Question 1.27

a. **[1 pt]** An individual is a lake in northern Wisconsin (north of Highway 8) in 2010.
b. **[1 pt]** The number of frogs on a lake is a discrete quantitative variable.
c. **[1 pt]** No, it is not reasonable to count frogs on every lake in northern Wisconsin because there is no reasonable way to get to every lake in the state at roughly the same time.
d. **[1 pt]** You should have a list of results from 10 lakes here.
e. **[1 pt]** The number of frogs differs between the first two lakes. This is an example of natural variability.
f. **[1 pt]** You should have the average of your 10 lakes here. The exact average depends on the sample.
g. **[1 pt]** You should have a list of results from 10 lakes here.
h. **[1 pt]** The average number of frogs per lake differs between the two samples. This is an example of sampling variability.
i. **[1 pt]** You average likely does not equal the population average. You should not be surprised because a sample is representative but not perfectly representative of the population.

Question 1.28

[4 pts] Natural variability is the differences among individuals. Sampling variability is the differences among summaries of samples. Narrative examples will vary among students.

Question 1.29

[2 pts] The two realities that make the field of statistics a necessity are the facts that we generally can not "see" the entire population and that variability is everywhere (beginning with natural variability and extending to sampling variability).

Notes from the Professor

- Make sure you follow the directions for formatting your homework found in Section 1.4 of the book – including (1) making sure to include and sign the "Honor Statement" from the syllabus, using complete sentences, not double-spacing results in tables, making sure that tables and figures are labeled and referred to as described in Section 1.4 of the book, and putting an appendix of R code (your script) at the end.
- Many of you got the variable in question 1.27 correct (i.e., number of frogs) but not the individual (mistakingly saying that an individual was a frog). An individual cannot be a frog if the variable is the number of frogs. Always ask yourself if it makes sense to record your variable about your individual – does it make sense to record the number of frogs on a single frog.
- Note that question 1.27E and H ask for type of VARIABILITY (natural or sampling), whereas 1.27B asks for type of VARIABLE (continuous, discrete, nominal, ordinal).
- Note that "quantitative" or "categorical" are not sufficient for answering a type of variable questions (e.g., 1.27B)
- Question 1.27I is trying to get you to realize that samples are generally not perfect representations of populations.
- In 1.28, make sure when describing sampling variability that you note that the statistics were from two samples from the same population. Some of you had a scenario like "sampling variability occurs when the mean wing length of Monarch butterflies in Minnesota is different than the mean wing length of Monarch butterflies in Pennsylvania." This is not sampling variability because Monarch butterflies in Minnesota and Pennsylvania are two different populations. A more correct scenario is "sampling variability occurs when the mean wing length of Monarch butterflies in one sample from Minnesota differs from that found in a secod sample of Monarch butterflies from Minnesota."

- Make sure to fully explain yourself. It is not good enough to say "That is not reasonable because it would take a lot of work." Rather you want to say "That is not reasonable because it would be physically impossible for a researcher to see every lake in northern Wisconsin in a week."