**Math 326 Exam #1 Review**

Intro to Experimental Design

* The contents of an Experiment: The Three Decisions
* The Three Sources of Variability
* The Three Kinds of Variability
* Difference between chance error and bias
* Responses
  1. Four Different Types of Responses
  2. Reliability and Validity
* Conditions
  1. Experiments vs. Observational Studies
* Material
  1. Units
  2. Representative and Uniform
* Three (or Four) Basic Principles of Experimental Design
* Four Experimental Designs Covered in Class
* Factor Structures of Four Experimental Designs Covered in Class

Chapter 5

* Roles of randomization – why randomize?
* What does it mean to have a balanced design?
* BF designs – when is it a CRD?
* Definition of a SRS of size n
* BF[1] design and model
* Structural factors vs. universal factors
* Effect size for a level of a factor
* General decomposition rules (for estimated effects and df)
* Inside / outside factors
* df for a factor
* Factor diagram and decomposition tables
* Boxplots, means plots, QQ plots, histograms – how do you calculate in R and SPSS?
* Checking the assumptions for a one-way ANOVA
* Doing a hypothesis test with hypotheses, F-tests, degrees of freedom, p-value, conclusions
* Doing a possible transformation
* “ANOVA-doku” (filling in blanks in the tables)
* Notation for the Factor Structure

Chapter 6

* “I by J factorial design”
* Crossed factors
* Definition of interaction
* BF[2] design and model
* Three hypotheses for a BF[2]
* Decomposition / factor diagram of BF[2]
* Main effects
* Cell means and interaction effects
* Df
* SS
* “ANOVA-doku” (filling in blanks in the tables)
* Notation for the Factor Structure
* Interaction plots, means plots, boxplots
* Checking the assumptions for a two-way ANOVA
* Doing a hypothesis test with hypotheses, F-tests, degrees of freedom, p-value, conclusions
* Doing a possible transformation
* Interpreting an interaction
  + Interpreting main effects when an interaction is significant /nonsignificant
* Why replication is important
  + What to do when there is no replication in a BF[2] design
* Unbalanced data
* Type I SS vs. Type III SS
* When does order matter when including factors in the model?

Section 11

* Why do we use multiple comparison procedures?
* Different types of comparisons and recommended approaches for each type
* Family-wise error rate

Variability?

Effect Sizes?

Transformations and how to do them?

Factor Structure Notation?