PES University, Bangalore

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UE19CS203 – STATISTICS FOR DATA SCIENCE

Unit-2 - Random Variables

QUESTION BANK

Derivations of Bernoulli & Binomial Distribution

1. A biased die is thrown thirty times and the number of sixes seen is eight. If the die is thrown a further twelve times find,

   a) The probability that six will occur exactly twice.
   b) Expected Number of sixes.
   c) Variances of the Number of sixes.

   Solution:

   a) The probability that six will occur exactly twice.

   Let X be defined by the number of sizes seen in twelve throws.

   Then, $X \sim Bin(12, p)$, where

   $$p = \frac{8}{30} = \frac{4}{15} = 0.267$$

   Since, $X \sim Bin\ (12, \frac{4}{15})$

   $$P\ (X = 2) = \frac{12!}{2!\ (12-2)!}\ (0.267)^2\ (1-0.267)^{12-2}$$

   $$= 0.211$$

   b) Expected Number of sixes.

   $$E(X) = np = 12 * 0.267 = 3.19 \sim 3.2$$

   c) Variances of the Number of sixes.

   $$V(X) = npq = 12 * 0.267 * 0.733 = 2.348$$

2. Consider a binomial distribution, the mean is 15 and variance is 10. What is the parameter n?

Solution:

Given that mean, $np = 15$
Variance, $npq = 10$

To find n,

$$np(1-p) = 10$$

$$15(1-p) = 10$$

$$1-p = \frac{2}{3}$$

$$p = 1 - \frac{2}{3} = \frac{1}{3}$$

$$So, n * \left(\frac{1}{3}\right) = 15$$

$$n = 45$$