1. Suppose that the observational units in a study are the 23 campuses in the California State University system (e.g., Cal Poly, Long Beach State, Fresno State, Cal State Northridge, . . .).
   a. State a quantitative variable that you could record on these observational units.
   b. State a categorical variable that you could record on these observational units.

2. In the August 12, 2007, issue of Parade magazine (which comes with the Sunday newspaper for millions of Americans), readers were asked to go online and vote on the question: Should the drinking age be lowered? The results were published in the October 7 issue: More than 14,000 readers voted, and 48% said “yes.”
   a. Is this number (48%) a parameter or a statistic? Explain (in one sentence or less) how you know.
   b. Do you trust this sample to be representative of the population of all American adults? Explain.
   c. How would you respond to someone who says, “Even if this had been a random sample, there’s no way that a sample of 14,000 people could be representative of an entire country of 300 million people.”

3. Another article in the October 7, 2007, issue of Parade magazine claimed that one-third of all homicides in the United States remain unsolved.
   a. Is this number (one-third) a parameter or a statistic? (No explanation is needed.)
   b. What are the observational units?
   c. If a researcher studies a random sample of 150 homicides from around the United States, will he/she necessarily find that one-third of them remain unsolved? Explain briefly.

4. In a recent study, researchers followed 104,000 U.S. veterans who had served in the armed forces and a comparison group of 216,000 nonveterans. Over a period of 12 years, they found that 197 veterans and 311 nonveterans committed suicide.
   a. Identify the explanatory and response variables in this study.
      Explanatory: 
      Response: 
   b. Is this an observational study or an experiment? Explain briefly.
   c. Calculate the proportion who committed suicide in the veterans group. Then do the same for the nonveterans group.
      Veterans group: 
      Nonveterans group: 
   d. The study also found that overweight people were much less likely to commit suicide than underweight people. Would you conclude that weight gain causes a lower risk of suicide? Explain briefly.
   e. Following the point about overweight people being less likely to commit suicide, the researchers said that smoking may be a confounding variable, however. Explain what this statement means in the context of this issue.

5. Consider the following dotplots of (hypothetical) ages for three groups of people:
a. Which group tends to have the oldest ages? (No explanation or calculation is needed.)
b. Which group tends to have the youngest ages? (No explanation or calculation is needed.)
c. Which group has the most consistency in ages? (No explanation or calculation is needed.)
d. Which group has the least consistency in ages? (No explanation or calculation is needed.)

6. Suppose an instructor wants to investigate whether statistics students who are taught using an online format learn just as much as students taught using a face-to-face format.
a. Identify the explanatory variable in this study.
b. Suggest a reasonable response variable for this study.
c. Suppose students are given the option of signing up for their choice of the online or face-to-face format class. Then, if the online students perform significantly better than the face-to-face students, could the instructor reasonably conclude that the online format has beneficial effects? Explain the reasoning behind your answer.

7. An April 9, 2002, news release from the National Institutes of Health describes a study that investigated whether the herb St. John’s wort is effective for treating depression. An excerpt from this press release follows:

An extract of the herb St. John’s wort was no more effective for treating major depression of moderate severity than placebo, according to research published in the April 10 issue of the Journal of the American Medical Association. The randomized, double-blind trial compared the use of a standardized extract of St. John’s wort (Hypericum perforatum) to a placebo for treating major depression of moderate severity. The multi-site trial, involving 340 participants, also compared the FDA-approved antidepressant drug sertraline to placebo as a way to measure how sensitive the trial was to detecting antidepressant effects.

a. Is this an experiment or an observational study? (Do not bother to explain.)
b. Explain what it means for this study to be “double-blind” and also why this is an important component of the study design.

8. In a study reported in the September 24, 2007, issue of the Archives of Internal Medicine, German researchers described a study conducted on 1162 German adults suffering from chronic low-back pain. These subjects were randomly assigned to one of three groups: real acupuncture, sham acupuncture, and conventional therapy. Researchers found that 47% of subjects in the real acupuncture group improved, compared to 44% in the sham acupuncture group and 27% in the conventional therapy group.

a. Identify the observational units in this study.
b. Identify the explanatory variable. Also classify it as categorical or quantitative.
   If it is categorical, indicate whether it is binary.
c. Identify the response variable.
d. Is this an observational study or an experiment? Explain briefly.
e. Did this study make use of random assignment or random sampling, or both, or neither? Explain briefly.
f. Construct an appropriate graph to display the results.
g. Comment on what the graph reveals.
h. If the researchers find that the difference in improvement percentages between the real acupuncture group and the conventional therapy group is significant, would it be appropriate to conclude that real acupuncture causes a higher improvement rate than conventional therapy? Explain.

9. Suppose the observational units in a study are customers arriving at a post office.
For each of the following, identify whether it is a variable that can be recorded on these observational units. (No explanations are required; simply answer “yes” or “no.”)
a. Gender
b. Total time spent waiting in line and being served
c. Number of customers who arrive before noon

d. Total amount of money spent

e. Whether men or women spend more money on average

10. On June 4–24, 2007, the Gallup Poll asked a nationwide sample of adult Americans about their attitude toward interracial marriage. Of the 2388 adults interviewed, 77% said that they approve of marriage between whites and blacks.

a. Is this number (77%) a parameter or a statistic? Explain briefly.

b. What kind of graph would be appropriate for displaying the results of this survey—a dotplot or a bar graph? Explain briefly. (Do not create the graph.)

c. Identify the sample size in this survey.

d. How would you respond to a person who argued that this sample cannot possibly be representative of the population of all American adults, because there are more than 200 million American adults but fewer than 3000 in this sample?

11. Consider the following dotplots of bowling scores for 15 games by three different bowlers:

![Bowling Scores Dotplots]

- Ahmed
- Brianna
- Charlie

b. Which bowler tends to have the lowest scores? (Do not provide explanations or calculations.)

c. Which bowler has the most consistency in his or her scores? (Do not provide explanations or calculations.)

d. Which bowler has the least consistency in his or her scores? (Do not provide explanations or calculations.)

12. Studies conducted at elementary schools have shown that children with longer feet tend to score higher on reading tests than children with shorter feet.

a. Are these studies observational or experimental? Explain briefly.

b. Suggest a potential confounding variable that could explain the observed phenomenon that children with longer feet tend to score higher on reading tests than children with shorter feet. Describe what makes this a confounding variable.

13. a. Does taking a larger sample help to reduce the bias of a sampling method?

Explain.

b. Does taking a larger sample help to reduce the sampling variability of a sampling method? Explain.