Math 10 MPS - Homework 2 Answers

1. A poll was taken of 150 students at De Anza College. Students were asked how many hours they work outside of college. The students were interviewed in the morning between 8 AM and 11 AM on a Thursday. The sample mean for these 150 students was 9.2 hours.

    a. What is the Population?
    All students at De Anza College

    b. What is the Sample?
    150 students at De Anza College

    c. Does the 9.2 hours represent a statistic or parameter? Explain.
    Statistic – it is from sample data, parameters are from populations.

    d. Is the sample mean of 9.2 a reasonable estimate of the mean number of hours worked for all students at De Anza? Explain any possible bias.
   **No, only morning students were asked, night students probably work longer hours.**

2. The following data represents the heights (in feet) of 20 almond trees in an orchard.

14	14	14	14	15	18	18	20	21	21
22	24	25	25	25	27	27	29	31	45

    a. Construct a box plot of the data.
    b. Do you think the tree with the height of 45 feet is an outlier? Use the box plot method to justify your answer.

    $$IQR = 9.5$$
    Fence 1 = 26 + (9.5)(1.5) = 40.25
    45 is a possible outlier
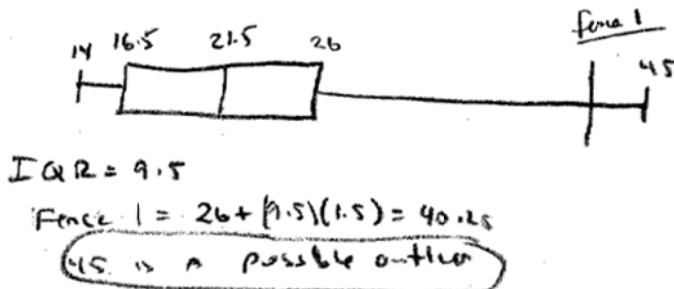
3. Rank the following correlation coefficients from weakest to strongest.
    .343,   -.318,   .214,   -.765,   0,   .998,   -.932,   .445

    0, .214, -.318, .343, .445, -.765, -.932, .998

4. A researcher wanted to know if students who use the library at a college have higher GPAs than students who do not use the library. The researcher decided used a random number generator to choose 20 random classes at the college. Students in each of these classes were given surveys that could be filled out anonymously. Students that completed the surveys were given a $5 gift card for the bookstore. 82% of students in the sampled classes returned the surveys.

Here are the two questions of interest:

How often do you use the library?

    a. Never
    b. Less than once a week
    c. More than once a week, but not every day
    d. Every day

What is your current GPA? _____

    a. What method of sampling was used by the researcher?
       Cluster sampling

    b. Discuss the wording of the questions for possible bias.
       Seems ok, choices for library may be too limited.

    c. Is this an observational study or an experiment? Explain.
       Observational, no manipulated variable

    d. The researcher concluded that students who use the library more frequently have higher GPAs. Is this a valid conclusion for this type of study? Explain.
       Yes, sampling method is representative and no cause and effect is mentioned.

5. Identify the Steps of a Statistical Process for the library use/GPA example in problem 4. The steps are listed below:

    a. Ask a question that can be answered with sample data.
       Do students who use the library at a college have higher GPAs than students who do not use the library?

    b. Determine the information needed
       Library Use and GPA

    c. Collect sample data that is representative of the population.
       Cluster sampling done correctly is usually representative

    d. Summarize, interpret and analyze the sample data.
   **no data given in study**

    e. State the results and conclusion of the study.
       Students who use the library more frequently have higher GPAs.

6. A researcher for an electric car company was testing a new battery system. The goal of the battery system was to extend the life of the battery before recharging is necessary.

    48 identical model electric cars were selected. 24 cars were given the new battery system (treatment group), while the remaining 24 cars kept the old system (control group). All cars were then fully charged. 24 drivers were then assigned a car. They were not told whether they were driving a car with the new batteries or a car with the regular batteries. The drivers were all given the same route to drive. The drivers drove the cars until the battery ran dead. The mileage driven was then recorded.

    The 24 drivers then returned the next day to repeat the experiment with the remaining cars.

Electric Car - miles on one charge
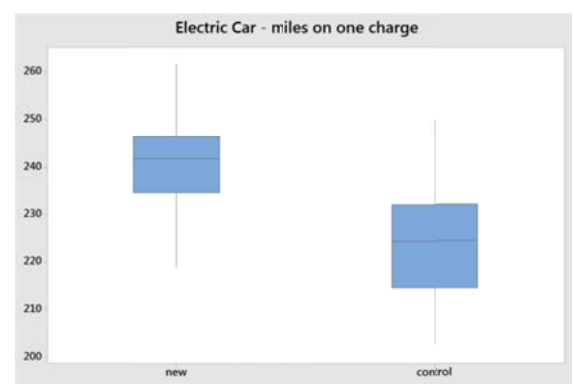
Each driver was assigned a new battery car and a regular battery car, but neither the driver nor the person assigning the car knew the order in which they drove the cars.

The results are shown in the box plot. The researchers concluded that new battery system did extend the life of the battery by about 7%.

    a. In this experiment, what is the explanatory variable and what is the response variable?
       Explanatory: battery system   Response: miles on one charge

    b. Was there blinding done in this experiment? Explain.
       Yes, they were not told whether they were driving a car with the new batteries or a car with the regular batteries.

    c. Suppose the researcher instead chose 48 drivers and each driver drove a single car. Would this create any lurking variables for the experiment?
       Yes, individual driver habits.

7. Identify the Steps of a Statistical Process for the multiple measures example in problem 6. The steps are listed below:

    a. Ask a question that can be answered with sample data.
       Does the new battery system extend the life of the battery before recharging is necessary?

    b. Determine the information needed.
       Battery system (new and control), miles on one charge.

    c. Collect sample data that is representative of the population.
       Random assignment was use so sampling is representative. Results shown in box plots

    d. Summarize, interpret and analyze the sample data.
       Box plots show that cars with new battery systems travel farther.

    e. State the results and conclusion of the study.
       The new battery system extends the life of the battery by about 7%.