# Professor Notes about "Why Stats is Important" Homework

- Make sure you follow the directions for formatting your homework found here – including (1) making sure to include and sign the "Honor Statement," using complete sentences, not double-spacing results in tables, making sure that tables and figures are labeled and referred to as described here, and putting an appendix of R code (your script) at the end.

- Note that you do not need to make your tables "fancy" (similar to mine or otherwise). You can simply copy the results right out of RStudio and paste them into Word without adding any horizontal or (definitely not) vertical lines.

- Make note of what an individual is in the Frogs question. An individual cannot be a frog because the number of frogs is what was recorded (i.e., the variables). Always ask yourself if it makes sense to record your variable about your individual – i.e., does it make sense to record the number of frogs on a single frog? Also note that an individual is one of what was sampled. In this question it was stated "... on each of several randomly selected lakes in northern Wisconsin" which makes a lake in northern Wisconsin the individual.

- Note that questions 4 and 8 in the Frogs question ask for a type of VARIABILITY (natural or sampling), not a type of VARIABLE (continuous, discrete, nominal, ordinal).

- Question 9 in the Frogs question is trying to get you to realize that samples are generally not perfect representations of populations.

- In the "Variability" section, 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."

# Frog Survey

1. An individual is a lake in northern Wisconsin (north of Highway 8) in 2010.
2. 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 northern Wisconsin in a week.
3. My first sample of ten lakes is in Table 1.

Table 1. Visual and call counts of frogs on the first sample of 10 lakes from northern Wisconsin.

| call | visual |
| --- | --- |
| 125 | 231 |
| 113 | 228 |
| 110 | 220 |
| 120 | 221 |
| 115 | 221 |
| 126 | 231 |
| 114 | 226 |
| 109 | 214 |
| 124 | 220 |
| 118 | 229 |

4. The number of frogs differs between the first three lakes (Table 1). This is an example of natural variability.
5. The average number of frogs in my first sample is 224.1.
6. My second sample of ten lakes is in Table 2.

Table 2. Visual and call counts of frogs on the second sample of 10 lakes from northern Wisconsin.

| call | visual |
|------|--------|
| 116 | 225 |
| 130 | 232 |
| 119 | 214 |
| 122 | 225 |
| 118 | 225 |
| 120 | 225 |
| 120 | 229 |
| 119 | 233 |
| 124 | 235 |
| 122 | 234 |

7. The average number of frogs in my first sample is 227.7.
8. The average number of frogs per lake differed between the two samples. This is an example of sampling variability.
9. Neither average number of frogs per lake equalled the known population average number of frogs per lake. I was not surprised by this result because a sample is representative but not perfectly representative of the entire population.

# Variability

1. Natural variability is the differences among individuals. Sampling variability is the differences among summaries of samples (i.e., among statistics).

2. Narrative examples will vary among students.

# Realities

1. 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).

# R Appendix

```
library(NCStats)
( sampA <- srsdf(Frogs,n=10) )
Summarize(~visual,data=sampA,digits=1)
( sampB <- srsdf(Frogs,n=10) )
Summarize(~visual,data=sampB,digits=1)
```