combination

eg:- we have 6 chocolates want to pick up 2 pair of it.

A B C D E F

AB	BC	CD	DE	EF
AC	BD	CE	DF	
AD	BE	CF		
AE	BF			
AF				

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

$n = 6$

$r = 2$

$$ = \frac{6!}{2!(6-2)!} $$

$$= \frac{6!}{2! \times 4!}$$

$$= \frac{6 \times 5 \times \cancel{4!}}{2! \times \cancel{4!}}$$

$$\Rightarrow \frac{30}{2} \Rightarrow \underline{15}$$

✱ Permutation

eg:- $n = 6$

$r = 3$

A B C D E F

A B

B A

A C

C A

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

$$= \frac{6!}{(6-3)!} \Rightarrow \frac{6 \times 5 \times 4}{}$$

$= \underline{120}$ Permutations.

✱ Probability Distribution.

① Descrite Prob. Dist.

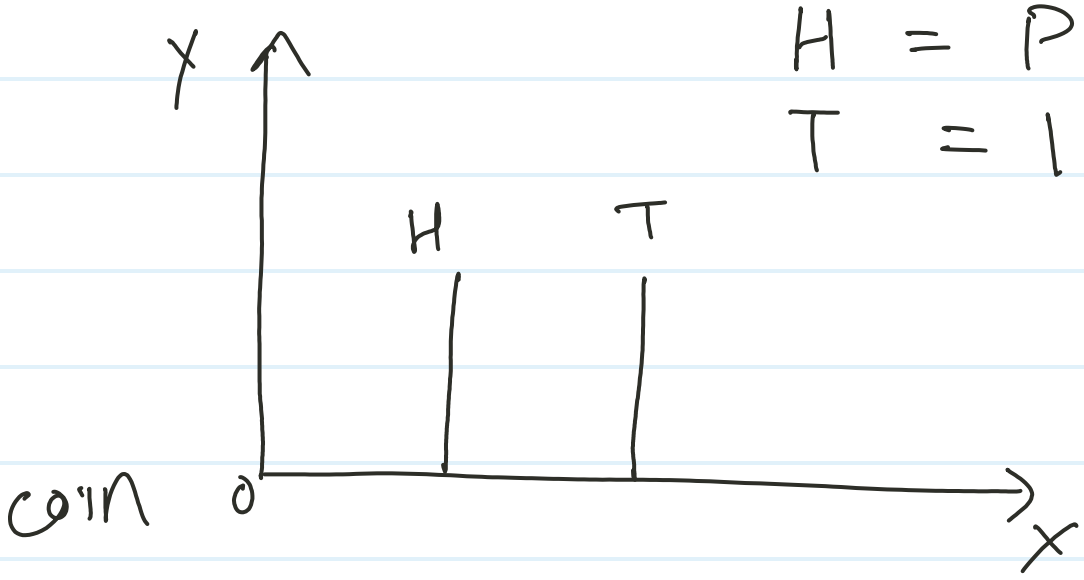
② Continous Prob. Dist.

① Descrete prob. Dist. –

Ⅰ Bernaulli's Dist.

experiment = single

No. of output = fix



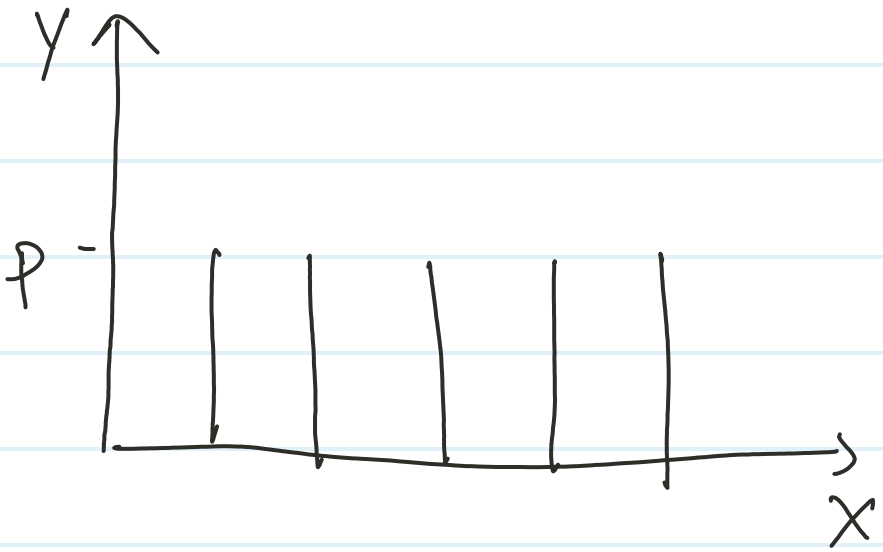
H = P

T = 1 – P

(II) Binomial Dist. -

experiment = more than one

no of outcome = fix



H = P

T = 1-P

$$P(X=r) = {}^{n}C_{r}\, P^{r}(1-P)^{n-r}$$

(III) poisson Distribution –

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

λ = Avg. no of time the event has occured in a certain period.

X = no. of events in that time interval.

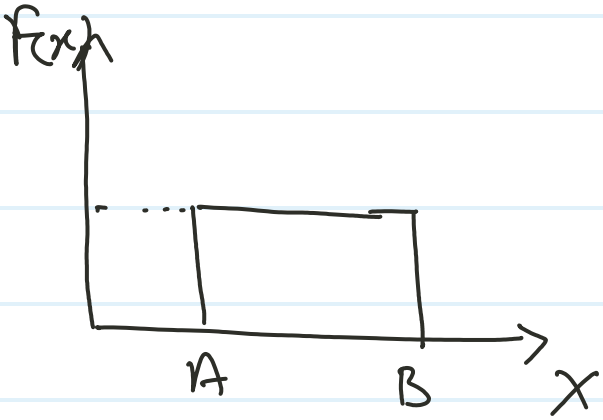
e = Euler's num.
($e = 2.71818$)

(II) Continous Probability Dist.

(I) uniform Distribution –

Eg:- Dice = $\frac{1}{6}$

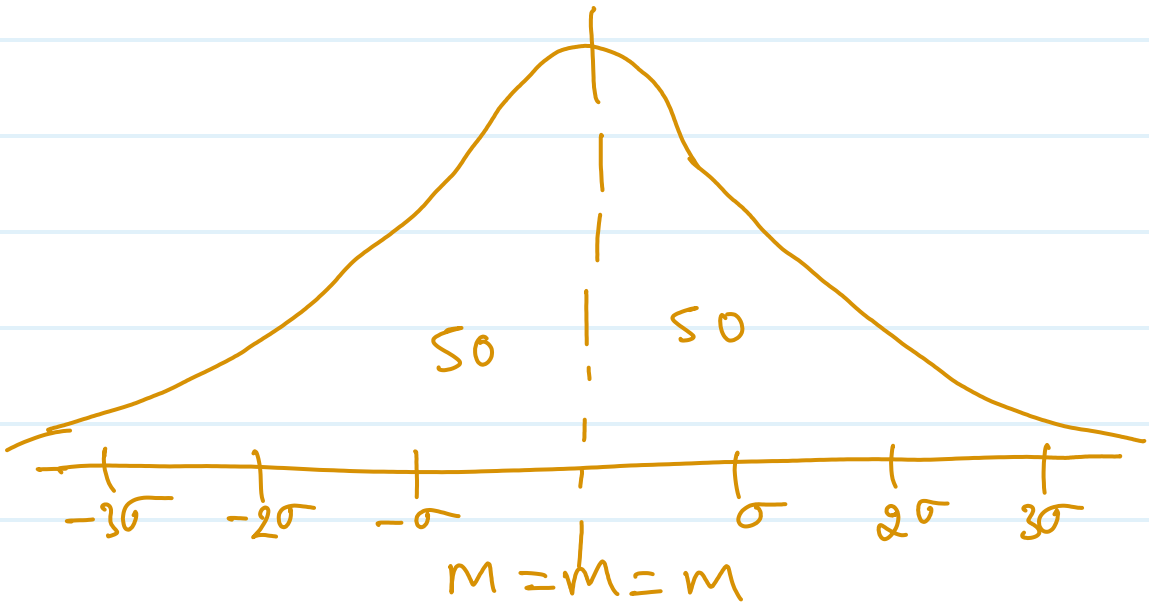
Card = $\frac{1}{52}$, $\frac{13}{52}$, $\frac{4}{52}$



mean $E(x) = \frac{a+b}{2}$

variance $V(x) = \frac{(b-a)^2}{2}$

(II) Normal Dist. / Gaussian Dist. / Bell curv.



(III) standard normal Dist.

SD = 1 mean = 0

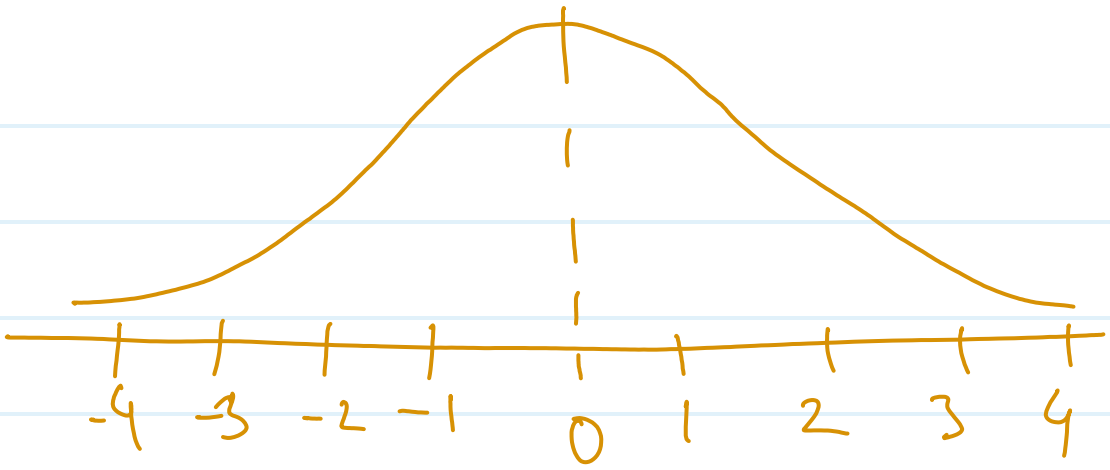
$$Z\text{score} = \frac{x_i - \mu}{\sigma}$$

[1, 2, 3, 4, 5, 6, 7, 8, 9]

$\mu = \frac{45}{9} = 5$, $\sigma = 1$ (Assumed)

$x_i - \mu$

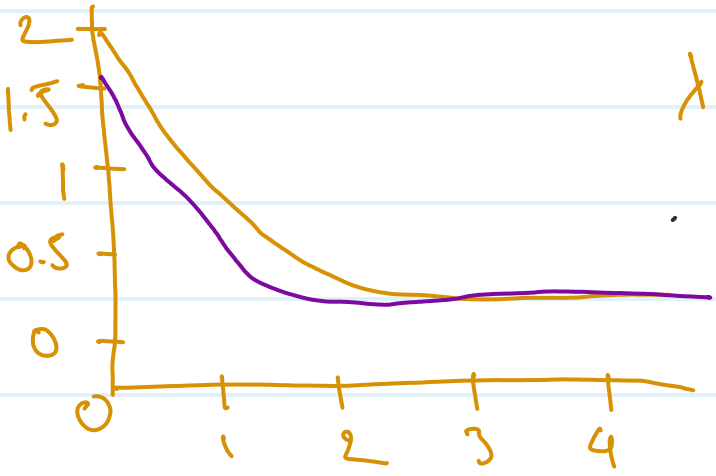
$1 - 5 = -4$
$2 - 5 = -3$
$3 - 5 = -2$
$4 - 5 = -1$
$5 - 5 = 0$
$6 - 5 = 1$
$7 - 5 = 2$
$8 - 5 = 3$
$9 - 5 = 4$



(IV) Log normal Dist. / Right skewed / Positive Dist

mean > median > mode

(V) Exponential Dist. –



$\lambda = 1$

2 calls per hour.

1 calls 30 minute / ½ hour.

$\lambda = 0.5$

$f(x) = \lambda e^{-\lambda x}$

mean $E(x) = \frac{1}{\lambda}$

variance $V(x) = \left(\frac{1}{\lambda}\right)^2$

Power law Dist. / Pareto dist.

20 – 80 rule.

Cricket

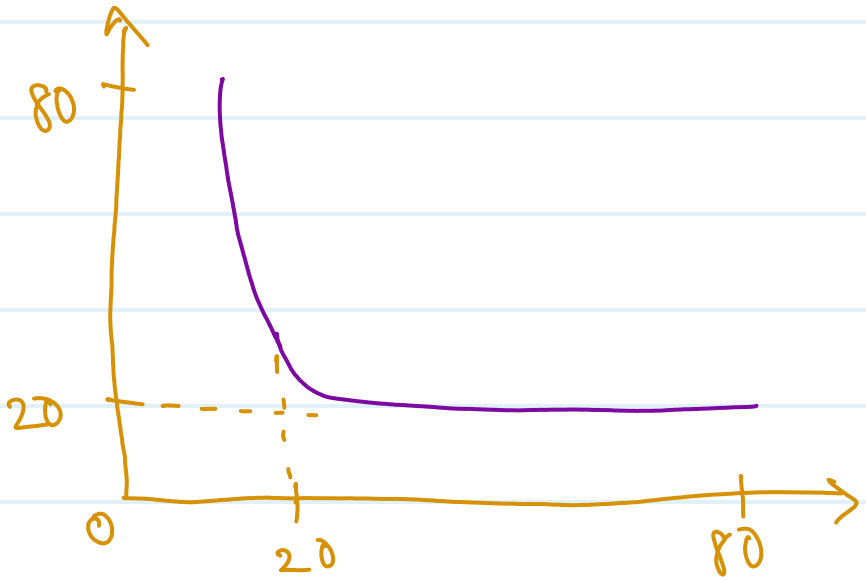
80% run – 20% batsman

20% run – 80% batsman

Family income

80% – 20%

20% – 80%

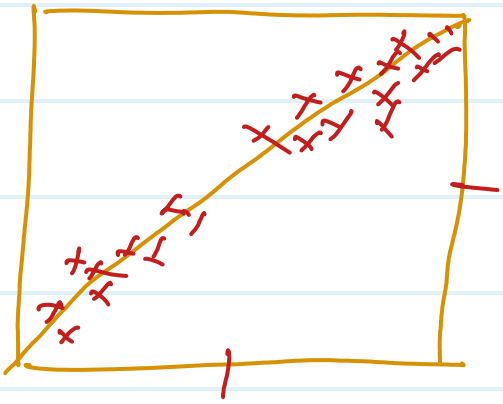


To transform in normal dist. we use two method

① Box-cox transformation
② Log normal transformation.

Quartile-Quartile plot (Q-Q plot)

This is non-Gaussian Distribution.



It is normal / Gaussian Distribution.