



RAMA  
UNIVERSITY

[www.ramauniversity.ac.in](http://www.ramauniversity.ac.in)

## FACULTY OF ENGINEERING & TECHNOLOGY

Dr. Vinod Kumar Yadav  
Assistant Professor in Mathematics  
Rama University Uttar Pradesh, Kanpur

# LECTURE- 20

BSc (AG)  
2<sup>nd</sup> Year , IIIrd Sem.  
Statistical Methods  
AES-213



Dr. Vinod Kumar Yadav  
Assistant Professor in Mathematics  
Rama University Uttar Pradesh, Kanpur

# Outline of Lecture

## Outline of lecture

- Poisson Distribution
- Introduction
- Definition & Formula
- Properties of Poisson Distribution
- Applications of Poisson Distribution
- Suggested Readings & References



## Introduction & Definition

- Poisson distribution was discovered by Mathematician Poisson in 1837.
- Let  $X$  is a random variable,  $n$  is a total number of trials,  $p$  is a probability of success.
- If  $n$  is a large and  $p$  is very small then it is called Poisson distribution.
- Poisson distribution is the limiting form of binomial distribution when,

$$n \rightarrow \infty, \quad p \rightarrow 0 \text{ such that } np = \text{finite number}$$

Poisson distribution is defined as-

$$P(r) = \frac{e^{-m} m^r}{r!}$$

where,

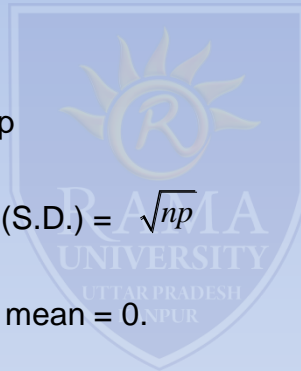
$$r = 0, 1, 2, 3, 4, \dots$$

$P(r)$  = probability of event will happen exactly  $r$  times.

This is called Poisson distribution.

## Properties of Poisson distribution

- In Poisson distribution there is only one parameter  $m$ .
- In Poisson distribution, mean =  $m = np$
- In Poisson distribution, variance =  $m = np$
- In Poisson distribution standard deviation (S.D.) =  $\sqrt{np}$
- In Poisson distribution first moment about mean = 0.
- In Poisson distribution, always mean = variance.



## Application or uses of Poisson distribution

- It is used in distribution such as number of telephone calls received per day in a particular company network (like Airtel, Jio, Vodaphone, etc ).
- .It is used in distribution such as number of patient admit in any hospital in a day.
- It is used in number of accidents in a city on a particular road.
- It is used in number of printing mistakes in any page of any book.

## Example

In a Poisson distribution the value of standard deviation is 25 then find the value of mean.

Solution: by using formula

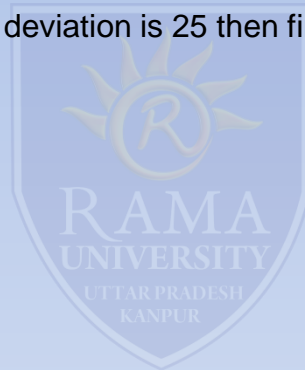
$$\text{S.D.} = 25$$

$$\text{Variance} = 25 \times 25$$

$$= 625$$

But in Poisson distribution

$$\text{Mean} = \text{Variance} = 625.$$



# Suggested Readings & References

## Suggested Readings & References

- 1) Statistical Methods: P.N. Arora, Sumeet Arora & S. Arora; S. Chand & Company Ltd.
- 2) Fundamental of Mathematical Statistics: S.C. Gupta & V. Kapoor; Sultan Chand & Sons.
- 3) Statistics: M.R. Spiegel; Schaum's Outline Series, Mc-Graw Hill Publication.
- 4) Advanced Engineering Mathematics: Erwin Kreyszig; John Wiley & Sons Inc.
- 5) Elements of Statistics: J.P. Chauhan & S. Kumar; Krishna Publication.



The logo of Rama University is a shield-shaped emblem. At the top is a sun with rays. Below the sun is a circle containing the letter 'R'. Underneath the circle, the word 'RAMA' is written in a serif font, followed by 'UNIVERSITY' in a smaller font. At the bottom of the shield, the word 'Rama' is written in a script font.

**\* THANK YOU \***