Algebra 2/Pre-Calculus

Name_____

Opinion Polling, Surveys, and More Practice (Day 15, Statistics)

In this handout, we will analyze some of the challenges inherent in opinion polling and surveys.

1. Successful polling is very challenging. Discuss potential sources of bias in each of the following situations.

a. A student conducts a survey in homeroom. He tells his classmates that the survey is optional. What are the source(s) of bias in this situation?

b. A different group of students conducts a survey in homeroom. They politely ask for everyone to complete the survey. What are the sources of bias in this situation? ***Hint:*** Will all of the students complete the survey?

c. A polling organization sets up a survey on the internet. Anyone who sees the survey is welcome to respond and lots of people do. What are the limitations of this approach?

d. A polling organization goes through the phonebook and calls a random grouping of people, asking them whom they will vote for on Election Day. What are the sources of bias in this poll? ***Hints:*** Is everyone listed in the phonebook? Who might not be listed? Does everyone respond when they are called?

e. Explain what might be meant by the term “non-response bias.”

f. The high school does a yearly survey to measure student behavior in risky activities (such as use of drugs and alcohol). Explain some reasons why the results of this survey might not be accurate.

2. Wording in surveys is extremely important. Consider the following questions regarding data collection by the NSA (National Security Administration):

Survey A: "Do you support the NSA collecting information on Americans in order to protect national security?"

Survey B: "Do you support the NSA violating the privacy rights of Americans by collecting information about them?"

a. Why might these surveys come to different conclusions regarding the level of public support for the NSA's data collection policy?

b. How would you word this survey in order to gage public opinion? (This is hard! Small changes in wording can have a big effect on how people answer questions.)

3. A student is trying to determine the average number of hours that students at LHS work on their homework each night. The student conducts a survey of every student in her math class, asking the students to report how many hours they work on homework each night. She finds that the average is 2.1 hours and concludes that this is the average for the school as a whole.

a. Explain the flaw in this student's argument. Be as specific as possible.

b. Is there a better way to design this study? Explain how you would do it. Be as specific as possible.

4. A teacher is trying to determine if peer tutoring helps students to do better on tests. The teacher finds out which students in his class are getting peer tutoring and compares their test average to the test average for the class as a whole. He finds that the students getting peer tutoring have a lower test average than the class as a whole and concludes that peer tutoring is not helpful.

a. Explain the flaw in this argument.

b. Consider the following experiment. "At the beginning of the school year, each student in the class is randomly assigned to two groups, tutoring and no tutoring. Students in the tutoring group will go to one session of peer tutoring each week, whereas students in the no tutoring group do not have this option. At the end of the year, the teacher compares the scores for the two groups."

Explain why the conclusions drawn from this experiment would be more statistically valid than the conclusions drawn in part **a**.

c. What are the practical and ethical reasons why the experiment described in part **b** would problematic in real life?

5. Consider the following survey questions:

1. Would you support LHS buying iPads for all LHS students?
2. Would you support LHS buying iPads for all LHS students or do you think there is a better use for these funds?

a. These questions both ask about support for buying iPads for students. Why might students respond differently to the two questions?

b. Suppose you were designing a survey and you wanted to bias the responses in favor of buying iPads. How would you word the survey? (You want to write the survey in a way that makes students more likely to say that they ***do*** support buying iPads.)

c. Suppose you were designing a survey and you wanted to bias the responses against buying iPads. How would you word the survey? (You want to write the survey in a way that makes students more likely to say that they ***do not*** support buying iPads.)

d. Suppose you were designing this survey and you wanted to eliminate bias as much as possible. How would you word the survey? (This is challenging!)

6. The High School is trying to decide if it should invest in iPads for LHS students. To help determine the answer, the LHS administration looks at the MCAS, SAT and AP scores for towns that have bought iPads for their students. They find that Lexington High is performing better than the towns with iPads on these tests.

Does this mean that LHS students are better off on these tests without the iPads? Explain.

7. In medical testing, a placebo is an inactive substance given to subjects in the control group. Here's an example: A medical team is testing whether a new drug helps cancer patients to recover more quickly. They randomly divide their patients into two groups. The treatment group is given the drug in a pill form, whereas the control group is given a sugar pill. (The sugar pill is the placebo). After three months, the medical team records how many patients from each group have recovered.

Explain why the placebo is necessary. (Why do the doctors need to give the sugar pill to the patients in the control group?)

More Questions! The following questions are adapted from the book, "Stats: Modeling the World," by Bock, Vellman, and De Veaux.

8. A local TV station conducted a poll about an upcoming mayoral election. Evening news viewers were invited to phone in their votes (either for the current mayor or for her challenger). Based on the phone calls, the TV station predicted that the current mayor would win by 52%, but instead she lost, getting only 46% of the vote.

Explain the problem(s) with the approach used by the TV station.

9. Some schools teach reading using phonics (the sounds made by letters) and others using while language (word recognition). Suppose a school district wants to know which method works better. Design an experiment the school could do to answer this question.

10. Researchers who examined health records of thousands of males found that men who died of heart attacks tended to be shorter than men who did not.

a. Is this an experiment? Explain.

b. Would it be accurate to say that being short causes heart attacks? Explain.