Understand that valid statistical conclusions are based on randomly selected, representative samples of the population. That is to say, if the sample is not representative of the population, then all bets are off.

Understand the caveats that statistical conclusions are based on the sample data and the level of significance. That is to say, if we were to use a different sample and/or a difference level of significance, then we might arrive at a different conclusion regarding the hypotheses.

Know the definition and application of \( p \)-values (it will not be necessary to calculate \( p \)-values). Use the definition in Montgomery and Runger, 4ed, Glossary, page 758.

Explain the difference between Statistical Significance and Practical Significance (page 302, Section 9-1.6).

Define Type I Error, Type II Error, Power of the Test.

Describe the effect of changing the Level of Significance has on both the Probability of Type I & Type II Errors.

For any problems dealing with hypothesis testing: you must be able to correctly state both the null hypothesis and the alternate hypothesis;
determine the appropriate critical value(s);
calculate the pertinent test statistic;
decide whether to “Reject the Null” or to “Fail to Reject the Null”;
draw a proper conclusion about the problem specifics based on your decision regarding the null hypothesis. Remember “Reject the Null” is a strong conclusion.
In general, “Fail to Reject the Null” is at its best, a suggestion that there is insufficient evidence to warrant rejecting the \( H_0 \), or equivalently, insufficient evidence to warrant accepting \( H_1 \).

Be familiar with Correlation, Regression, & Prediction and the properties of the correlation coefficient \( r \). Understand that significant correlation is never proof of Cause and Effect. Understand that the regression equation should only be used for prediction when there is significant correlation.
Apply the concepts of correlation, regression, and prediction, including;
calculating the correlation coefficient
hypothesis testing for significant correlation
determining the coefficients of the regression equation as appropriate; and if so using the correlation equation to predict values of the response variable \( Y \), for values of the regressor variable \( X \).

Be able to apply hypothesis testing for both Dependent and Independent Two-Sample Testing.

Dependent
   Paired \( t \)-test (same subjects measured twice {Example: Pre & Post Testing and Different Instruments} ).

Independent
   Population Means \( \mu_i = \mu_j \) for both cases where population variances are known and unknown.

Use a One-Way ANOVA table to determine whether or not there is a statistically significant difference among means for a multi-level single-factor experiment.

Practice Review Problems: (Use \( \alpha = 5\% \) for all problems. It is not necessary to calculate any \( p \)-values.)

Homework #6a All listed problems
Homework #6b All listed problems
Homework #7 Problems 10-13a, 10-19a, 10-33a, 10-35a
Homework #8 Problems 13-3, 13-5, 13-6