HOMEWORK 1.1

An Overview of Statistics

Problem 1 A researcher measures the cholesterol levels of 250 patients at a clinic to learn about the cholesterol levels of all adults in Ohio.

a.) Population _____

b.) Sample _____

Problem 2 To estimate the average price of regular gas in a state, an agency records the price at 120 gas stations.

a.) Population _____

b.) Sample _____

Problem 3 Decide whether each number is a parameter or a statistic. Explain.

a.) A poll of 900 likely voters shows that 47% favor a new school levy. _____

b.) Of the 30 Major League Baseball teams, 15 play in the American League. _____

c.) A survey of 300 restaurants found an average wait time of 12 minutes. _____

d.) The 2020 U.S. Census counted about 11.8 million people living in Ohio. _____

Problem 4 Decide whether each statement uses descriptive or inferential statistics. Explain.

a.) The mean score on yesterday's quiz in Room 214 was 84. _____

b.) After testing 1,000 phones, a company estimates that 2% of all its phones have a defective screen. _____

c.) Of the 30 students in our class, 12 have a part-time job. _____

Problem 5 A study of 500 high school seniors found that seniors who ate breakfast every day had a mean GPA of 3.3. Seniors who usually skipped breakfast had a mean GPA of 2.9.

a.) Identify the population. _____

b.) Identify the sample. _____

c.) Which part of the study is descriptive statistics?

d.) What inference might be drawn from the study?

e.) Does this study prove that eating breakfast raises a student's GPA? Explain.

Problem 6 Decide whether each statement is true or false. If it is false, rewrite it so it is true.

a.) A statistic is a number that describes a population characteristic. _____

b.) A sample is a subset of a population. _____

c.) Inferential statistics involves only organizing, summarizing, and displaying data. _____

Problem 7 Decide whether each symbol describes a parameter or a statistic.

a.) $\bar{x}$ _____ b.) σ _____

c.) s _____ d.) μ _____

HOMEWORK 1.2

Data Classification

Problem 1 Decide whether each variable is qualitative or quantitative.

a.) Favorite music genre _____

b.) Number of pets in a household _____

c.) Jersey numbers of the Cleveland Browns players _____

d.) Heights of plants, in centimeters _____

e.) Brand of running shoes _____

f.) Gallons of gas bought at a station _____

Problem 2 Identify the level of measurement of each data set. Explain.

a.) The types of trees in a city park _____

b.) The final standings of the four AFC North teams (1st, 2nd, 3rd, 4th) _____

c.) T-shirt sizes: S, M, L, XL _____

d.) Water temperatures of a lake, in degrees Celsius _____

e.) Monthly rent amounts, in dollars _____

f.) Seasons in which Ohio State won a national championship in football since 2000: 2002, 2014, 2024 _____

g.) The number of points a team scored in each game _____

Problem 3 A student says, “It is 30°C in Miami and 15°C in Chicago, so Miami is twice as warm as Chicago.” Is the student correct? Explain.

Problem 4 One employee earns $60,000 per year and another earns $30,000 per year. Is it meaningful to say the first employee earns twice as much? Explain.

Problem 5 A car dealership keeps the data below for every car it sells. Identify the level of measurement of each variable.

a.) Body style (sedan, SUV, pickup truck, …) _____

b.) Customer satisfaction: poor, fair, good, excellent _____

c.) Price, in dollars _____

d.) Model year (2023, 2024, 2025, …) _____

Problem 6 Which data set is at the **nominal** level of measurement?

(A) Finishing places in a 5K race
(B) The blood types of donors at a blood drive
(C) The weights of packages, in pounds
(D) Daily high temperatures, in degrees Fahrenheit

HOMEWORK 1.3

Data Collection and Experimental Design

Problem 1 Decide which method of data collection fits best: observational study, experiment, simulation, or survey.

a.) Asking 500 voters which candidate they prefer _____

b.) Recording the number of birds that visit a feeder each morning _____

c.) Giving one group of plants a new plant food and comparing their growth to plants without it _____

d.) Using a computer model to predict how a flu spreads through a city _____

Problem 2 A researcher tests whether a new app helps students learn vocabulary. 120 students volunteer. 60 are randomly assigned to use the app for 2 weeks, and 60 study with paper flash cards. Then both groups take the same vocabulary test.

a.) Describe the treatment group. _____

b.) Describe the control group. _____

c.) Can the students be blinded? Explain. How could blinding still be used?

d.) The researcher thinks grade level may affect the results. Describe a randomized block design.

Problem 3 To test a new tire, a company puts the new tires on trucks that drive in the city and its old tires on trucks that drive on highways. The new tires wore out faster.

a.) Identify a problem with this experiment.

b.) Suggest a way to fix it.

Problem 4 Researchers apply a new sunscreen to one arm of each of 50 volunteers and the old sunscreen to the other arm. Which experimental design is this? Explain why it is a good choice.

_____

Problem 5 Identify the sampling technique. Then tell whether the sample could be biased.

a.) A pollster picks a random starting point on a list of phone numbers and calls every 50th number after it. _____

b.) A researcher divides NFL players into offense, defense, and special teams, then randomly selects 20 players from each group. _____

c.) A teacher surveys the first 10 students who arrive to class. _____

d.) A factory randomly selects 5 of its 40 shipping crates and inspects every item in those crates. _____

e.) The ID numbers of all 2,400 students are entered into a random number generator, and 100 numbers are chosen. _____

Problem 6 A club numbers its 45 members from 1 to 45 and wants to choose 6 of them at random.

a.) What should be entered on the TI-84? _____

b.) The calculator shows 17, 4, 38, 17, 22, 9. Which members are in the sample? _____

Problem 7 Decide whether you would take a census or use a sample. Explain.

a.) The mean age of the 9 members of a school board _____

b.) The mean sugar content of all boxes of cereal a company makes _____

Problem 8 A sports website asks visitors to vote on whether their city needs a new stadium. Of those who voted, 85% said yes. Explain why this result may be biased.

Problem 9 To test a new pain reliever, a company gives it to 6 patients and gives a placebo to 6 other patients. Five of the 6 patients who took the new drug felt better.

a.) Identify a problem with this experiment.

b.) Suggest a way to fix it.

Problem 10 A principal wants the opinions of 40 students about a new schedule. The school has grades 9 through 12. Explain why a stratified sample might be better than a simple random sample.