# Probability & Random Variable Assignment-1

Chandrajeet Singh
BT22BTECH11005

Question:
It is known that 10 % of certain articles manufactured are defective.What is the probability that in a random sample space of 12 such articles,9 are defective?

Solution:
The repeated selections of articles in a random sample space are bernauli trails.Let X denote the number of times of selective defective article in random sample space of 12 articles.

Here, 0

| Parameters | Value | Description |
|---|---|---|
| $n$ | 12 | Number of Articles |
| $p$ | 0.1 | Probability of Defective Articles |
| $q$ | 0.9 | Probability of Non-Defective Articles |

TABLE 0

The Binomial distribution of X is given by,

$$P(X = r) = {}^{n}C_{r} p^{r} q^{n-r} \tag{1}$$

To calculate the probability of getting exactly 9 defective articles in a sample of 12 is:

$$P(X = 9) = {}^{12}C_{9} \left(\frac{1}{10}\right)^{9} \left(\frac{9}{10}\right)^{3} \tag{2}$$

$$= \frac{12!}{9!3!} \left(\frac{1}{10}\right)^{9} \left(\frac{9}{10}\right)^{3} \tag{3}$$

$$= \frac{12 \times 11 \times 10 \times 9!}{9! \times 3 \times 2 \times 1} \left(\frac{1}{10}\right)^{9} \left(\frac{9}{10}\right)^{3} \tag{4}$$

$$= 22 \frac{9^{3}}{10^{11}} \tag{5}$$

$$\tag{6}$$

Hence, Probability of getting 9 defective articles is $22 \left(\frac{9^{3}}{10^{11}}\right)$