and of these, 72% are completely satisfied with their coffee experience.
   c) Savannah asks all of her teachers if they can read Spanish. Three of her five teachers can read Spanish.
   d) Angel asks his colleagues if they would like to buy Girl Scout Cookies from his daughter.

2. A random sample is *simple* if every subgroup of a population has the same chance of being selected as any other subgroup of the same size. Determine if each is a simple random sample. Explain.

   a) (OpenStax Statistics, Page 49 #12) A group of test subjects is divided into twelve groups; then four of the groups are chosen at random.

   b) You manage a law firm and are asked to hire two secretaries. Your choose your two best friends.

   c) A computer generates a random whole number A between 1 and 100, and all people of age A are selected.

d) Men aged 18-26 were drafted into the Vietnam war according to their birth dates. A lottery was conducted to randomly assign draft orderings s 1-366 to every date of the year. So everyone born on a certain date were drafted together.

3. A study is used to determine if a vaccine is effective against the omicron variant of COVID. Two hundred healthy (no symptoms) volunteers participate, where 110 are randomly assigned to a control group, while the remaining 90 are assigned to the experimental group. The participants were tested after four weeks with the following results.

Group	Control	Experimental
Total	110	90
Positive Test	33	20
Deaths	5	3

a) Is there a significant difference in the number of positive tests between the two groups? (Explain your reasoning.)

b) Is there a significant difference in the number of deaths between the two groups. (Explain your reasoning.)

4. Compute a student's GPA if their grades for four classes are A (3 units), B (3 units), B (5 units), and D (4 units). Round your answer to the nearest hundredth.

5. Give a frequency distribution for the following data.

18 7 8 13 7 9 13 11 9 11 11 10 8 11 9 7 9 8 7 15 5 8 7 13 9 12 10 19 9 7

Use the categories 5-7, 8-10, 11-13, 14-16, 17-19.

6. Estimate the mean of the data by computing a weighted average of the midpoints of the categories with their frequencies as weights. Compare to the actual mean.

7. Draw a histogram for the frequency distribution in the previous problem, and describe its shape.

8. Give real life examples of a uniform distribution, or a process which results in an (approximately) uniform distribution. Give examples for bell-shaped, right-skewed, and left-skewed distributions.

9. Compute the (1) mean, (2) median, (3) sample standard deviation, (4) draw a histogram, and (5) construct a boxplot for the following data sets.

(a) 18 7 8 13 7 9 13 11 9 11 11 10 8 11 9

(b) 7 9 8 7 7 5 8 7 13 9 12 10 9 9 7