After Mids

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Chapter # 06. Probability

chances of occurrence to something

⇒ **Random experim:** The term experim means a planned activity or process whose result yield a set of data.

• A single performance of an experiment is called a trial.

The result obtained from experi or trial is called outcomes.

Exples: We have toss coins n=5 times.

H T T H H

⇒ **Sample Space** A set consisting of all possible outcomes that can be result from random experi is defined to be sample space. It is denoted by S

Each possible outcomes is member of Sample Space. and is called a sample point in that space.

We have die, die is rolled possible

Perm = As order of selection matters
Combi = As order of selection X matters

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outcomes are S: {1,2,3,4,5,6}, rolled 2 die

$S = \{(1,1)(1,2),(1,3)(1,4),(1,5),(1,6)$
$(2,1)(2,2)(2,3),(2,4),(2,5)(2,6)$
$(3,1)(3,2)(3,3)(3,4)(3,5),(3,6)$
$(4,1)(4,2)(4,3)(4,4),(4,5)(4,6)$
$(5,1),(5,2)(5,3)(5,4)(5,5)(5,6)$
$(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)\}$

$n(S) = 36$

⇒ **Event** An event is an individual or any no. of outcomes of a random experiment or trial.

⇒ **Rule of Permutation** (order matter) ${}^nP_r = \frac{n!}{(n-r)!}$ ${}^nC_r = \frac{n!}{r!(n-r)!}$

① A club consists of 4 members How many sample points r in sample space when 3 officers president, secre treasurie are to be chosen?

${}^4P_3 = 24$ are sample space.

P S T
B A C
A B C order matter

② A 3 person comittee is to be formed by list of 4 person How many S point associated with experiment

order not tell, position not tell rank not matter $\overline{BAC}$ $\overline{ABC}$ ${}^4C_3 = 4$

$S = \{(A,B,C), (A,B,D), (B,C,D), (A,C,D)\}$

Def: let A be an event then probability of an event A, denoted by P(A) is defined as

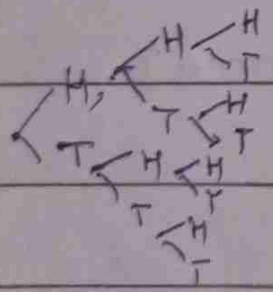
$$P(A) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of possi outcomes}} = \frac{m}{n}$$

Probn of an event is always greater or equal to zero.

A fair coins is toss x3 what is probability that atleast one head appears?

Experi = Tossing a coins

(H,T), (H,H,H), (H,H,T), (T,H,H) —



$n(S) = 8$

Let A denoted the event which has atleast one appear then

$n(A) = 7$

$$P(A) = \frac{n(A)}{n(S)} = 7/8$$

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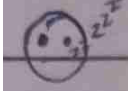
If two fair dyes are thrown, What is personbility,



Note:- We will always assume with replacement until it is not mention.

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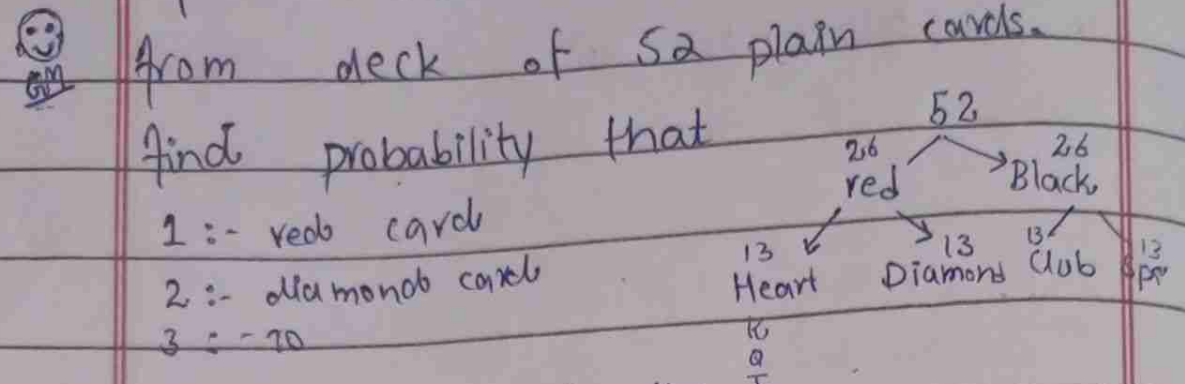
- If a card is drawn ordinary from deck of 52 plain cards. find probability that

1 :- red card
2 :- diamond card
3 :- 10



Let **A** represent the event that card is red coloured.

$n(A) = 26$ $\quad n(P) = \frac{26}{52} = \frac{1}{2} = 50\%$

Hence, probability of red color is 50%

let **B** be event that card is dia

$n(B) = 13$ $\quad n(P) = \frac{13}{52} = \frac{1}{4} = 25\%$

let **C** be event that card is 10.

$n(C) = 4$ $\quad n(P) = 4/52 = 1/13$

- 6 white balls and 4 black balls which are distinguishable apart from color and placed in bags. If 6 balls are taken from bag find probability of their being 3 white, 3 black?

Two cases 1:- With Replacement

2:- Without Replacement

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Law of Probability

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Law of Complement

$A + \bar{A} = S$ where $\bar{A} = S - A$

$P(A) + P(\bar{A}) = P(S)$

$P(A) + P(\bar{A}) = 1$ $\quad P(S) = \frac{n(S)}{n(S)} = 1$

$P(\bar{A}) = 1 - P(A)$

Example:- A coin is tossed 4 times in succession. What is prob that at least one head occurs?

Solution:- $n(S) = 2^4 = 16$

Let A be event at least 1 head occurs

$\bar{A}$ → no head occurs

$\bar{A} = \{TTTT\}$ $\quad P(\bar{A}) = 1/16$

$P(A) = 1 - 1/16 = 15/16$

Example:- A coin is (H ≠ T biased) so that (6.11) prob that is false showing tales (75%) 3/4? • find pro of obtain at least 1 H. when coin is Tossed 5 times • How many times must the coin be tossed so that prob of obtaining at least one head greater than 0.98.

Solution:- P(a head appears) = 1/4

P(no head or tail appears) = 3/4

Atleast → where complemen

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(a) A → at least one head

$\bar{A}$ → no head occurs

$P(\bar{A}) = \frac{3}{4}$

$P(A) = 1 - P(\bar{A})$

$= 1 - (\frac{3}{4})^5$

$= 0.763$

(b) $1 - (\frac{3}{4})^n \geq 0.98$

Addition Law

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

(or) (and)

Example:- If 1 card is selected at random from dec of 52 card. What prob that card is a club or face card or both ∩

Solution:- $n(S) = 52$

A → card is club

B → card is face

Total 12 face card note he

A∩B → card is club and face

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

$= \frac{13}{52} + \frac{12}{52} - \frac{3}{52}$

$= \frac{22}{52}$

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Example:- An integer is chosen at random from 1st 200 +ve integer. What is proba that integer chosen is divisible by 6 or by 8?

Solution:- $n(S) = 200$

$A \rightarrow$ divisible by 6 $\quad B \rightarrow$ divisible by 8

$n(A) = \left[\frac{200}{6}\right] = 33 \quad n(B) = \left[\frac{200}{8}\right] = 25 \quad n(A \cap B) = \left[\frac{200}{24}\right] = 8$

$P(A \cup B) = \frac{33}{200} + \frac{25}{200} - \frac{8}{200}$

Example :- (6.15) 3 horses A, B and C are in race. A is twice lightly to win as B. B is twice as lightly to win as C. What is prob that A or B wins?

Solution:- let prob of C is $P(C) = p$

$P(B) = 2p \quad p(A) = 2(2p) = 4p$

We know that chances are always 1

$p + 2p + 4p = 1$

$\Rightarrow p = 1/7$

if $p = 1/7$ then

$P(C) = \frac{1}{7}$

$P(B) = 2/7$

$P(A) = 4/7$

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

$= \frac{4}{7} + \frac{2}{7} = \frac{6}{7}$

$\therefore P(A \cap B) = 0$

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Addition law for three events:

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

Different

nple :-