Date..........

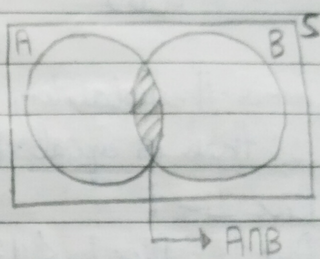
Naive Bayes Algorithm

Conditional Probability

A, B two Events are given.

Q1: $P(A|B) = ?$

Ans $P(A|B) = \frac{P(A \cap B)}{P(B)}$ given $P(B) \neq 0$.



Q2: $P(B|A) = ?$

Ans $P(B|A) = \frac{P(B \cap A)}{P(A)}$ given $(A) \neq 0$.

Q Practise of Conditional Probability...

Dice 1 and Dice 2 are rolled together.

(1) What is the Probability that Dice A should be equal to '5' and the Dice 1 and Dice 2 together should be Less than or equal to '10'.

Ans Dice 1 = 5 and Dice 2 = Dice 1 + Dice 2 ≤ 10

A = Dice 1 = 5

B = Dice 1 + Dice 2 ≤ 10

(i) Without using Formula:-

⇒ Total Cases where the Dice 1 + Dice 2 ≤ 10 = 33

Total Cases where Dice 1 is '5' are ⇒ 5

Dice 1

Dice 2	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Sample Space...

$P(\text{Dice }1=5, \text{Dice }1+\text{Dice }2 \leq 10) = \frac{5}{33}$

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(ii) Using Formula ⇒ $\frac{P(A \cap B)}{P(B)}$ ⇒ $P(A \cap B) = \frac{5}{36}$

and $P(B) = \frac{33}{36}$

So:- $\frac{P(A \cap B)}{P(B)} = \frac{5/\cancel{36}}{33/\cancel{36}} \Rightarrow \boxed{\frac{5}{33}}$

(2) What is the Probability that Dice 1 = '4' and the Dice 1 and Dice 2 together is less than or equal to "11".

sol. Dice 1 = 4

Dice 1 + Dice 2 $\leq$ 11

(i) Without Formula ⇒ P(Dice 1 = 4) ⇒ (and Dice 1 + Dice 2 $\leq$ 11) $\boxed{\frac{6}{35}}$

(ii) With Formula ⇒ $P(\text{Dice } 1 = 4) \Rightarrow \frac{6}{\cancel{36}}$

$P(\text{Dice } 1 + \text{Dice } 2 \leq 11) = \frac{35}{\cancel{36}}$ ⇒ $\boxed{\frac{6}{35}}$

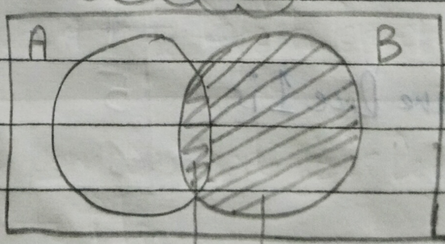
Independent Events

A, B are two events..

$P(A \cap B) = P(A) * P(B)$

It means if P(A) occurs then It should have no effect on P(B) or vica-versa...

$\boxed{P(A|B) = \frac{P(A \cap B)}{P(B)}}$ ⇒ 1



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

'B' is already occured it means ⇒ $\boxed{\frac{P(A \cap B)}{P(B)}}$

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$P(A) = \frac{P(A \cap B)}{P(B)}$. [Because :- $P(A \cap B) = P(A) * P(B)$]

$P(A) = \frac{P(A \cap B)}{P(B)}$ → Values is derived as ⇒ $\frac{n(A \cap B)}{\cancel{n(S)} \times \frac{n(B)}{\cancel{n(S)}}}$

⇒ $\boxed{\frac{P(A \cap B)}{n(B)}}$ (II)

From (I) and (II)

$\boxed{P(A) = P(A|B)}$ → It means that $P(A)$ is also equal to $P(A|B)$ means that $P(A)$ will not be affected even if Event "B" is already occurs. that means they are Independent.

∴ Hence Proved..

Mutually Exclusive Events

"Mutually Exclusive Events are those Events which cannot Survive together."

For example :- (i) A Dice is thrown, what is the Probability that it appears "2" as well as "3", once

Ans "0" Zero because together they cannot appear. As One number is appeared at a time.

A and B are 2 events.

$\boxed{P(A \cap B) = 0}$ → It is termed as Mutually Exclusive Events..

It means :- $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{P(B)} = 0$

So :- $\boxed{P(A|B) = 0}$ If "A" and "B" are Mutually Exclusive...