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(Lecture 9,10) Events:-

- An event is a subset of Sample Space.
- Particular outcome which is in my interest.

Example:- If we through a dice & interest is in divisible by 3.
Then event is $A = \{3, 6\}$

Complement of S.S - $A = A' = \{1, 2, 4, 5\}$

→ Mutual Exclusive or Disjoint

$A \cap B = \phi$

→ If $A = \{1, 4, 6\}$, $B = \{1, 3, 5\}$ ∴ They don't interfere each other, Don't effect each other

$A \cap B = \{\}$

→ If $A = \{1, 3, 5\}$, $B = \{3, 5\}$

$A \cap B = \{3, 5\}$. Not disjoint

→ Union:-

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

- Counting Sample points:-

Theorem 2.1:- (Multiplication Rule)

- A Dice and A Coin

$n_1 = 6$ ways , $n_2 = 2$ ways

$n_1 \cdot n_2 = 12$ ways

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Theorem 2.2:- more than

If we have two values.

$n_1 \cdot n_2 \cdot n_3 \cdot n_4 \ldots\ldots = ?$

Example 2.16:-

→ 0, 1, 2, 5, 6 and 9

Write four digits even number.

Find out possibilities?

Case 1:- for 0 at Unit

Tho.	Hun.	Ten	Unit
5	4	3	0

$n_1 = 1, n_2 = 5, n_3 = 4, n_4 = 3 = 1.5.4.3 = 60$

Case 2:- for (2,6) at Unit

Tho.	Hun.	Ten.	Unit
$n_2 = 4$	$n_3 = 4$	$n_4 = 3$	$n_1 = 2$

$= 4.4.3.2 = 96$

Total possibilities = $60 + 96 = \underline{156}$

Definition 2.7:-

Arrangement of Elements:-

abc Arrange them to all possibilities:-

a, b, c
a, c, b
b, c, a
b, a, c
c, a, b
c, b, a

H T U

$3 . 2 . 1 = 6$

Formula: $n(n-1)(n-2) = 6$

$\downarrow$

$n! = 3!$

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If we want to find Arrangement for 2 Digits from four then we will count upto 2!

$$\frac{n!}{(n-r)!} = \frac{4!}{(4-2)!} = \frac{4!}{2!} = \frac{4 \cdot 3 \cdot 2!}{2!} = 12$$

Theorem 2.4:-

Formula:- $${}^{n}P_{r} = \frac{n!}{(n-r)!}$$

Example- If we want to divide 3 Awards Among 40 graduates!

$$\frac{40!}{(40-3)!} = \frac{40!}{37!} = \frac{40 \cdot 39 \cdot 38 \cdot 37!}{37!} = 59280$$

→ In case of Circle, we will count factorial upto (-1) from total. Formula :- $(n-1)!$

Example- 8 people are sitting in Circle. Find out possible Arrangements?

We will calculate = 7!

Theorem 2.5:- If we want to divide in groups:-

$$\text{Formula} = \frac{n!}{n_1! \cdot n_2! \cdot n_3!}$$

Example.. Divide 10 Students in 3 groups.

$$\frac{10!}{3! \cdot 3! \cdot 4!} = ?$$

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Combination:-

Order & Arrangement does not matters.

Object = n

at a time r = 2

$$nC_r = \frac{n!}{r!(n-r)!}$$