## 2 Lab Portion

Disclaimer: This exam is not intended to be a *comprehensive* guide to everything I could possibly ask about on the midterm. However, if you understand how to perform and interpret results of each procedure below, you are probably in good shape for the exam.

### 2.1 General Lab Hints

Save all of your scripts/dialogs and give them informative names! This means you will just have to open up the right script/dialog and follow its example. Look in the example problems and Sapling/lab assignments for tell-tale signs that a question will involve power analysis or a specific type of hypothesis test/confidence interval. Often, deciding the type of hypothesis test/confidence interval can be solved by answering four simple questions:

1. What is a case/unit/subject in this study?
2. What categorical variable(s) am I recording for each case, and how many possible values does each variable have?
3. What numerical variables am I recording for each case?
4. How many samples do I have, and are all the cases in my sample(s) independent?

### 2.2 Lab 14

- Create a histogram to graphically display a numerical variable
- Create a boxplot to graphically display a numerical variable
- Linearly transform a numerical variable (using *Transform* function in Rguroo or *mutate* command in R)

### 2.3 Labs 13, 15, and 17

- For a normal random variable/normal population distribution, find the probability of obtaining an *individual value* below a given value/above a given value/between two given values
- For a sampling distribution of sample mean, find the probability of obtaining a *sample mean value* below a given value/above a given value/between two given values
- For a t-distributed random variable, find the probability of obtaining a *t-statistic* below a given value/above a given value/between two given values
- Perform those procedures "in reverse" to find cumulative proportions/upper tail probabilities (i.e., using qnorm/qt or Probability → Values)

### 2.4 Labs 18-20

- Perform a one-sample t hypothesis test in the Neyman-Pearson framework and make an appropriate conclusion
- Compute the power and $\beta$ for a one-sample t hypothesis test in the Neyman-Pearson framework (using Rguroo's Mean Inference → Details → Power Analysis or R's power.t.test function)
- Perform a one-sample t hypothesis test in the NHST framework and make an appropriate conclusion

- Add a variable to the dataset containing paired differences (using *Transform* function in Rguroo or *mutate* command in R)
- Perform a matched pairs t hypothesis test in the NHST framework and make an appropriate conclusion
- Create a set of histograms showing the distribution of a numerical variable in two or more groups
- Perform a two-sample t hypothesis test in the NHST framework and make an appopriate conclusion
- Create a set of boxplots showing the distribution of a numerical variable in two or more groups
- Perform a One-Way ANOVA hypothesis test (Fisher framework) and make an appropriate conclusion
- If the null hypothesis for a One-Way ANOVA hypothesis test is rejected, perform *post hoc* procedures and make an appropriate conclusion

### 2.5 Labs 21-22

- Construct a t confidence interval for population mean and interpret it
- Construct a t confidence interval for population mean of paired differences and interpret it
- Construct a t confidence interval for difference of population means and interpret it (in particular, which population mean is bigger and by how much)
- Determine whether a specific null hypothesis can be accepted (N-P framework) or rejected (NHST framework) based on the confidence interval