Session #1

• What is Statistics?
• Basic Descriptive Statistics
  - Graphs for Quantitative Data
    - Histograms (shape, location, spread)
    - Stem Plots
    - Time Plots (trends)
  - Numerical Measures for Quantitative Data
    - Mean, Median
    - Quartiles, 5-Number Summaries, Boxplots
    - Standard Deviation
• "Normal" Distributions/Models

Session #2

• Producing Data
  - Observational Studies and Experiments
  - "Random Sampling" in Observational Studies
• Modeling Randomness/Chance
  - Rules of Probability
  - Applications to Finite Sample Spaces
• Random Variables (and Their Probability Distributions)
  - Discrete Random Variables
  - Continuous Random Variables (Normal the main example)
• "Sampling Distributions"
  - Simulation
  - Theory for $\bar{x}$
    - Law of Large Numbers
  - Mean and Standard Deviation for $\bar{x}$
  - Central Limit Theorem

Session #3

• (Fake) Confidence Intervals for a Mean from the Sampling Distribution of $\bar{x}$
• (Fake) Prediction Intervals for Another $x$ … Class Notes
• (Fake) Significance Tests for a Mean from the Sampling Distribution of $\bar{x}$
Session #4

- Real Inference for a Mean
- (Real Prediction Intervals for Another $x$ … Class Notes)
- Real Inference for a Difference in Means

Session #5

- Inference for a Standard Deviation
- Business Process Improvement and Statistics
- Shewhart Control Charts

Session #6

- Exam 1
- Descriptive Statistics for $(x,y)$ Data
  - Least Squares Line
  - Sample Correlation, $r$
  - Coefficient of Determination, $R^2$

Session #7

- Cautions/Caveats About Interpretation
- Normal SLR Model
- Estimates in the SLR Model
  - $b_0$, $b_1$ and $s_e$
- Inference in the SLR Model
  - Confidence intervals for $\sigma$
  - Confidence Intervals for $\beta_1$
  - Confidence Intervals for $\mu_{y|x}$
  - Prediction Intervals for $y_{new}$
  - $t$ tests for $\mu_{y|x}$ and $\beta_1$
  - $F$ tests for $\beta_1$ and ANOVA
Session #8

- Finish SLR Inference
  - $F$ tests for $\beta_1$ and ANOVA
- Descriptive Statistics for $(x_1, x_2, \ldots, x_k, y)$ Data
  - Least Squares Coefficients $b_0, b_1, b_2, \ldots, b_k$
  - $R^2$
- Normal MLR Model
- Inference in the MLR Model
  - Confidence Intervals for the $\beta_j$
  - Confidence Intervals for $\mu_{y|x_1,x_2,\ldots,x_k}$
  - Prediction Intervals for $y_{\text{new}}$

Session #9

- More Inference in the MLR Model
  - Confidence Intervals for $\mu_{y|x_1,x_2,\ldots,x_k}$
  - Prediction Intervals for $y_{\text{new}}$
  - $t$ tests for the $\beta_j$
  - $F$ tests for $H_0: \beta_1 = \beta_2 = \cdots = \beta_k = 0$ and ANOVA
  - Partial $F$ tests for $H_0: \beta_{i+1} = \beta_{i+2} = \cdots = \beta_k = 0$ and ANOVA
  - Multicollinearity
- Transforming Old and Building New Predictors

Session #10

- Building Responses and Predictors
  - "Interaction"
  - Dummy Variables
- Model Searching
  - Goals/Model Comparison Criteria
  - "Algorithms"
- Model Checking/Diagnostics
  - Residual Plotting
  - Standardized Residuals
  - Deleted Residuals and PRESS
  - "Leverage Values" $h_{ij}$ (JMP "hats")
  - Cook's D
Session #11

- More Diagnostics?
  - Partial Residuals and JMP "Leverage Plots"
- Time Series Analysis Methods