

Probability

① Introduction ✓

② Addition Rule (For mutually exclusive event)

③ Addition Rule (For non mutually exclusive event)

④ Multiplication Rule (Independent & Dependent Events)

① Probability : It is about determining the likelihood of an event

Eg: Toss a coin $\{H, T\}$

$$Pr(H) = \frac{1}{2} = 50\%$$

$$Pr(T) = \frac{1}{2} = 50\%$$

Rolling a dice $\{1, 2, 3, 4, 5, 6\}$

$$Pr(x=1) = \frac{1}{6}$$

Mutual Exclusive Event

Two events are Mutual exclusive if they cannot occur at the same time

Eg: Tossing a coin



$$Pr(H) = \frac{1}{2} \quad Pr(T) = \frac{1}{2}$$

$$\begin{aligned} Pr(H \text{ or } T) &= Pr(H) + Pr(T) \quad \{ \text{Addition Rule for mutual Exclusive Event} \} \\ &= \frac{1}{2} + \frac{1}{2} = 1 \end{aligned}$$

Eg: Rolling a dice $\{1, 2, 3, 4, 5, 6\}$

$$\begin{aligned} \Pr(1 \text{ or } 5) &= \Pr(1) + \Pr(5) \\ &= \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3} // \end{aligned}$$

* Non Mutual Exclusive Events

Eg: Taking a card from the deck

\boxed{K}

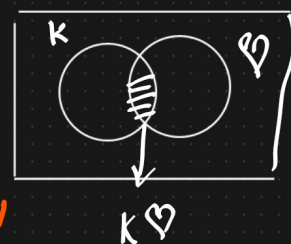
$\boxed{K \heartsuit}$

$\boxed{52} \longrightarrow \boxed{K} \text{ or } \boxed{K \heartsuit}$

$$\Pr(K \text{ or } \heartsuit) = \Pr(K) + \Pr(\heartsuit) - \Pr(K \text{ and } \heartsuit)$$

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

Non Mutual
Exclusive Event



$$= \frac{17}{52} - \frac{1}{52}$$

$$\Pr(K \text{ or } \heartsuit) = \frac{16}{52} //$$

Multiplication Rule {Independent And Dependent Events}

2 events are Independent if they do not affect one another

Eg: Tossing a coin $\{H \text{ and then Tails}\}$

$$\Pr(H) = \frac{1}{2} \quad \Pr(T) = \frac{1}{2}$$

Eg: Rolling a dice

$$\Pr(1) = \frac{1}{6} \quad \Pr(2) = \frac{1}{6}$$

Dependent Events

2 Events are Dependent if they effect each other

Eg: Take a King from the deck and then the Queen Card from the deck

52 \rightarrow K

$$Pr(K) = \frac{4}{52} \quad Pr(Q) = \frac{4}{51}$$

Multiplication Rule

① Independent Event {Tossing a Coin}

$$Pr(H \text{ and } T) = Pr(H) * Pr(T)$$
$$= \frac{1}{2} * \frac{1}{2}$$

$$\boxed{\frac{1}{4}} = \frac{1}{4}$$

② Dependent Event

Conditional Probability
 $\uparrow \uparrow$

$$Pr(K \text{ and } Q) = Pr(K) * Pr(Q/K) \rightarrow \text{Bayes Theorem}$$

$$= \frac{4}{52} * \frac{4}{51}$$
$$= \underline{\underline{\frac{16}{2652}}}$$