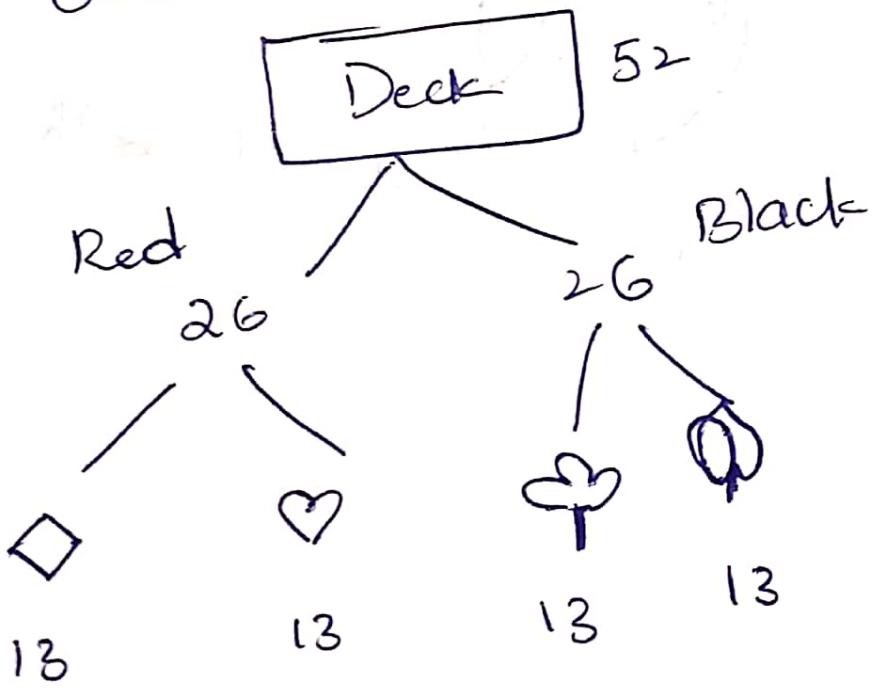
12/12/23

Conditional Probability

Probability with a Condition on basis of another event occuring.



Probabilities

◇ 9 – $\frac{1}{52}$

♡ 9 – $\frac{1}{52}$

Red – $\frac{26}{52} = \frac{1}{2}$

7 - Red – $\frac{2}{52}$

Conditional Probability

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$P(A|B)$ → Should occur → already occured

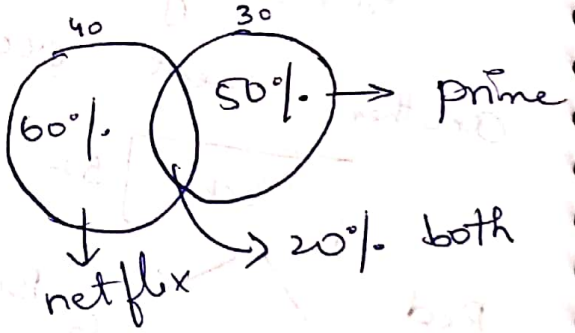
A → Prob 7 $(4/52)$

B → Red Card $(26/52)$

$$P(A \cap B) = \frac{2}{52}$$

$$P(A|B) = \frac{\frac{2}{52}}{\frac{26}{52}} = \frac{1}{13}$$

(9) It is known that 60% people use netflix 50% use amazon prime 20% people use both Among those who use netflix, what fraction also use prime.



$$P(P|n) = \frac{P(P \cap n)}{P(n)}$$

$$= \frac{20}{60}$$

$$=$$

(10) In a City, there are about 60% people have disease out of which 40% test positive and out of 40% who don't have disease have 10% testing positive what is the total positive percentage out of the population.

1000 people

60% disease

600

40% test true

600 × 40%

= 240

40% without disease

400

10% test positive

400 × 10%

= 40

Total population = 240 + 40

= 280 (28%).

(11) In a population 80% of people like pizza, 40% like burgers & 30% people like both. What is the prob of people liking burgers even they like pizza.

$$P(B|P) = \frac{P(B \cap P)}{P(P)} = \frac{30\%}{80\%} = \frac{3}{8}$$

Total Probability Law :-

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$P(A \cap B) = P(A|B) \cdot P(B)$$

$$P(B) = \frac{P(A \cap B)}{P(A|B)}$$

The probability of an event occuring with multiple permutation and combination of its sample set.

- If there are multiple conditions we use total probability Law.

$$P(C) = P(C_1|A) * P(A) + P(C_2|B) * P(B) + P(C_3|D) * P(D) \text{ --- } P(C_n|N)$$

$$\boxed{P(C) = \sum_{i=1}^{n} P(C_i|A_i) * P(A_i)}$$

(12) In a given dataset, 30% of emails are spam, 70% of mails are not spam and purchase keyword occurs in 80% of spam mail, 10% of not spam mails. Overall what is the percentage of email have purchase?

Total 100 mails

Spam - 30% | not Spam - 70%

30 P(S) | 70 P(S')

Purchase - 80% | Purchase - 10%

24 P(K|S) | 7 P(K|S')

Using general thinking - 31% emails.

$$P(K) = P(K|S) * P(S) + P(K|S') P(S')$$

$$= 80\% \times 30\% + 10\% \times 70\%$$

$$\boxed{P(K) = 31\%}$$

(12) 5% of all linkedin users are premium Users. 10% of premium users are actively seeking new jobs opportunities. Only 2% of non-premium users are actively seeking new job opp. What % people are actively seeking new job opp.

$P(P) = 5\%$

$P(N) = 95\%$

$P(P|S) = 10\%$

$P(N|S) = 2\%$

$$P(S) = P(P) * P(P|S) + P(N) * P(N|S)$$

$$= 5\% * 10\% + 95\% * 2\%$$

$$\boxed{P(S) = 2.4\%}$$

(B) An e-Commerce website shows two types of ads A and B - 60% of visitors see Type A ads, and 40% visitors see type B ads. The click through rate for A ads 15%, while the click through rate for B ads is 3%. What is the overall click through rate?

$P(A) = 60\%$

$P(B) = 40\%$

$P(A|C) = 15\%$

$P(B|C) = 3\%$

$P(C) = P(A) * P(A|C) + P(B) * P(B|C)$

$= 60\% * 15\% + 40\% \times 3\%$

$P(C) = 7.2\%$

(M) In a NPS Survey- it is seen that 70% are promoters, 20% are neutral, 10% are detractors. 90% promoters, 40% neutral, 5% of detractors recommend the product to a friend. What is the overall percentage of people who recommend the product.

$P(P) = 70\%$

$P(N) = 20\%$

$P(D) = 10\%$

$P(P|f) = 90\%$

$P(N|f) = 40\%$

$P(D|f) = 5\%$

$P(f) = 70 \times 90\% + 20\% \times 40\% + 10\% \times 5\%$

$P(f) = 71.5\%$