STA 251 Syllabus

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1 Data Visualization

- Histogram / Stack Graph
- Line Chart (only mentioneded in class)
- Pie Chart (only mentioneded in class)

2 Counting Principles(see notes)

- Product Rule
- Sum Rule
- Division Rule
- *Related Topics:*
  - Vector Space
  - Function Space
  - Balanced Parentheses Problem

3 Set Theory

- Ordered Sets
- Unordered Sets

4 Functions

- One-to-One Functions
- Onto Functions
- Bijection

5 Relations

- Relations (General overview)

6 Descriptive Statistics

- *Measures of Centrality:*
  - Mean / Average
  - Median
  - Distribution
- *Types of Means:*
  - Arithmetic Mean
  - Geometric Mean
- *Variability & Dispersion:*
  - Variance
  - Standard Deviation
- Noisy Data

7 Probability

- Sample Space and Events
- Proves of Probability
- *Probability Axioms:*
  - Non-Negativity
  - Countable Additivity
  - Normalization
- Bayes' Law
- *Independence:*
  - Mutually Independent
  - Pairwise Independent
  - K-way Independent
- *Random Variables:*
  - Binomial Random Variable
  - Geometric Random Variable
  - Probability Mass Function (PMF)
  - Cumulative Distribution Function (CDF)
- Conditional Probability
- Law of total probability
- Expectation
- Conditional Expectation
- Law of Total Probability
- Linearity of Expectation
- Variance and Covariance
- Covariance from Scatter Plot

- *Example Problems:*
  - Monty Hall Problem
  - Birthday Problem Paradox
  - Two-Envelope Problem
  - Light Bulb Problem
  - Prisoner Problem
  - C Program Delay Problem
  - Hat Check Problem
  - Coupon Collector's Problem