

Probability

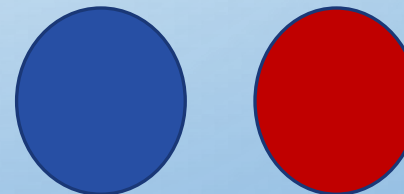
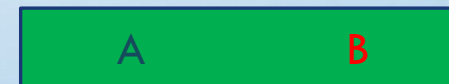
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Probability

- The likelihood of occurrence of any event is called as probability.
- Range : (0-1)
- Eg: In tossing a coin :
 - The outcomes are head/ tail
 - As both have equal chances, $p(\text{head})=p(\text{tail}) =0.5$
 - sample set = { H, T }
 - Sum of all elements occurrence =1.
 - Formula is $P=(\text{no. of desired outcomes}/ \text{total no. of outcomes})$

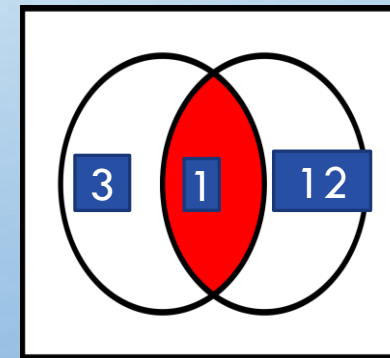
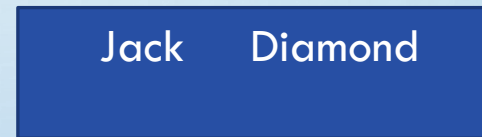
Mutually Exclusive Events

- Any 2 Events that cannot occur at a time.
- Tossing a coin and getting a head & tail can't occur simultaneously.
- $P(A \cup B) = P(A) + P(B)$



Mutually Inclusive Event

- Events which aren't mutually exclusive comes under this.
- Eg: Events of getting a jack and a diamond comes under this.
- $P(A \cup B) = P(A) + P(B) - P(A \text{ AND } B)$



$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Independent Events

- If the outcomes of 1st event doesn't affect on the outcomes of the 2nd event.
- $P(A \text{ AND } B) = P(A).P(B)$
- Eg: While rolling 2 diff. dies, the events of getting odd number on 1st die and even number on 2nd die are independent events.

Dependent Events

- If the outcomes of 1st event shows an affect on the outcomes of 2nd event, is called as dependent events.
- $P(A \text{ AND } B) = P(A).P(B/A)$
- Eg : A jar contains 3 white balls, 2 black balls, 3 blue balls. What is the probability of getting 2 white balls in 2 draws and without replacement.

$$\begin{aligned} P(2 \text{ white balls}) &= [(3/8) * (2/7)] \\ &= (6/56) = 3/28 (0.107) \end{aligned}$$

Conditional Probability

- It is the probability of occurrence of 2 dependent events one after the other.
- For dependent events :
 - $P(A \text{ AND } B) = P(A).P(B/A)$
 - Here $P(B/A)$ is the conditional probability
- From above equation :
 - $P(B/A) = [P(A \text{ AND } B)/P(A)]$

Bayes Theorem

- To calc. Conditional Prob. When the value of $P(A \text{ AND } B)$ is not available.
- $P(A \text{ AND } B) = P(A).P(B/A)$ - (1)
- $P(A \text{ AND } B) = P(B).P(A/B)$ - (2)
- From (1) & (2), by equating them :

$$P(A).P(B/A) = P(B).P(A/B) - (3)$$

- Hence Conditional probability of A, given event B has occurred is $P(A/B)$.

- $$P(A/B) = (P(B/A).P(A)) / P(B)$$

- Similarly $P(B/A) = (P(A/B).P(B)) / P(A)$

ASSIGNMENT -2

- **P(odd OR prime) on a spinner from 1-8 ?**
- Sample space = $\{1,2,3,4,5,6,7,8\}$
- Odd (A) = $\{1,3,5,7\}$, Prime (B) = $\{2,3,5,7\}$
- It is a mutually exclusive event.
- $P(A \cup B) = P(A) + P(B) - P(A \text{ AND } B)$
- $P(\text{ odd OR prime }) = P(\text{odd}) + P(\text{prime}) - P(\text{ odd AND prime})$
- $= (1/2) + (1/2) - (3/8)$
- $= (5/8)$



- For numbers in 1-9 , what is the probability of getting a number less than 4 or 2 ?

- $P(<4 \text{ OR } < 2) = P(<4) + P(<2) - P(<4 \text{ AND } <2)$

- $= (3/9) + (1/9) - (1/9)$

- $= 3/9$



- GIVEN : X , Y ARE 2 INDEPENDENT EVENTS. $P(X) = 0.3$ $P(Y) = 0.7$
- $P(X \text{ AND } Y) = 0.3 * 0.7 = 0.21$
- $P(X \text{ OR } Y) = 0.3 + 0.7 = 1$