Lecture 4 (Gr 25-27)

01 August 2022 10:32

Summary

- Sample space
- Event
- Probability function
- $P(E) = \frac{\#(E)}{\#(S.S.)}$ if outcomes are equally likely → classical

  $P(E)$ → relative frequency

Todays lecture

How we define P when S.S. is infinite?

Experiment:- Choosing a random number from $[0,1]$.

S.S. $[0,1]$ ⟶

$P(\text{getting a number} = 0.5) = 0$

If $P(\text{single point}) = a$

then $P(a_1 \cup a_2 \cup a_3 \cup a_4 \cup \dots \cup a_N) = \sum_{i=1}^{N} P(a_i) = Na$

I can always choose N large enough so that $Na > 1$.

Note:- In such cases when S.S. is infinite we are going to talk about

$P(\text{number in the interval } [a,b]) =$ length of the interval $[a,b]$

$(b-a)$

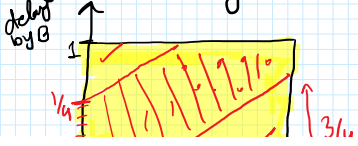
If your original interval is $[A\ B]$

then $P(\text{a no. in the interval } [a,b] \subseteq [A,B]) = \frac{b-a}{B-A}$

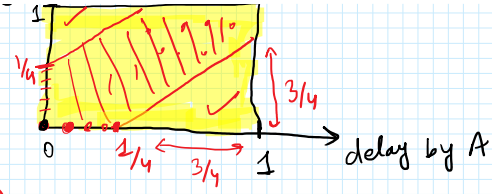
Que A & B decided to meet at a fixed point with a delay of 0 to 1 hour. The first to arrive will wait for 15 minutes & then will leave, if the other is not yet arrived.

What is the probability that they will meet?

Soln Yellow portion represents — all possible



Soln Yellow portion represents — all possible delays.



Red → favourable outcomes

∴ P(they will meet) = area of red portion

= 1 − 2* area of yellow triangle

$= 1 - 2 * \frac{1}{2} \times \frac{3}{4} * \frac{3}{4}$

$= \frac{7}{16}$ Ans.

Que:- How many even four digit numbers can be formed from the digits 0, 1, 2, 5, 6 and 9 if each digit is used only once?

Soln Case I

3	4	5	0

↓ fix 0 here

3 * 4 * 5 = 60 ✓

Case II unit place ≠ 0

			2 or 6
↓ 4	↓ 4	↓ 3	↓ 2

4 × 4 × 3 × 2 = 96 ✓

∴ 156 Ans

Que 3 different awards are to be given to a class of 25 students. What are the possible no. of ways if each student can get 1 award?

$25 C_3$ $25 P_3$ $25 C_1 \times {}^{24}C_1 \times {}^{23}C_1$

25 × 24 × 23 ↓ 25 × 24 × 23

Que:- A president and a vice president for a club with 50 people. How many choices of officers are possible

(a) if there are no restrictions.

$50P_2$

(b) A will serve only if he is the president.

$50 * 48 = 2400$

Case I when A is president → 49 ways to choose VP

when A is not president → $49 * 48$

$\therefore 49 + 49 * 48 =$ [illegible]

(c) B and C will serve together or not at all.

$1 + 48 * 47$ ✗

$2 + 48 * 47$ ✓