discrete dist.

① Bernoulli dist.

②. Binomial dist

n sequential Bernoulli dist

prob (K success) is.

① $\binom{n}{k}$.

② $p^k \cdot (1-p)^{n-k}$.

$\rightarrow$. $\binom{n}{k} \cdot p^k (1-p)^{n-k}$

③. Geometric distribution

k trials. in total. < k-1 trials 1-P / k^{th} success

k-1 trials failure.

k^{th} trial success.

$(1-p)^{k-1} \cdot p$ *.

Q. E(x)?, Var(x).

Def. $E(X) = \sum x \cdot P_X$

$Var(X) = E(X - E(X))^2$

$= \sum_i (x_i - E(X))^2 \cdot P_X(x_i)$

$\underbrace{P_X}_{(X=k)} = (1-p)^{k-1} \cdot p$

$E(X) = \frac{1}{p}$

$Var(X) = \frac{1-p}{p^2}$ $\boxed{Q}$

Q: What is the prob of ..... based on distribution

Note X

$P(X \leq 3) = P(X=0) + P(X=1) + P(X=2)$
$+ P(X=3)$.

$P(X \leq 3) = 1 - \underline{P(X>3)}$

$\underline{P(X>3)} = \overline{P(X=4) + P(X=5) + \cdots}$

the prob of number of trials needed

for the first time success is greater than 3.

~~Prob~~

that is, the first 3 trials are all failures.

$$\text{prob} = (1-p)^3$$
$$= P(X>3)$$

△ Pois dist

Def. # of events occurred in a certain time period or space.

0, 1, 2, ...

pmf. $p(x) = \dfrac{e^{-\lambda} \cdot \lambda^x}{x!}$, $x = 0, 1, 2, \ldots$

λ : the rate parameter.

Notes ① the count data.

② each occurrence is independent.

③ the rate of occurence in a time period / space.

④ it's counting how many events have occurred, not the events that have not occurred.

⑤

Q $E(x)$? $Var(x)$

$E(x) = \lambda$.

$Var(x) = \lambda$.

Q: this prob. $p(x) = \frac{e^{-\lambda} \cdot \lambda^{x}}{x!}$ the pmf?

① $[0, 1]$

② $\sum_{k=0}^{\infty} p(x) = 1$.

$(X=k)$

$$\sum_{k=0}^{\infty} P(X) = \sum_{k=0}^{\infty} \frac{e^{-\lambda} \cdot \lambda^{k}}{k!}$$

$$= e^{-\lambda} \cdot \sum_{k=0}^{\infty} \frac{\lambda^{k}}{k!}$$

Fact: $e^{x} = \sum_{k=0}^{\infty} \frac{x^{k}}{k!}$ trick.

$$= e^{-\lambda} \cdot e^{\lambda}$$

$$= e^{0}$$

$$= 1 \quad \boxed{}$$