(Uniform Distribution)

→ in uniform distribution, it can take any value with equal probability.

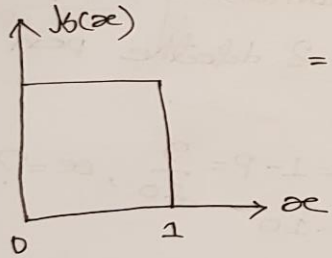
It has 2 types.

→ continuous → discrete.

Continuous :

$X \sim U[0,1]$ → means x is uniformly distributed between 0 and 1

$$f(x) = PDF = \begin{cases} 1 & \text{if } x \in [0,1] \\ 0 & \text{otherwise} \end{cases}$$ → 1 if btn 0 to 1 → 0 otherwise

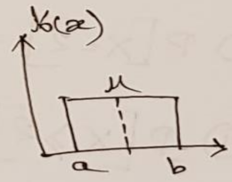


$$= I_{\{0 \leq x \leq 1\}}^{x}$$ → I is indicator func.

$$P\left(0 < x < \tfrac{1}{2}\right) = \int_{0}^{1/2} \frac{f(x)}{1} \cdot dx = \int_{0}^{1/2} dx = \frac{1}{2}$$

In uniform distribution,

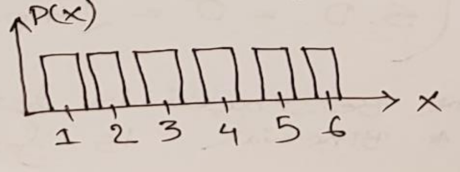
$$\text{median} = \text{mean}(\mu) = \frac{a+b}{2}$$



$$\text{variance} = \sigma^2 = \frac{1}{12}(b-a)^2$$

Discreate :

rolling a dice has equal discreate p.



(Binomial Distribution) (july 23)

Formula:

$$P[X=x] = {}^{n}C_{x}\, p^{x} q^{n-x}$$

Here, n = total (eg. 10 egg, 100 books)

p = success
q = failure
} $p+q=1$

x = get x from ques.

QUES: If 10% pen made by company are defective, find the probability that a box containing 12 pens have: (i) exactly 2 (ii) at least 2 defective pen

p

$n=12$

x

$x \geqslant 2$

Solution:

(i) $n=12,\ p=10\% = \frac{1}{10},\ q=1-p=\frac{9}{10},\ x=?$

(i) $P[X=2] = {}^{12}C_{2} \cdot \left(\frac{1}{10}\right)^{2} \cdot \left(\frac{9}{10}\right)^{12-10}$

(ii) $P[X \geqslant 2] = 1 - P[x<2] = 1 - [P(x=0)+P(x=1)]$

Expected value = mean = np

variance = σ^2 = npq

S.D. = σ = $\sqrt{npq}$

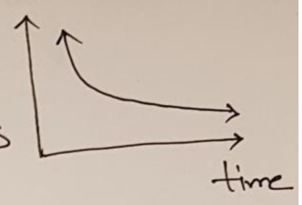
*** Bernoulli is for 1 (1 coin, 1 dice)

*** Binomial is for n (10 pen, 1000 coins)

Exponential Distribution:

Time taken to occur 2 events. It's continuous.

$$A \xleftrightarrow{\text{time}} B$$



λ = rate / avg. no. of events in a time unit.

The probability of X, X = time betn two events

x = particular time / number of

$$P(X > x) = e^{-\lambda x}$$

$$P(X < x) = 1 - e^{-\lambda x}$$

Poisson Distribution:

Number of events in a time interval. It's discrete.

λ = waiting time between events which is exponentially distributed.

$$P(X = x) = \frac{e^{-\lambda} \lambda^{x}}{x!}$$