

# **ADHIKAANSH ACADEMY (IITJEE NEET IX X XI XII)**

**RUN BY:**

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# **MATHS NOTES (CLASS 12<sup>TH</sup>)**



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# Key Notes

## Chapter-13

### Probability

The salient features of the chapter are –

- The conditional probability of an event E, given the occurrence of the event F is given by

$$P(E|F) = \frac{P(E \cap F)}{P(F)}, P(F) \neq 0$$

$$0 \leq P(E|F) \leq 1,$$

$$P(E'|F) = 1 - P(E|F)$$

$$P((E \cup F)|G) = P(E|G) + P(F|G) - P((E \cap F)|G)$$

- $P(E \cap F) = P(E)P(F|E), P(E) \neq 0$   
 $P(E \cap F) = P(F)P(E|F), P(F) \neq 0$

$$P(E \cap F) = P(E)P(F)$$

- $P(E|E) = P(E), P(E) \neq 0$   
 $P(F|E) = P(F), P(E) \neq 0$

- **Theorem of total probability:**

Let  $\{E_1, E_2, \dots, E_n\}$  be a partition of a sample space and suppose that each of  $E_1, E_2, \dots, E_n$  has non zero probability. Let A be any event associated with S, then

$$P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + \dots + P(E_n)P(A|E_n)$$

- **Bayes' theorem:** If  $E_1, E_2, \dots, E_n$  are events which constitute a partition of sample space S, i.e.  $E_1, E_2, \dots, E_n$  are pairwise disjoint and  $E_1 \cup E_2 \cup \dots \cup E_n = S$  and A be any event with

non-zero probability, then, 
$$P(E_i|A) = \frac{P(E_i)P(A|E_i)}{\sum_{j=1}^n P(E_j)P(A|E_j)}$$

- A random variable is a real valued function whose domain is the sample space of a random experiment.
- The probability distribution of a random variable X is the system of numbers

# Key Notes

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1          2                          n

1          2                          n

Where,  $p_i > 0, \sum_{i=1}^n p_i = 1, i = 1, 2, \dots, n$

- Let X be a random variable whose possible values  $x_1, x_2, x_3, \dots, x_n$  occur with probabilities  $p_1, p_2, p_3, \dots, p_n$  respectively. The mean of X, denoted by  $\mu$  is the number  $\sum_{i=1}^n x_i p_i$ . The mean of a random variable X is also called the expectation of X, denoted by E (X).

- Let X be a random variable whose possible values  $x_1, x_2, x_3, \dots, x_n$  occur with probabilities  $p(x_1), p(x_2), \dots, p(x_n)$  respectively. Let  $\mu = E(X)$  be the mean of X. The variance of X, denoted by Var (X) or  $\sigma_x^2$  is defined as  $\sum_{i=1}^n (x_i - \mu)^2 p(x_i)$  or equivalently

$\sigma_x^2 = E (X - \mu)^2$ . The non-negative number,  $\sigma_x = \sqrt{\text{Var} (X)} = \sqrt{\sum_{i=1}^n (x_i - \mu)^2 p(x_i)}$  is called the standard deviation of the random variable X.

$$\text{Var} (X) = E (X^2) - [E(X)]^2$$

- Trials of a random experiment are called Bernoulli trials, if they satisfy the following conditions:
  - (i) There should be a finite number of trials.
  - (ii) The trials should be independent.
  - (iii) Each trial has exactly two outcomes: success or failure.
  - (iv) The probability of success remains the same in each trial.

For Binomial distribution  $B(n, p), P(X=x) = {}^n C_x q^{n-x} p^x, x = 0, 1, \dots, n (q = 1 - p)$

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