Probability Cheat Sheet

- $P(A^c) = 1 - P(A)$
- $P(A \cup B) = P(A) + P(B)$ if A, B do not overlap.
- $P(A \cap B) = P(A)P(B)$ if A, B are independent.
- $\mathbf{E}(aX + bY + c) = a\mathbf{E}X + b\mathbf{E}Y + c$
- $\mathbf{E}g(X) \neq g(\mathbf{E}X)$ unless $g(\cdot)$ is a linear function
- $Var(X) = E(X - EX)^2 = E(X)^2 - (EX)^2$
- $\mathbf{E}(XY) = (\mathbf{E}X)(\mathbf{E}Y)$ if X, Y are independent.
- $Var(X + Y) = Var(X) + Var(Y)$ if X, Y are independent.
- $Var(X + Y) = Var(X) + Var(Y) + 2cov(X, Y)$
- $Var(aX + c) = a^2 Var(X)$
- If X, Y independent $\Longrightarrow g(X), h(Y)$ also independent.
- CDF $P(X \leq t) = F(t) = F_X(t)$
- density $f(t) = \frac{dF(t)}{dt}$
- $\mathbf{E}X = \int x f_X(x) dx = \int x dF(x)$
- $Eg(X) = \int g(x) dF(x)$
- Central Limit Theorem: Suppose $X_1, X_2, \ldots X_n, \ldots$ are independent with a distribution $F(x)$. Let $\mathbf{E}X = \mu$ and $Var(X) = \sigma^2$. If $0 < \sigma^2 < \infty$ then (in terms of distribution) for large n

$$\sqrt{n}(\bar{X} - \mu) = \sqrt{n}[\frac{1}{n}\sum_{i=1}^{n} X_i - \mu] \approx N(0, \sigma^2)$$

Plus the table for "Brand name distrbution/random variables". (include all mean, variance, etc.)

Plus the map of how the different random variables are connected.