$$f(x) = P(X=x), \quad \sum_x f(x) = 1$$

$$F(x) = P(X \le x)$$

$$\mu = E(x) = \sum_S x f(x)$$

$$Var(x) = \sum_S f(x)(x-\mu)^2$$

varience $s^2 = \frac{\sum_i (x_i - \mu)^2}{n-1}$

$$(a+b)^n = \sum_x^n \binom{n}{x} a^x b^{n-x}$$

Standard dev $s = \sqrt{s^2}$

$$e^x = \lim_{n\to\infty} \left(1 + \frac{x}{n}\right)^n = \sum_{i=0}^{\infty} \frac{x^i}{i!}$$

$$n^{(r)} = \frac{n!}{(n-r)!}$$

$$\binom{n}{r} = \frac{n!}{r!(n-r)!} = \binom{n-1}{r-1} + \binom{n-1}{r}$$

$$P(A|B) = \frac{P(AB)}{P(B)} = \frac{P(B|A)P(A)}{P(B)}$$

A,B indep $\iff P(AB) = P(A)P(B)$

$$P(A \cup B) = P(A) + P(B) - P(AB)$$

Bernoulli: ~~Repeated~~ single trial of experiment

boolean

$$f(x) = \begin{cases} p & x=1 \\ 1-p & x=0 \end{cases}$$

$\mu = E(x) = 1$

$Var(x) = p(1-p)$

Binomial Distribution: repeated Bernoulli (indep) trials

$f(x) = \binom{n}{x} p^x (1-p)^{n-x}$, $E(x) = np$ $\quad Var(x) = np(1-p)$

Poisson Distribution:

$f(x) = \frac{e^{-\lambda t}(\lambda t)^x}{x!}$, $E(x) = \lambda t$ $\quad Var(x) = \lambda t$