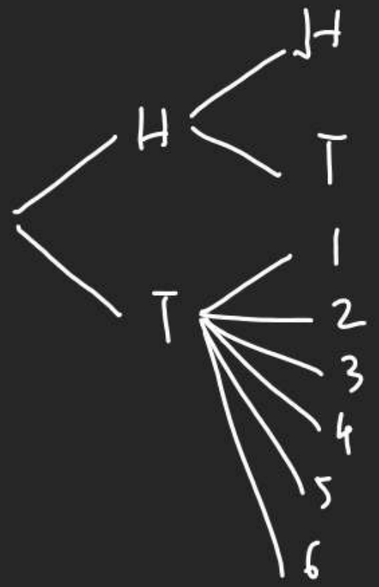
Nishant Jindal

Q A Fair Coin is tossed if it shows head then again a Coin is tossed & if it shows tail then a dice is Rolled find Sample Spaces?



S.S = { HH, HT, T1, T2, T3, T4, T5, T6 }

n(S) = 8

Event :- Subset of Sample Space is Event.

Ex: S.S for dice = {1,2,3,4,5,6}

Coming Even No on dice {2,4,6} is an Event

* Event will come / define within S.S.

Types of Event:

(1) Impossible Event :- Prob. of happenning an Impossible Event = 0

(2) An Event in whose Occurance is not possible.

(2) Sure Event :-

A) An Event in whose occurance is Sure.

(B) Prob. of a Sure Event in 1 Toss of a Coin.

(3) Elementry Event

An Event in whose SampleSpace is Single ton Set.

Ex:- Even Prime No on dice is an Elementry Event

A = {2}

(4)** Equi Probable Event

2 Events are Equiprobable if chance of their occuring is Same.

Ex:→ A) Prob of H or T on toss of a coin is Equiprobable

(B) finding any No from {1,2,3,4,5,6} on throw of a Dice is Equiprobabe

Q getting odd No & getting Prime No on throw of a Dice is Equiprobable?

$A_1 = \{1,3,5\}$ $P(A_1) = \frac{3}{6}$ $A_2 = \{2,3,5\}$ $P(A_2) = \frac{3}{6}$

Yes both are Equiprobable.

(5)** Mutually Exclusive

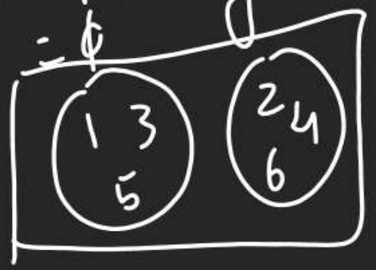
1) A & B are said to be ME Event if $A \cap B = \phi$

Q getting Even No & getting odd No on dice is ME & Equiprobable?

$E = \{2,4,6\} \rightarrow P(E) = \frac{3}{6}$

$O = \{1,3,5\} \rightarrow P(O) = \frac{3}{6}$

$E \cap O$ = Nothing common $= \phi$

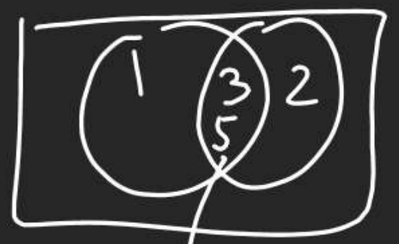


ME & Equiprobable

Q getting odd No & Prime No on Dice is ME?

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

$P = \{2,3,5\}$



Com. Not ME

Nishant Jindal

(6) Exhaustive Events

Exhaustive Event
When Union of Set of Events
give Sample Space.

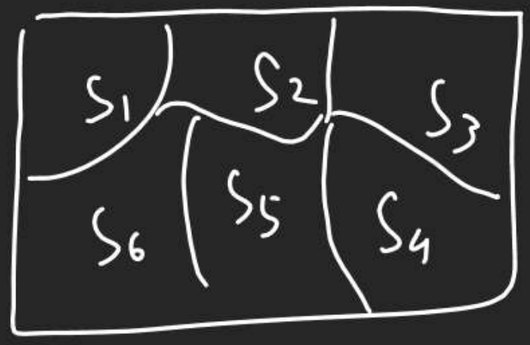
Q getting odd No & getting Event is Exhaustive.

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

$E \cup O = \{1,2,3,4,5,6\}$

$= S.S.$ of Dice

Yes both are ME, Exhaustive & Equiprobable



$S_1 \cup S_2 \cup S_3 \cup S_4 \cup S_5 \cup S_6 = S.S.$

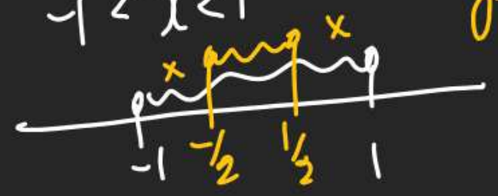
$\therefore S_1, S_2, S_3, S_4, S_5, S_6$ are Exhaustive Events

Q $x \in (-1/2, 1/2)$ is Exhaustive Event if $x^2 - 1 < 0$?

$x^2 - 1 < 0$ (given)

$(x-1)(x+1) < 0$

$-1 < x < 1$



given set $x \in (-1/2, 1/2)$ is not Exhaustive for $x^2 - 1 < 0$

Axiomatic Definations of Probability.

If a Random Experiment Results in "n" ME, Equally Likely & Exhaustive Events out of which "m" Events are in Favour of Event "A" then Prob. of occurance of Event A is

$$P(x) = \frac{\text{Favourable Cases}}{\text{Total Cases}}$$

$$P(x) = \frac{m}{n}$$

So $P(A) = \frac{m}{n}$

Rk (1) m = Fav. Case

$$0 \le m \le n$$

(2) $0 \le m \le n$

$$0 \le \frac{m}{n} \le 1$$

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

(3) If m is Fav. case

$n-m$ = non Fav. case

$P(\bar{A})$: Prob of not happenning of A.

$$P(\bar{A}) = \frac{\text{Non Fav.}}{\text{Total}} = \frac{n-m}{n} = 1 - \frac{m}{n} = 1 - P(A)$$

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

(4) $P(A) + P(\bar{A}) = 1$

हर Q सको Solve करने के 2 Method होते। A के Rule से या Ulta $\bar{A}$ के Rule से

(5)** Odds in Favour & Odds against

Odd in Fav. = Non Fav. में Fav. का होना

Odds against = Fav. में non Fav. का होना

(A) $\text{Odds in Fav.} = \frac{\text{Fav.}}{\text{Non Fav.}} = \frac{m}{n-m}$

(B) $\text{Odds against} = \frac{\text{Non Fav}}{\text{Fav.}} = \frac{n-m}{m}$

Odd in Fav. of India's win. are 3:5

⇒ Implies chance of India's win in 3. & chance of India's loss in 5

(C) $\text{Odds in Fav} = \frac{m}{n-m}$

$\text{odd in Fav.} = \frac{m/n}{\frac{n-m}{n}} = \frac{P(A)}{P(\bar{A})}$

$\text{Odds against} = \frac{P(\bar{A})}{P(A)}$

Nishant Jindal

Q If 2 dices are thrown then

A) Prob. of Doublet?

$\{(1,1),(2,2),(3,3)(4,4)(5,5)(6,6)\} = \frac{6}{36} = \frac{1}{6}$.

(B) $\{$Prob. of getting Sum $= 3\} = \frac{2}{36}$.

(C) $\{$Prob $\_\_\_\_\_ = 4\} = \frac{3}{36}$

$(1,3)(3,1)(2,2)$

(5) $\{$ $\_\_\_\_\_ = 5\} = \frac{4}{36}$

(6) $\{$ $\_\_\_\_\_ = 6\} = \frac{5}{36}$

(7) $\{$ $\_\_\_\_\_ = 7\} = \frac{6}{36}$

(8) $\{$ $\_\_\_\_\_ = 8\} = \frac{5}{36}$

(9) $\{$ $\_\_\_\_\_ = 9\} = \frac{4}{36}$

(10) $\{$ $= 10\} = \frac{3}{36}$

$P(1) = \frac{2}{36}$

$P(12) = \frac{1}{36}$

(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)

$$P(X) = \begin{cases} 0 & X = 1 \\ \frac{X-1}{36} & 2 \le X \le 7 \\ \frac{13-X}{36} & 8 \le X \le 12 \end{cases}$$

Nishant Jindal

Q 7 Colored Boxes with 7 Colored Balls.

Are given

$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

1 Ball can be put in 1 Box

(1) What is the Prob. that No ball is going in Box. of same color.

(1) $n(S) = \lfloor 7$

(2) Fav. Cases = Dearrangement of 7 Balls.

$$= D(7) = \lfloor 7 - \frac{\lfloor 7}{\lfloor 1} + \frac{\lfloor 7}{\lfloor 2} - \frac{\lfloor 7}{\lfloor 3} + \frac{\lfloor 7}{\lfloor 4} - \frac{\lfloor 7}{\lfloor 5} + \frac{\lfloor 7}{\lfloor 6} - \frac{\lfloor 7}{\lfloor 7}$$

(Pn1 Last)

$$P(A) = \frac{\lfloor 7\left(\frac{1}{\lfloor 2} - \frac{1}{\lfloor 3} + \frac{1}{\lfloor 4} - \frac{1}{\lfloor 5} + \frac{1}{\lfloor 6} - \frac{1}{\lfloor 7}\right)}{\lfloor 7} \text{ Ans}$$

(2) Prob of Balls when Exactly 4 Balls will go in their Own Colored Box.

$$P(B) = \frac{{}^{7}C_4 \times 1 \times D(3)}{\lfloor 7}$$

$$= \frac{{}^{7}C_4 \times \left(\lfloor 3 - \frac{\lfloor 3}{\lfloor 1} + \frac{\lfloor 3}{\lfloor 2} - \frac{\lfloor 3}{\lfloor 3}\right)}{\lfloor 7}$$

$$= \frac{{}^{7}C_4 \times \lfloor 3\left(\frac{1}{2} - \frac{1}{6}\right)}{\lfloor 7} = \frac{7 \cdot 6 \cdot 5}{1 \cdot 2 \cdot 3} \times \frac{2}{6} \times \frac{1}{\lfloor 7}$$

Nishant Jindal

Q There are 6 Married Couples & We have to Select 4 person out of these 6 Couples

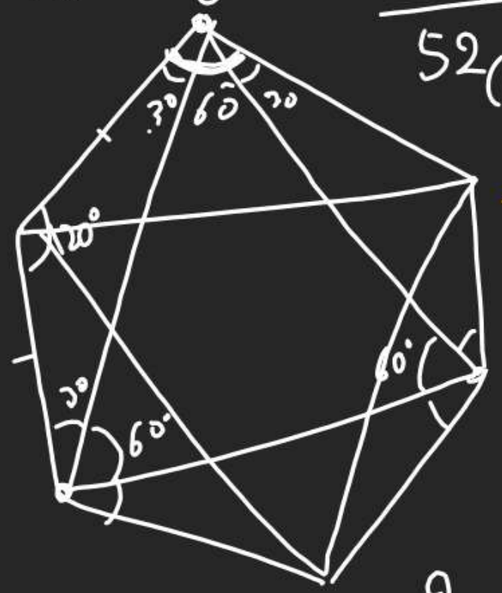
(1) Find Prob. of getting Exactly one couple.

$$P(A) = \frac{{}^6C_3 \times {}^3C_1 \times {}^2C_1 \times {}^2C_1}{{}^{12}C_4}$$

(2) P(getting atleast one couple)

$$P(B) = \frac{{}^6C_3 \times {}^3C_1 \times {}^2C_1 \times {}^2C_1 + {}^6C_2}{{}^{12}C_4}$$

Q 3 Vertices of Regular hexagon are selected randomly Find the Prob. of getting Eq! Δ.



$$P(A) = \frac{2}{{}^6C_3}$$

Q From a Well shuffled deck of Cards 2 Cards are drawn.

(1) Find Prob. that Both Cards are Face Cards → (12)

$$\frac{{}^{13}C_1}{{}^{52}C_1} \times \frac{{}^{13}C_1}{{}^{51}C_1} \quad \frac{13 \times 13}{52 \times 51}$$

$$P(A) = \frac{{}^{12}C_2}{{}^{52}C_2}$$

(2) Find Prob. that one Card is Spade & other is heart.

$$P(B) = \frac{{}^{13}C_1 \times {}^{13}C_1}{{}^{52}C_2} = \frac{13 \times 13 \times 2}{52 \times 51}$$

(3) 2 Cards are drawn one by one without Replacement Find Prob that 1st Card is Spade & 2nd is heart.

$$\frac{{}^{13}C_1}{{}^{52}C_1}$$