For Exam 3 you should be familiar with 3 major topics:

- **Chi-squared tests**
    - Understand the limitations of tests involving a single proportion or difference in proportions and why Chi-squared tests are necessary for questions involving nominal categorical variables.
    - Know the null and alternative hypotheses for Chi-squared goodness of fit tests and Chi-squared tests of association/independence.
        - Be able to identify scenarios where each of these tests should be used
        - Know how to calculate expected counts and the X^2 test statistic when given a table summarizing a sample of observed data
        - Know how to interpret a significant Chi-squared test and use residuals and/or expected counts to identify which groups of data deviate most from what is expected.
    - Know the expected count assumptions of Chi-squared testing and that simulation-based approaches or Fisher's exact test can be used when these assumptions are violated.
- **One-way ANOVA**
    - Be able to identify scenarios where one-way ANOVA should be used.
        - Understand the relationship between what can be observed in side-by-side boxplots and the results of the ANOVA F-test.
    - Know the models and hypotheses involved in one-way ANOVA.
        - Understand the concept of measuring model fit using sums of squares
        - Understand the relationship between randomly assigning group labels to observations and the null hypothesis in ANOVA.
        - Know the assumptions of the models involved in ANOVA and how to check these assumptions.
        - Know how to interpret the results of an F-test and what the test statistic tells you about sums of squares. You do not need to know how to calculate the test statistic yourself.
    - Know when and how to perform post-hoc testing after a significant F-test result.
        - Understand the importance of Type 1 error control in these tests and why R reports adjusted p-values by default.
- **Inference for linear regression models**
    - Know how sums of squares and the F-test apply to scenarios involving regression modeling:
        - Know the null and alternative hypotheses of the F-test.
        - Know how to identify whether two linear regression models are nested, and that the F-test can only be used to compare nested models,
        - Know the assumptions of the F-test and how to evaluate them using plots involving the residuals that are produced by R.
        - Be familiar with strategies for developing models that better fit the assumptions of the F-test, such as log-transforming the outcome variable, including omitted predictors, and transforming predictors so that the model captures quadratic or polynomial relationships.
    - Know how to interpret t-tests involving individual coefficients in a regression model:

- Understand how regression provides conditional effects that are adjusted for other variables.
- Understand the idea of re-coding categorical predictors so that they can be used in a regression model.
- Know that the default null hypothesis for these tests is $H_0: b_j = 0$, and understand what it means to reject this null hypothesis.