Probability :

$$P(\text{event}) = \frac{\#\text{Favourable Event}}{\#\text{ Total Event}}$$

① Coin

Total Event = {Head, Tail}

↓

Sample Space

② Dice

SS = {1, 2, 3, 4, 5, 6}

③ Deck

SS = {1, 2, ---52}

ⓐ club – 13

ⓑ spade - 13

ⓒ Diamond - 13

ⓓ Heart - 13

Q: Coin

$P(H)$?

$$P(H) = \frac{1}{2}$$

Q: dice

$$P(1) = \frac{1}{6}$$

$$P(2) = \frac{1}{6}$$

Q: Deck

$$P(\heartsuit) = \frac{13}{52}$$

Probability = [0, 1]

① Mutually Exclusive Event (Additive Rule)

$$P(H \text{ or } T) = P(H) + P(T)$$

$$= \frac{1}{2} + \frac{1}{2} \Rightarrow 1$$

Q: P(H) or P(T) when tossing a coin.

⇒ Both event can't occur together.

$$P(2 \text{ or } 4) = P(2) + P(4) \Rightarrow \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

② Non Mutually Exclusive Event (Additive Rule)

⇒ Both event can occur together

$P(\heartsuit)$ or $P(K)$?

$$P(\heartsuit \text{ or } K) = P(\heartsuit) + P(K) - P(\heartsuit \cap K)$$

→ Both can occur together

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

$$= \frac{16}{52}$$

Additive Rule

ME :

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

NME :

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

Independent Event (Multiplicative Rule)

Q: Tossing a coin twice, P(H) and P(T)

-> one event can't affect other event

$$P(H \text{ and } T) = P(H) * P(T)$$

$$= \frac{1}{2} * \frac{1}{2} \Rightarrow \frac{1}{4}$$

Q: Rolling a dice twice

$$P(6 \text{ and } 1) = \frac{1}{6} * \frac{1}{6} \Rightarrow \frac{1}{36}$$

(+) Probability of second event is going to be same.

Dependent Event (Multiplicative Rule)

⇒ One event can affect other event.

⇒ Probability of next event gets reduced.

Q: Drawing a card twice without replacement?

P(♡) and P(K)

$P(♡ \text{ and } K) = P(♡) * P(K/♡)$ → Conditional Probability

$= \frac{13}{52} * \frac{4}{51}$ ⇒ ✓

(#) Probability of K when P(♡) has already occured.

② Multiplicative Rule

(a) Independent Event

$$P(A \text{ and } B) = P(A) * P(B)$$

(b) Dependent Event

$$P(A \text{ and } B) = P(A) * P(B/A)$$

PA = ?

SS = 2

FE = 1

PA = FE/SS

= 0.5

5G, 5R, 4W

GGWG

P(G and G) when you draw twice w/o replacement ?

$\frac{5}{14} * \frac{4}{13}$

Permutation & Combination

↓ repetation (Groups)

↓ Unique (Groups)

Blue, Green, Red, Pink

BG
GB
RG
GR

BG
RG

(permutation)

(Combination)

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

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

Data

① Discrete
- Categorical
  - Text
    - Ordinal : Low, Medium, High
    - Nominal : Red, Green, Blue
  - Date
- Discrete Number : 1, 2, 3 (or) 2, 4, 6 : (Fixed Numbers)

② Continuous → Continuous Numbers :

(Every Number is valid)