Binomial Distribution: Used when finding probability of event that has multiple choices (Ex: Five children chosen out of ten).
$\binom{n}{x}(p)^x(1-p)^{n-x}$
In which p is probability, x is total population, n is the number of items chosen.
Expected Value: np
Variance: $\sigma^2 = np(1-p)$
Hypergeometric Distribution Used when replacement isn't in place (When the probability changes after selecting an option).
$P = \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$ N=population size, K=Successes in population, n=number of draws, k=observed successes
$E(X) = n\frac{M}{N}$
$V(x) = \frac{N-n}{N-1}np(1-p)$
Negative Binomial Distribution Used when determining time or other quantifier before event occurs.
P(X)=$\binom{x+r-1}{r-1}p^r(1-p)^x$
$E(X) = \frac{r(1-p)}{p}$
$V(X) = \frac{r(1-p)}{p^2}$
Poiseon Distribution Use when given the average amount of an event.
$p.m.f. = \frac{e^{-\lambda}\lambda^x}{x!}$
$E(x) = \lambda$
$V(x) = \lambda$
If-then Represented as $P(A|B)$, meaning Probability of A given B. Probability equals $P(A|B) = \frac{P(A\cap B)}{P(B)}$.
If $P(A)P(B) = P(A\cap B)$, then $P(A)$ and $P(B)$ are independent, otherwise they are dependent.
Baye's Theorem:
$P(A_j|B) = \frac{P(A_j\cap B)}{P(B)} = \frac{P(B|A_j)P(A_j)}{\Sigma_{i=1}^{k}P(B|A_i)P(A_i)} i \in \mathbb{N}$