Applied Statistic

Lec 1

Data

- Qualitive
  1. Not express with price/Number
  2. Data collected by observation
- Quantitive
  1. Express with Number
  2. Data is measurable
     - Discrete: not changable, whole
     - Continuous: Variable, fraction

Applied statistics :- Applying practical data & theoretical statistics to ~~Data~~ is called applied statistics.

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Probability: Degree of uncertainity:

Probability is a concept which numerically measures the degree of uncertainity and therefore, of certainity of the occurance of elements

A → elements

$0 \leq P(A) \leq 1$

$$P(A) = \frac{\text{Number of fabourable outcome}}{\text{Total number of outcomes}}$$

Experiment :- Two fair coins together

1st coin

	H_1	T_1
H_2	$H_1 H_2$	$T_1 H_2$
T_2	$H_1 T_2$	$T_1 T_2$

Exhaustive event | sample

#Possibility of two head

$$= \frac{F.O}{T.O} = \frac{1}{4}$$

one head and one tail

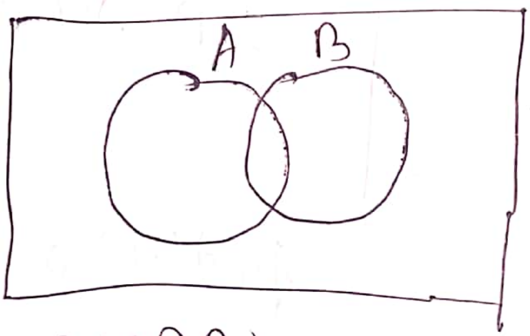
$$= \frac{2}{4} = 1/2$$

Trial & Event :-

Bias হলে fair হবে না

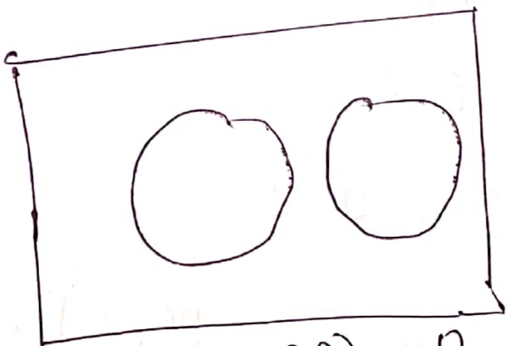
Event :-

① Er Independent event



$P(A \cap B)$ = some value

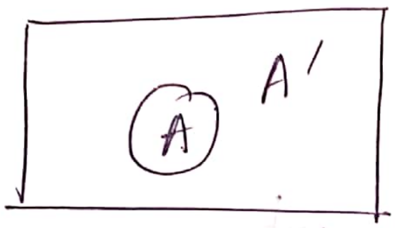
② Mutually exclowsure event

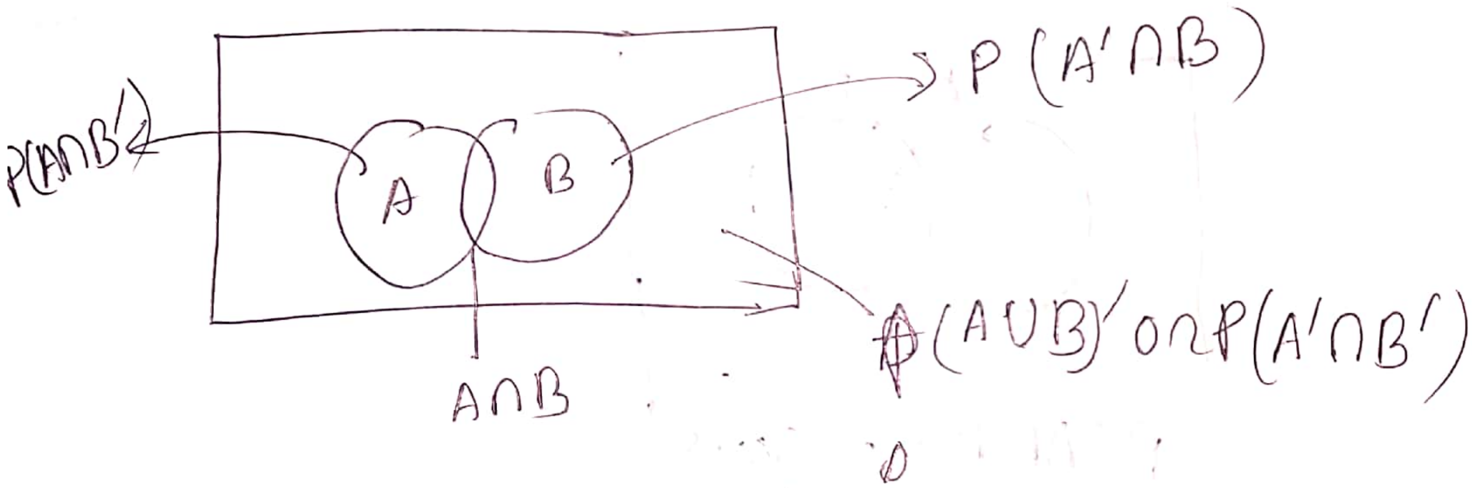


$P(A \cap B) = 0$

seeA 2nd see

$P(A)$





Q: A & B are two elements and

$P(A) = 0.6$

$P(B) = 0.7$

$P(A \cup B) = 0.9$

Find out $P(A \cap B)$, $P(B')$, $P(A')$, $P(A' \cup B)$, $P(A' \cap B)$, $P(A \cap B')$

Solution Here

$P(A') = 1 - 0.6 = 0.4$

$P(B') = 1 - 0.7 = 0.3$

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

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

$= 0.6 + 0.7 - 0.9$

$= 0.4$

$P(A' \cap B) = 0.4 \times 0.7 = 0.28$

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

$= 0.4 + 0.7 - 0.28$

$= 1.1 - 0.28 = 0.73$ Ans

$P(A \cap B') = 0.6 \times 0.3$

$= 0.18$

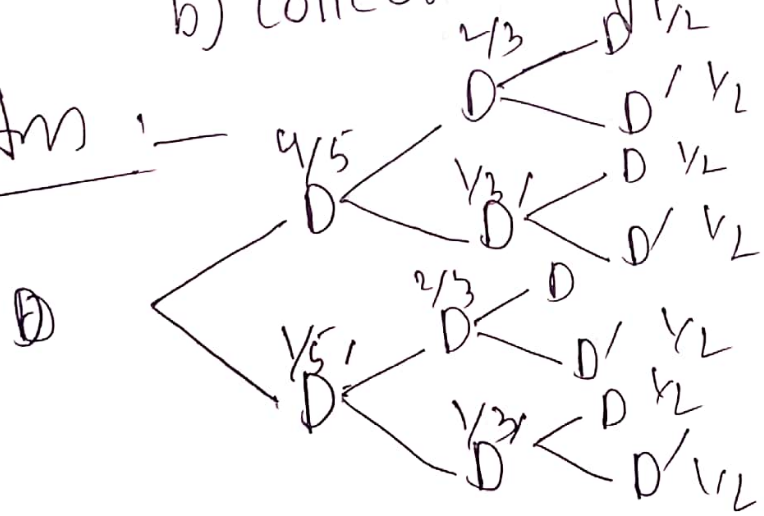
A computer game has 3 levels and one of the objectives of a 3 level is to collect a diamond. The probability of a randomly chosen player collecting the first level is 4/5, second level is 2/3 and the third level is 1/2. The ~~ex~~ events are independent

Find out the probability a randomly chosen player

a) collect all three diamonds.

b) Collect only one diamond

Ans :-



$P(DDD)$

$= \frac{4}{5} \times \frac{2}{3} \times \frac{1}{2}$

$= \frac{4}{15}$

collect all diamonds

∴ collect only one diamond

$= P(DD'D') + P(D'DD') + P(D'D'D)$

$= \frac{\cancel{4}^{2}}{15} \times \frac{1}{3} \times \frac{1}{\cancel{2}} + P\left(\frac{1}{5} \times \frac{\cancel{2}}{3} \times \frac{1}{\cancel{2}}\right) + P\left(\frac{1}{5} \times \frac{1}{3} \times \frac{1}{2}\right)$

$= \frac{2}{15} + \frac{1}{15} + \frac{1}{30}$

$= \frac{4+2+1}{30} = 7/30$ Ans

Q: A pair of dice is tossed. Find the probability of getting

i) a total of 8

ii) at most of 10

1st die \ 2nd die	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

① Probability of $8 = \frac{5}{36}$ Ans

ii) Probability of at most 10.

$$= \frac{\cancel{33}\ 11}{\cancel{36}\ 12} = \frac{11}{12}$$

Show there is an independent relation or, there is a mutually exclusive relation :—

~~Show~~

1. they are mutually exclusive

$\cancel{P(A) =}\ 8 \quad A = 8$
$B = 1$

$P(A \cap B) = 0$

2. Independent :—

$A = 8$
$B = 4$

$P(A \cap B) =$ some value

lec 3 and CT

Conditional probability

Let A and B be two ~~eb~~ events of a sample space S and let $P(B) \neq 0$. Then conditional probability of the event A, given B, denoted by $P(A/B)$ is defined by

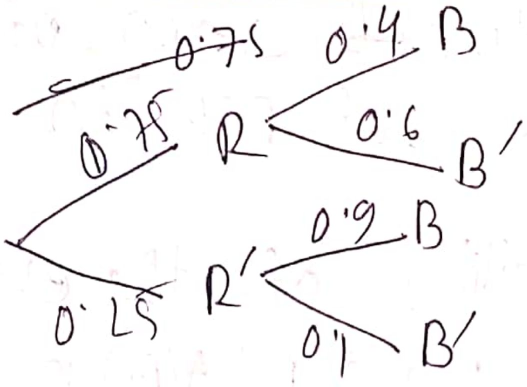
$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

Q: The turnout of spectator at a motor rally is dependent upon the weather. On a rainy day, the probability at a big turnout is 0.4, But If it does not rain the probability increases to 0.9. The weather forecast gives a probability of 0.75 that it will rain on the day of the race.

Find out the probability that

a) There is a big turnout and it rains

b) There is a big turnout



Let, the big turnout in B and rain is R

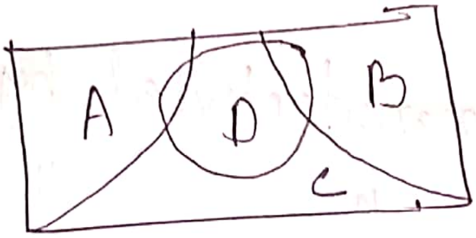
(i) We have, $P(B/R) = 0.4$

$$\Rightarrow \frac{P(B \cap R)}{P(R)} = 0.4$$

$$\Rightarrow P(B \cap R) = 0.4 \times 0.75$$
$$= 0.3$$

(ii) $P(B) = 0.4 \times 0.75 + 0.25 \times 0.9$
$$= 0.525$$

Bias theory :



If B_1, B_2, B_3, B_n are mutually exclusive events with $P(B_i) \neq 0$ $(i = 1, 2, \ldots n)$ of a random experiment then for any arbitary event A of the sample space of the above experiment with $P(A) > 0$, we have

$$P(B_i/A) = \frac{P(B_i)\, P(A/B_i)}{\sum_{i=1}^{n} P(B_i) P(A/B_i)}$$

$$P(B_2/A) = \frac{P(B_2)\,(A/B_2)}{P(B_1) P(A/B_1) + P(B_2)\, P(A/B_2) + P(B_3) P(A/B_3)}$$

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Example C :-

solution :-

~~bo~~ A : bolt is manufactured by machine A

B : " " " " " B

C : " " " " " C

The probability of drawing a defective bolt manufactured by machine A is

$P(D/A) = 0.05$

similarly

$P(D/B) = 0.04$

$P(D/C) = 0.02$

By bays theorem,

$$P(B/D) = \frac{P(B) \; P(D/B)}{P(A)\;P(D/A) + P(B)\;P(D/B) + P(C)\;P(D/C)}$$

$$= \frac{0.35 \times 0.04}{0.25 \times 0.05 + 0.35 \times 0.04 + 0.40 \times 0.02}$$

$= 0.41$ similarly

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