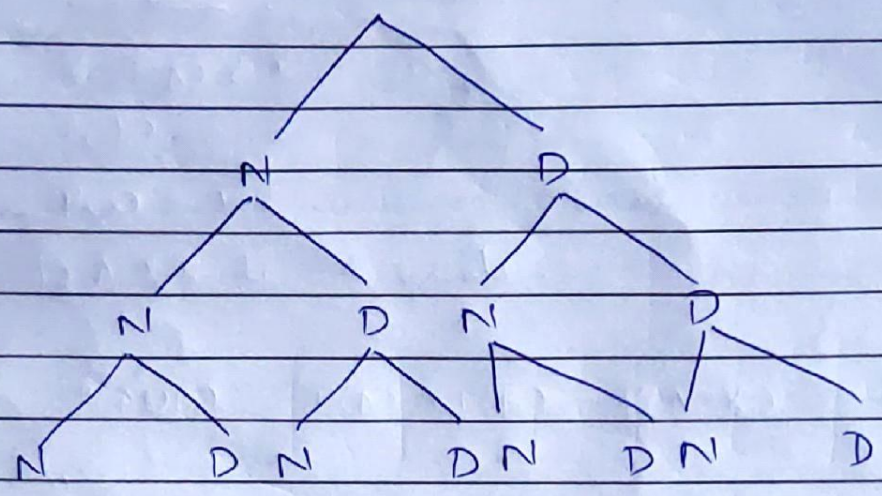
Probability & Statistics



DDD, DDN, DND, DNN, NDD, NDN, NND, NNN

$\rightarrow A'$ or A^c

$= S - \{A\}$

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

$A = \{1, 3, 5\}$

$^nC_r = {^nC_{(n-r)}}$

$\downarrow$ Set $\quad \downarrow$ Complementary Set.

Also, $A \cap A' = \phi$ (disjoint)

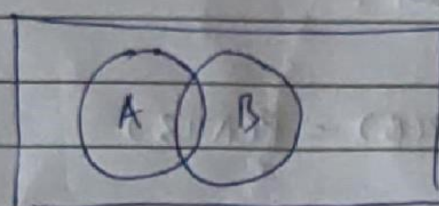
Mutually Exclusive

When two or more events can't happen simultaneously is called mutually exclusive.

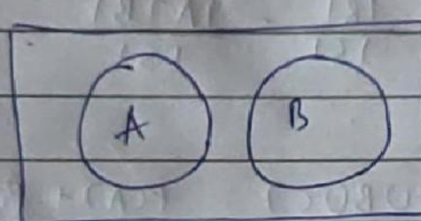
Ex:- A & B are mutually exclusive events.

$A \cup A' = S$

Let A & B be any two events,



$\longrightarrow |A \cup B| = |A| + |B| - |A \cap B|$.



$\longrightarrow |A \cup B| = |A| + |B|$

Only $A \rightarrow A - (A \cap B)$
" $B \rightarrow B - (A \cap B)$.

Demorgan's Laws

$(A \cup B)' = A' \cap B'$
$(A \cap B)' = A' \cup B'$

Probability

$S = \{1, 2\}$ $\quad |P(S)| = 2^n$

↳ Power Set.

$P(S) = \{\phi, \{1\}, \{2\}, \{1, 2\}\}$

Let S : be the sample space & A be an event.

$P(A) = \dfrac{\text{size of } A}{\text{size of } S} = \dfrac{n}{N}$

↓

Probability of A

Probability measure

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

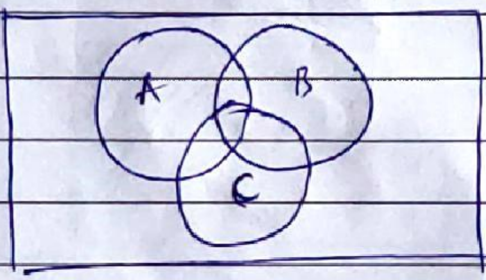
(2) $P(\phi) = 1$

(3) $P(S) = 1$

(4) If A & B be 2 events.

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

$$\frac{|A \cup B|}{|S|} = \frac{|A|}{|S|} + \frac{|B|}{|S|} - \frac{|A \cap B|}{|S|}$$



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

If $A_1, A_2, A_3 \ldots, A_k$ are mutually exclusive events.

$$P(A_1 \cup A_2 \cup A_3 \cup \ldots \cup A_k) = P(A_1) + P(A_2) + \ldots + P(A_k)$$

(Q) A coins is tossed 3 times. what is the probability of getting (i) 2H (ii) atleast 2H (iii) atmost 2H.

(A) $S = \{HHH, HHT, HTH, THH, HTT, TTT, TTH, THT, THH\}$

(i) $A = \{HHH, HTH, THH\}$

$|(A)| = 3$

$P(A) = \frac{3}{8}$

(ii) $A = \{HHT, HTH, THH, THH\}$

$(A) = 4$.

$\{P(A)\} = \frac{4}{8} = \frac{1}{2}$

(iii) $(A) = 7$.

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

(a) A die is rolled twice. Find the probability of getting the sum of the two faces is
(i) 10 (ii) atleast 10 (iii) atmost 10

(A) Here $|S| = 6^2 = 36$.

$S = (1,1) \; \cdots \; (1,6)$

$\vdots$

$(6,1) \; \cdots \; (6,6)$

(i) $A = \{(4,6)(5,5)(6,4)\} = \frac{3}{36}$

$P(A) = \frac{3}{36}$.

(ii) $B = \{(4,6)\ (5,5)\ (5,6)\ (6,4)\ (6,5)\ (6,6)\}$

$P(B) = \frac{6}{36}$.

(iii) $P(C) = \frac{33}{36} = \frac{11}{12}$.

2.7 $S_1 = \{$ MMMM MMFF FFFF FFMM
MMMF MFMF FFFM FMFM
MMFM MFFM FFMF FMMF
MFMM MFFF FMFF FMMM $\}$

$S_2 = \{0,1,2,3,4\}$

2.3 (a) $A = \{1,3\}$
(b) $B = \{x \mid x$ is a number on a die $\}$;
$= \{1,2,3,4,5,6\}$
(c) $C = \{x \mid x^2 - 4x + 3 = 0\} = \{1,3\}$
(d) $D = \{x \mid x$ is the number of heads when 6 coins are tossed $\} = \{0,1,2,3,4,5,6\}$
So, A & C are same.