All material covered so far has to be included in your review.

Here are some things not to miss to review:

- Descriptive statistics
- Probabilities and distributions
- The binomial distribution
- The normal distribution
- **Power**
    - What is the interpretation of alpha and beta in hypothesis testing?
        - Type I error:
        - Type II error:
        - Power:
        - How are alpha and beta related?
- **Review of statistical tests**
    - What kind of test to use?
        - T test (assumptions: normal distribution, independent observations, variances are equal {there is a special test for unequal variances})
            - Paired
                - Special case where the T distribution is used for the situation that every subject observed in the first group is observed again in the second group
                - Null and Alternative Hypotheses?
            - One sample
                - When we want to compare the mean of a variable to a specific value
            - Two sample
                - When we want to compare means from two different study samples
                - The test determines whether the difference between the observed means is too large to have occurred by chance
                - The null hypothesis is that the means are the same. The alternative hypothesis is that the means are not equal.
        - ANOVA
            - Null: all means are equal
            - Alternative: at least one mean is not equal to the others
            - Assumptions
                - Independent observations
                - Normal distribution of the dependent variable
                - Homogeneity of variances across groups

- Analysis of variance
    - The outcome (dependent) variable must be continuous and the explanatory (independent) variables are categorical variables with two or more categories
    - If there are only two groups, the one-way ANOVA p value is the same as a 2-sample t test p value
- Bonferroni
    - This method to adjust for multiple testing addresses the problem of multiple comparisons among the groups
    - If we want to determine which groups are different from others we may use the Bonferroni method
    - We don't want to inflate the overall alpha level, so we need a way to adjust the pair-wise alphas so that we keep the experiment-wise alpha at 0.05
    - Bonferroni achieves this by dividing the overall alpha by the number of pairs of means that will be compared

▪ Simple Linear Regression
- Assumptions
    - The relationship between the outcome and the predictor can be described by a linear relationship
    - The errors are normally distributed
    - The errors have the same variance
    - All of the data points are independent
- Goal: to find a linear equation relating a dependent variable to the independent variable
- Both variables must be continuous
- Null: rho=0
- Alternative: rho $\neq$ 0 (same as slope=0 and slope$\neq$0)
- Interpretation of estimated slope
- Outliers
- Extrapolating outside the range of the data
- Correlation
    - The degree to which two continuous variables are linearly related to each other
    - Rho: ranges from -1 (perfect negative correlation) to 1 (perfect positive correlation)
    - Rho=0 means that there is no linear relationship between the two variables
    - Perfect correlation means that knowing one variable allows perfect knowledge of the other variable
    - Used with two continuous variables
    - Not necessarily cause and effect relationship
    - When the relationship is known or strongly suspected (and linear), we use regression to predict the value of one variable, given the values of the other

        - Degree of correlation
            - 0 – absence
            - 1 or -1 – perfect correlation
            - 0.75 to 1 or -0.75 to -1 – high degree
            - 0.25 to 0.75 or -0.25 to -0.75 – moderate degree
            - 0 to 0.25 or 0 to -0.25 – low degree
    - R^2
        - Describes how much of the variability in the dependent variable was accounted for by the model
        - The more variables in the model, the larger R^2

- How to evaluate normality?
    - Visually
    - Statistical test
- P-value and test statistic
    - If p<alpha then reject the null and conclude the alternative
    - If p>alpha, then fail to reject the null hypothesis
    - Likewise, if the calculated test statistic is less than the critical value (from F table, or t table…), then you fail to reject the null hypothesis. If the calculated test statistic is greater than the critical value, you reject the null hypothesis and conclude that the alternative hypothesis is true.