Probability

It is the likelihood of the event.

$$P_b = \frac{\text{number of ways it can happen}}{\text{Total no. of outcome}}$$

Eg. = $P_r \text{ coin} = \frac{1}{2}$

$P(H/T) = 0.5 = 50\%$

Type of probability

1. mutually exclusive
2. Non mutually exclusive

(1) Mutually Exclusive :-
The event where the probability of outcome is one.

eg :- coin = H / T

Dice = 1 / 2 / 3 / 4 / 5 / 6

(2) Non mutually exclusive -
The event where probability of outcome is more than one.

eg :- Deck of Card

Pr King = ♠ ♥ ♣ ♦

Rules of Probability

(1) Additive rule of probability.

$$P(A \text{ or } B) = P(A) + P(B)$$

For (i) mutually exclusive

Dice 2 or 5

$$P(2 \text{ or } 5) = P(2) + P(5)$$

$$= \frac{1}{6} + \frac{1}{6}$$

$$= \frac{2}{6}$$

$$P(2 \text{ or } 5) = \frac{1}{3}$$

(2) Non-mutually probability -

Eg:- Deck of card King or club?

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(K \text{ or club}) = P(K) + P(\text{club}) - P(K \text{ and } C)$$

$$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$$

$$\Rightarrow \frac{16}{52}$$

$$P(K \text{ or club}) = \frac{4}{13} =$$

2. multiplicative rule of prob. -

① Independent event -

Number of outcome will no be reduce

Case-I $P(A)$ or $P(B) = P(A) \times P(B)$

Eg:- $Pr(\text{coin})$ and $Pr(\text{Dice})$

$Pr(H)$ or $Pr(2)$

$$P(4) \text{ or } P(2) = \frac{1}{2} \times \frac{1}{6}$$

$$= \frac{1}{12}$$

② Dependent event –

When number of outcome will be reduce one by one.

$$P(A) \text{ or } P(B) = P(A) \times P(B/A)$$

$$P(J) \text{ and } P(K)$$

$$P(J) \text{ or } P(K) = P(J) \times P(K/J)$$

$$= \frac{4}{52} \times \frac{4}{51}$$

$$= \frac{16}{2652} = \frac{4}{663}$$

* Dependent event is condition probability.

Permutation

Eg:- In a school trip 30 student are there. They have to pick-up 2 chocolate:

DM, KK, Munch, Perk, Star, Amul.

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

$$n = 6$$

$$r = 2$$

$$^6P_2 = \frac{6!}{(6-2)!}$$

$$= \frac{6 \times 5 \times \cancel{4 \times 3 \times 2 \times 1}}{\cancel{4 \times 3 \times 2 \times 1}}$$

$$= 30$$

Eg:- 2 $n = 6$

$r = 3$

$${}^{6}P_{3} = \frac{6!}{3!}$$

$$= 6 \times 5 \times 4$$

$$\Rightarrow 120$$

Combination

$n = 6$ chocolate

$r = 3$

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

$${}^{6}C_{3} = \frac{6!}{3!\,(6-3)!}$$

$$= \frac{\cancel{6}^{2} \times 5 \times \cancel{4}^{2} \times \cancel{3 \times 2 \times 1}}{\cancel{3} \times \cancel{2} \times 1 \times \cancel{3 \times 2 \times 1}}$$

$$\boxed{{}^{6}C_{3} \Rightarrow 20}$$

Probability Distribution

① Descret pro. Dist.

② continous pro. Dist.

① Descret pro. Dist.

Ⅰ Bernoulli Dist.

Ⅱ Binomial Dist.

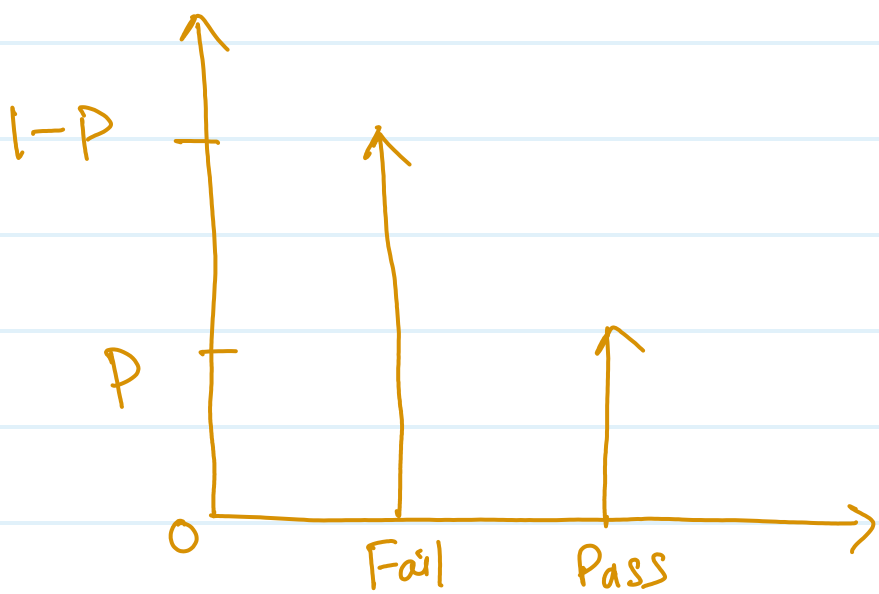
✡ Bernaulli Dist. :-

experiment = Single

fixed no. of outcome = 1

Pass = p

fail = 1 − p



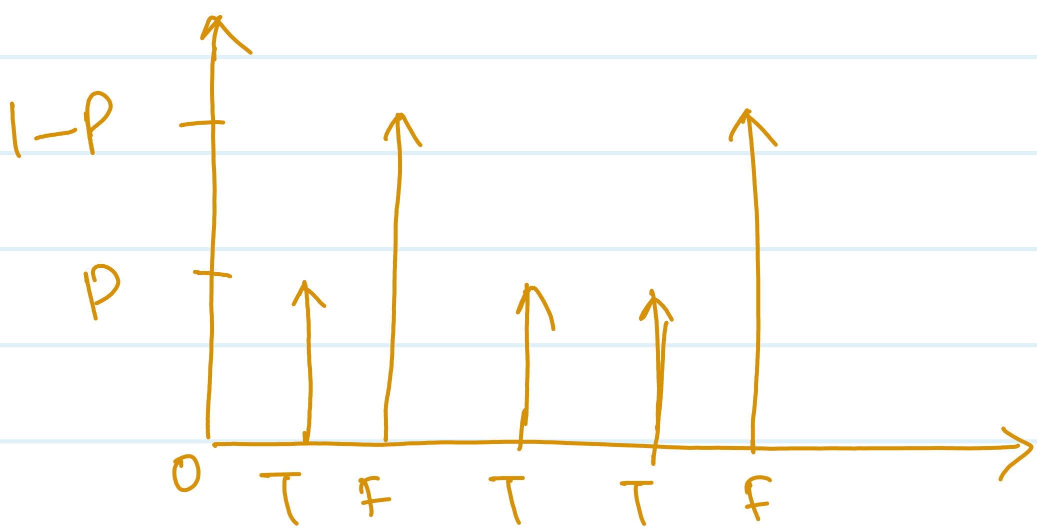
① Binomial Dist.

experiment = fix. no. of time

fixed outcome = P/F

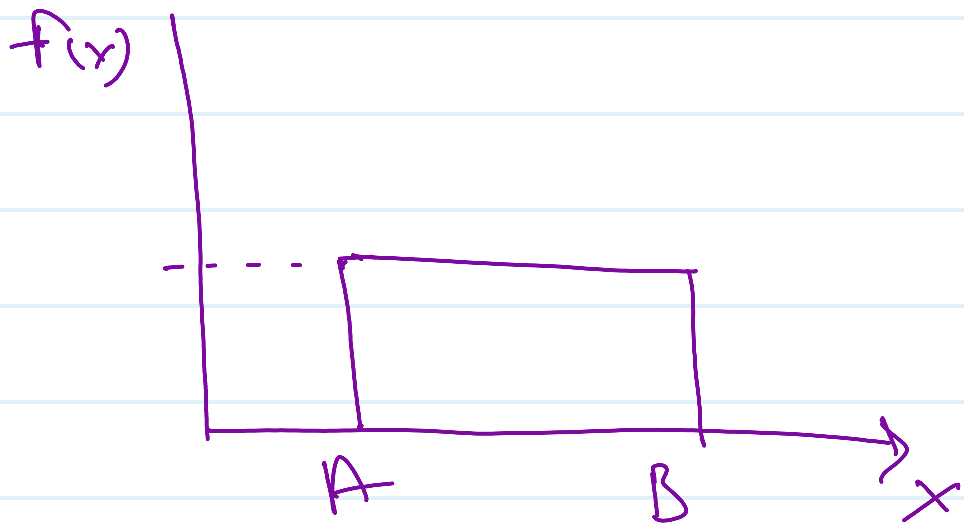
True = p

False = $1-p$



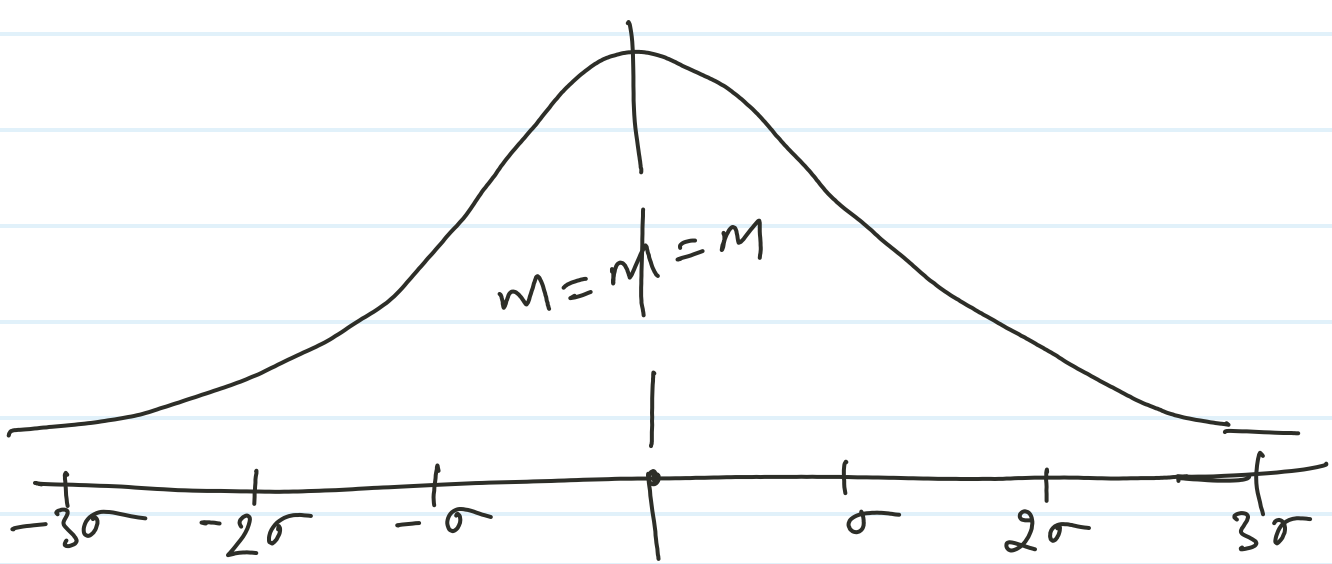
② Continous Pro. Dist.

(I) Uniform Dist.

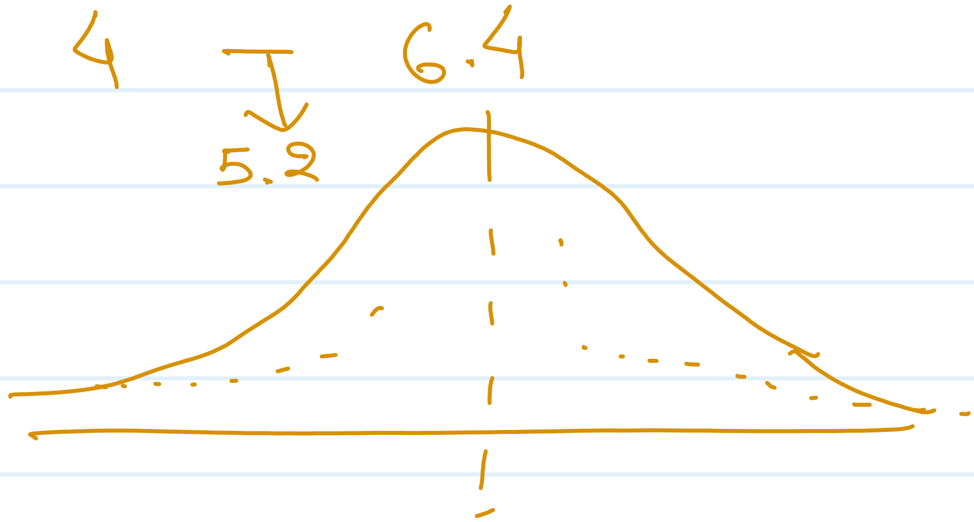


Dice = $\frac{1}{6}$

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



Eg:- Height of population in india.

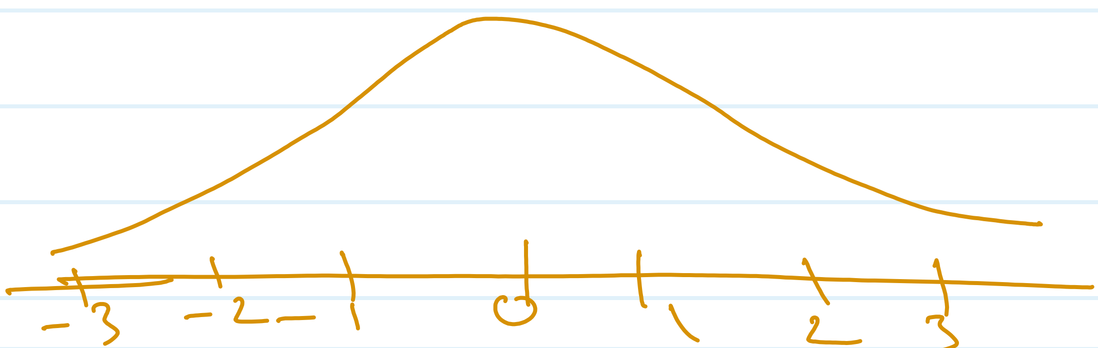


(III) standard normal Dist.

$\mu = 0$ $\sigma = 1$

To convert normal Dist. into SND. we use z-score formula

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



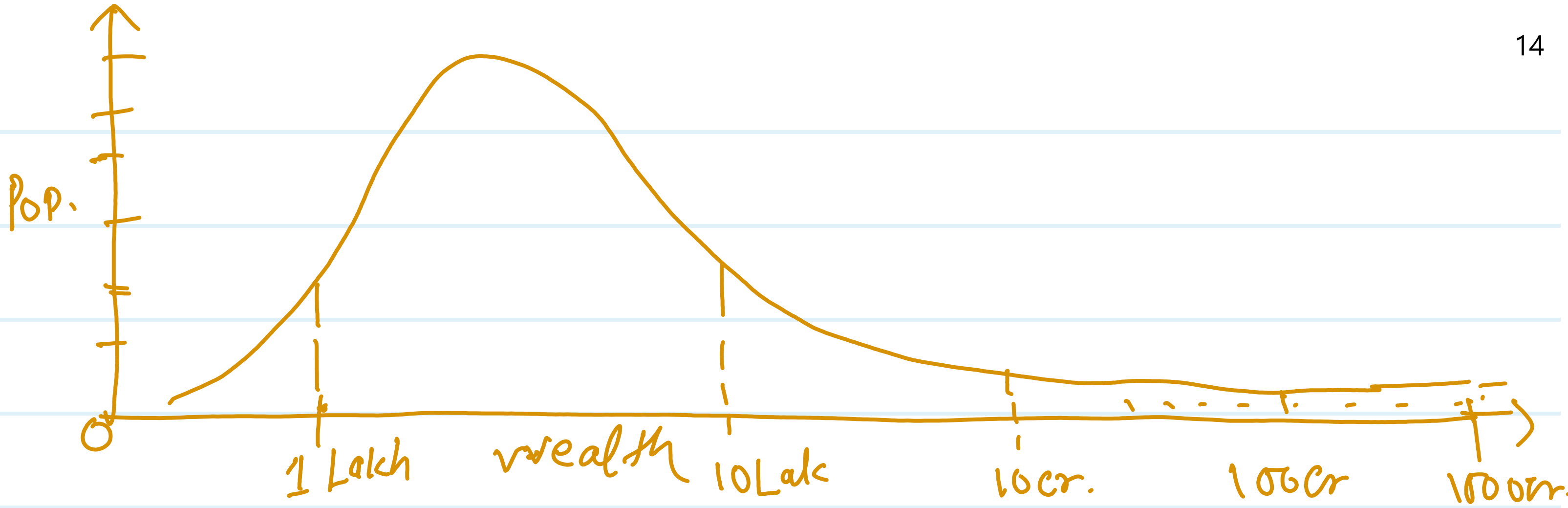
Data [1, 2, 3, 4, 5, 6, 7]

Suppose $\sigma = 1$

x	μ	$x_i - \mu$
1		-3
2		-2
3		-1
4	4	0
5		1
6		2
7		3

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

mean > median > mode



wealth

(V) Left skewed | Negative Dist. –

lifespan