

# Assignment3(Q.11.16.3.13)

## NCERT EXAMPLER

### Probability And Random Processes

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#### I. Q.11.16.3.13

A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the Probability that

- (a) All the three balls are white
- (b) All the three balls are red
- (c) One ball is red and two balls are white

#### **Solution:**

Using multinomial distribution formula :

$$P(X_1 = x_1, X_2 = x_2, \dots, X_k = x_k) = \frac{x_1! \cdot x_2! \cdot \dots \cdot x_k!}{n!} \cdot p_1^{x_1} \cdot p_2^{x_2} \cdot \dots \cdot p_k^{x_k}$$

Where:

$n$  is the total number of trials (in this case, the number of balls drawn).

$k$  is the number of classes (in this case, the number of ball colors).

$x_1, x_2, \dots, x_k$  are the numbers of observations for each class.

$p_1, p_2, \dots, p_k$  are the probabilities of drawing each class of ball. (0)

We know that there are 8 red balls and 5 white balls in the bag.

Let,

$$p_1 = P(W) = 5/13$$

$$p_2 = P(R) = 8/13$$

a) All three balls are white:

$$P(\text{All three balls are white}) = \frac{3!}{3! \cdot 0!} \left(\frac{5}{13}\right)^3 \left(\frac{8}{13}\right)^0 = 0.05689$$

(b) All three balls are red:

$$P(\text{All three balls are red}) = \frac{3!}{0! \cdot 3!} \left(\frac{5}{13}\right)^0 \left(\frac{8}{13}\right)^3 = 0.233045061$$

(c) One ball is red and two balls are white:

$$P(\text{One ball is red and two balls are white}) = \frac{3!}{2! \cdot 1!} \left(\frac{5}{13}\right)^2 \left(\frac{8}{13}\right)^1 = 0.273099681$$