PPD - Unit 1

Counting principle

* **Permutation of n objects :-**

taken all at a time $= n!$

taken r at a time $= p(n, r) = \dfrac{n!}{(n-r)!}$

* **Per Circular permutation of n objects :-**

clockwise & anticlockwise order is diff.

$$= p(n) = (n-1)!$$

clockwise & anticlockwise order is same.

$$= p(n) = \dfrac{(n-1)!}{2!}$$

* **Permutation with repetition**

total permutation $= \dfrac{n!}{n1! \, n2! \, n3! \cdots}$

circular permutation $= \dfrac{(n-1)!}{n1! \, n2! \, n3! \cdots}$

PPD - Unit 2

Principles of inclusion and exclusion.

* **Principles of inclusion and exclusion theorem**

a) $|A \cup B| = |A| + |B| - |A \cap B|$

b) $|A \cap B| \leq \min(|A|, |B|)$

c) $|A \setminus B| = |A| - |A \cap B|$

d) $|A^c| = |U| - |A|$

e) $|A \oplus B| = |A \cup B| - |A \cap B|$

f) $|A \times B| = |A| \times |B|$

* Dearrangement Theorem
no. of dearrangements: $(!n) =$

$$!n = n! \left(1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \dots + (-1)^n \frac{1}{n!}\right)$$

* Combination =

$$C(n,r) = \binom{n}{r} = \frac{n!}{r!\,(n-r)!}$$

PPD – Unit 3

Probability

* Basic probability of an event $(A) =$

$$P(A) = \frac{n(A)}{n(s)}$$

* Non-negativity =
$$P(E) \geq 0$$

* Normalization =
$$P(s) = 1$$

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

* Conditional probability

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

A is happening, B happed already

* Bayes Theorem =
$$P(A|B) = \frac{P(B|A)\,P(A)}{P(B)}$$

* Law of total probability =
$$P(A) = P(B_1)\,P(A|B_1) + P(B_2)\,P(A|B_2) + \ldots + P(B_n)\,P(A|B_n)$$

PPD - Unit 4
Random Variables and Mathematical Expectation

* Expectation (mean) =
$$E(x) = \sum x\, P(x)$$

* Variance =
$$Var(x) = E(x^2) - (E(x))^2$$

* Standard Deviation =
$$SD(x) = \sqrt{Var(x)}$$

PPD - Unit 5
Discrete & Continuous Probability Distribution

* Binomial Probability Mass Function (PMF) =
$$P(X=x) = \binom{n}{x} p^x\, q^{n-x}$$

* Mean of Binomial PMF =
$$E(x) = np$$

* Variance of Binomial PMF =
$$Var(x) = npq$$

⋆ Standard Deviation of Binomial PMF =
$$\sigma = \sqrt{npq}$$

⋆ Poisson Distribution Formula =
$$P(x=r) = \frac{e^{-\lambda} \lambda^r}{r!}$$
$$0$$

⋆ Formula for z-score in Normal Distribution =
$$z = \frac{x - \mu \leftarrow \text{mean}}{\sigma \leftarrow \text{standard deviation}}$$

* Mean in continuous uniform distribution =
$$\mu = \frac{a+b}{2}$$

⋆ Variance in continous uniform distribution =
$$\sigma^2 = \frac{(b-a)^2}{12}$$